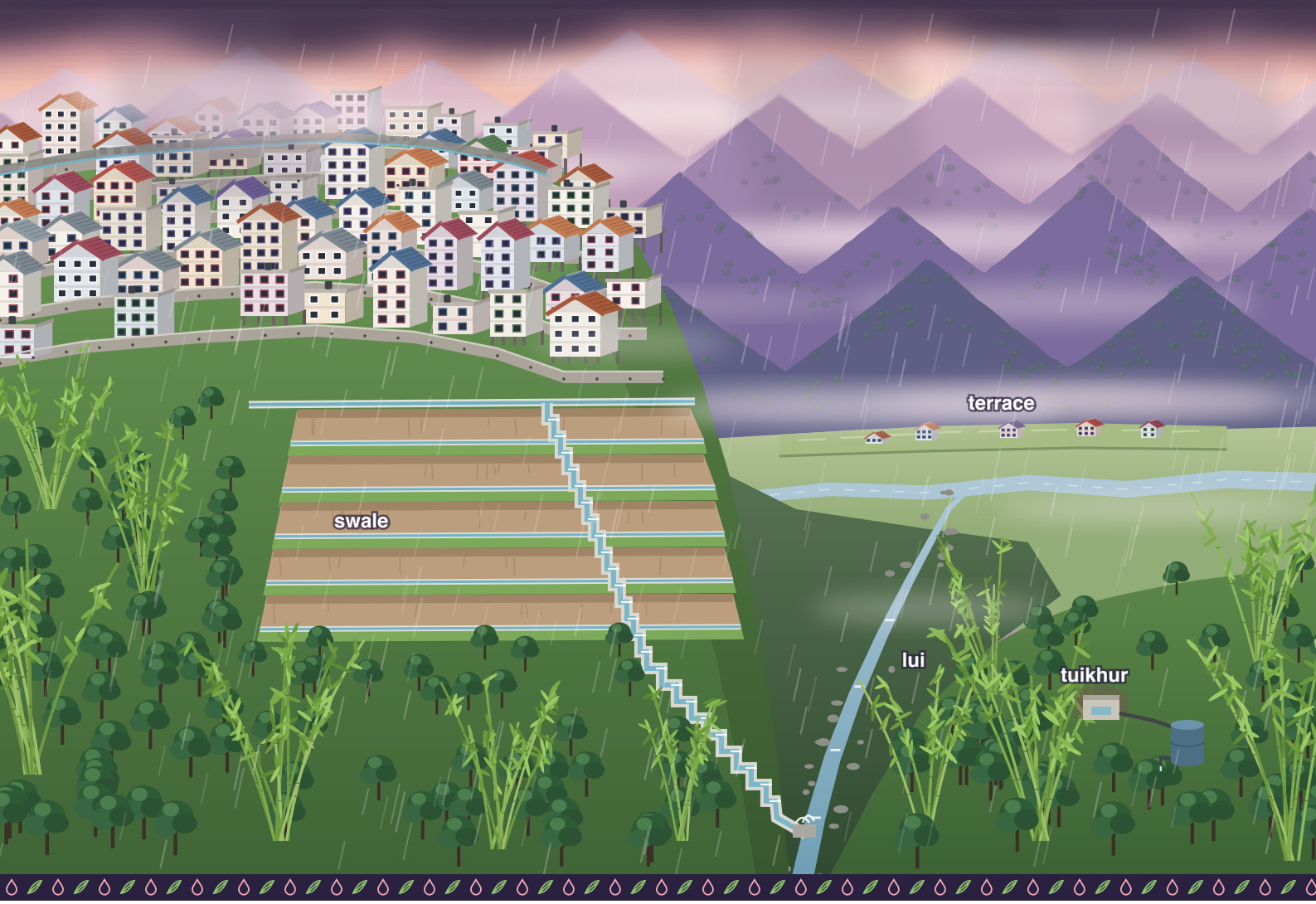
MIZORAM

Ruahtui Luanna Design Kaihhruaina Bu

Ruahtui luanna system ruahmanna, design, siamna, kalpui leh enkawl dan tur standard



Humhalh | Khawl | Dah rih | Luan tir | Enkawl

Draft v1.0

November 2026

Buatsaihtu

Neer.

He draft chungchang

Dinhmun. Hei hi *Mizoram Ruahtui Luanna Design Kaihhruaina Bu* Draft v1.0 a ni. Neer-in Mizoram tan ruahtui design standard rawtna atan a buatsaih a ni.

Pawm a ni lo. He Kaihhruaina Bu hi Mizoram sawrkar, a Governor, a Council of Ministers emaw a Legislative Assembly emaw, a Department, local body emaw agency reng rengin pawm a ni lo, notify (Gazette-a tarlan) a ni lo, thlawp a ni hek lo. A bik takin, Urban Development & Poverty Alleviation Department (UD&PA), Aizawl Municipal Corporation, a Board of Councillors, a Local Council-te emaw a Ward Committee-te, Lunglei Municipal Council (LMC), Aizawl Development Authority (ADA, hman hlui), Landslide Policy Committee for Aizawl City emaw Aizawl Smart City Ltd-in pawm a ni lo, notify a ni lo, thlawp a ni hek lo. Lai, Mara emaw Chakma Autonomous District Council-te, Village Council reng reng, Mizoram State Water Resources Council (MISWARC), Water Resources Development and Management Authority (WARDMA) emaw District, Village emaw Local Water Resources Committee reng reng, River Rejuvenation Committee, emaw Mizoram River Protection Authority (din a nih hmuh a ni lo)-in pawm a ni hek lo, notify a ni hek lo, thlawp a ni hek lo. Pawl hming a tarlanna apiangah, entirnan Public Works Department (PWD), Public Health Engineering Department (PHED), Irrigation & Water Resources Department (IWRD), State Investment Programme Management and Implementation Unit (SIPMIU), Disaster Management & Rehabilitation Department (DM&R), Mizoram State Disaster Management Authority (MSDMA) emaw District Disaster Management Authority, Mizoram Pollution Control Board (MPCB), Environment, Forests & Climate Change Department (EF&CC), Land Revenue & Settlement Department, Directorate of Geology and Mineral Resources, Mizoram Remote Sensing Application Centre (MIRSAC), Directorate of Science and Technology (DST), Young Mizo Association (YMA), Deputy Commissioner, Gauhati High Court (Aizawl Bench), National Green Tribunal (NGT) emaw Supreme Court, emaw sawrkar laipui pawl emaw vantlang pawl dang, entirnan Central Water Commission (CWC), India Meteorological Department (IMD), Central Ground Water Board (CGWB), Central Pollution Control Board (CPCB), CAG (Comptroller and Auditor General of India), National Institute of Hydrology (NIH), NEEPCO, National Highways and Infrastructure Development Corporation Ltd (NHIDCL), National Disaster Management Authority (NDMA) emaw Ministry of Environment, Forest and Climate Change (MoEF&CC), emaw zirchianna pawl, sum puktu emaw thurawn petu, entirnan Mizoram University (MZU), Asian Development Bank (ADB) emaw GeoHazards International (GHI), he Kaihhruaina Bu hi pawm a nih chuan chu pawl hna tur chauh a sawi a ni. Chu pawl chuan chu hna chu a remti tawh tihna a ni lo. Pawl thuziak a tarlan avangin he Kaihhruaina Bu hi chu pawl thuziak a ni chuang lo.

Dan anga thuneihna a nei lo. Competent authority-in (thlak danglamna nen emaw, nei lovin emaw) a pawm hma chu, he Kaihhruaina Bu hian dan anga thuneihna a nei lo. Chu hma chu, Aizawl Municipal Corporation Building Regulations, 2012, siam ṭhat angin (AMCBR); Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 (SD&SM); Mizoram Municipalities Act, 2007 leh a hnuaia siam rule-te; Mizoram (Village Councils) Act, 2025; Mizoram Water Resources (Management and Regulation) Act, 2024; Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih chuan leh enact a nih ang zelin, enact a nih finfiah a ni lo; Master Plan for Aizawl: Vision 2030; Corporation leimin hlauhawm map (landslide hazard map)-te; court leh tribunal order-te; leh phalna condition hman mek-te hi hman zel tur a ni.

Mizoram, a Village Council-te leh Sixth Schedule. State-ah hian dan lam ram (legal geography) chi thum a awm a, he Kaihhruaina Bu hian an thlen dan a inang lo. Mizoram Municipalities Act, 2007 hi "Mizoram State pumah a huam ang, Panchayat emaw Village Council anga puan tawh emaw puan leh tur emaw, a chhunga tel emaw ram erawh chu a huam lo … mahse Sixth Schedule paragraph 20 PART III-a tarlan Mizoram Tribal Areas a huam lo ang" (shall extend to the whole of the State of Mizoram except the area which has been or may hereafter be declared as, or included in, a Panchayat or a Village Council … but shall not extend to the Mizoram Tribal Areas, as referred to in PART III of the paragraph 20 of the Sixth Schedule) (section 1(2)); a hman dan takah pawl pahnih, Aizawl Municipal Corporation leh Lunglei Municipal Council, a thleng. Mizoram (Village Councils) Act, 2025 hi "Municipality-te leh Lai, Mara leh Chakma Autonomous District Council-te thuneihna hnuaia ram tih loh

Mizoram pumah a huam ang" (shall extend to the whole of Mizoram except the areas under the jurisdiction of the Municipalities and the Lai, Mara and Chakma Autonomous District Councils) (section 1(2)); khaw-te leh urban local body nei lo notify a nih town-te a thleng, CAG hmuh danin chung town 13-ah mi 5,950 aṭanga 32,734 thleng an awm. Chhim lama Autonomous District Council pathumte, Lai (Lawngtlai), Mara (Siaha) leh Chakma (Kamalanagar/Chawngte), chanchin tlangzarh angin, hi Act pahnih pawn lamah an awm a, Water Resources Act, 2024 ("Autonomous District Council-te tih loh" (except the Autonomous District Councils)) leh Rivers Bill, 2023 pawn lamah pawh an awm; 74th Amendment ruahmanna-te hi "Sixth Schedule ramah hman a ni lo" (are not applicable in the Sixth Schedule areas), CAG hmuh danin. Corporation chauhin building leh site-development regulation a nei: AMCBR leh SD&SM hi "Aizawl Municipal Council-in a huam ram zawng zawngah" (all the areas covered by the Aizawl Municipal Council) hman a ni (AMCBR reg. 1(2)), State pum huap building regulation hmuh a ni lo va, LMC regulation pawh hmuh a ni lo [TBC]. Village Council ram-ah chuan 2025 Act hian Council hi "State sawrkar-in a siam model building bye-laws chu pawm leh zawm tir" (adopt and enforce the model building bye-laws as may be framed by the State Government) a phal a, District Disaster Management Authority phalna nen, "leimin tihziaawm nan, in sak atan hmun him lo angin hmun ṭhenkhat … puang" (declare certain area … as unsafe site for house construction for mitigation of landslide) a phal bawk (section 13(6)); model bye-laws hmuh a ni lo. District Council ram-ah building emaw drainage regulation hmuh a ni lo: Kamalanagar Town Planning Committee phalna leh no-objection certificate (2018) leh kawng sira in sak tan phalna hmasa (November ni 20, 2020) phut Chakma District Council notice-te, Chakma District Council Village Council-te tan "Village Council ziak phalna tel lovin" (without the written permission from the Village Council) in sak khap 2002 ruahmanna, leh Lai District Council Land Holding and Settlement Act, 2002 te hi hming leh search snippet aṭangin chauh hriat an ni [TBC], leh Mara District Council tan engmah hmuh a ni lo. Chuvangin, Corporation ram pawn lamah chuan, he Kaihhruaina Bu hian State Department hrang hrang leh agency-te hnathawh vantlang hna (kawng, culvert (kawng hnuaia tui kalna), drain (tui luanna), tui pek chhuahna leh luipui hna, Clause 1.5.1(b)) leh a pawmtu pawl reng reng a thleng thei; Village Council ram-ah State-in model building bye-laws a siam hnuah chuan building thar pawh a thleng thei ang; District Council ram-ah chuan District Council-in a pawm loh chuan engmah a thleng lo. Corporation ram pawn lama chhungkua tan chuan he Kaihhruaina Bu hi kaihhruaina (guidance) mai a ni. UD&PA-in AMCBR leh SD&SM siam ṭhatnaah a dah lut thei ang, chungte chu Corporation Board of Councillors-in Municipalities Act section 371 hnuaiah "a hmaa tlangzarh hnuah" (after previous publication) a siam a, UD&PA-in a notify ṭhin; Village Councils Act model building bye-laws-ah pawh drainage annex atan a dah lut thei ang; LMC-in amah regulation ngei hmangin chu chu a pawm thei ang; WARDMA-in Water Resources Act, 2024 section 16(2)(ix) hnuaiah ruahtui khawl khawm a thupek thei ang, Village leh Local Water Resources Committee-te chuan tuikhur (tui chhuahna, spring) catchment (ruahtui luan khawmna hmun) a humhalh thei ang; MSDMA leh District Disaster Management Authority-te chuan leimin tihziaawmna-ah leh Village Council-te hmun him lo puanna phalna pekah a hmang thei ang; leh District Council-in amah instrument ngei hmangin a ram tan a pawm thei ang. Pakhatin mah a pawm lo. Ram record leh ram hman dan (land use) hi Land Revenue & Settlement Department kutah a awm, Corporation ram chhungah pawh, CAG hmuh danin; Village Council-te chuan 2025 Act hnuaiah in hmun an sem; leh District Council ram-ah chuan ram hi District Council hnuaiah a awm [TBC]. He Kaihhruaina Bu hian drainage corridor (tui luanna atana humhalh ram) leh easement (mi ram kal tlanga hman phalna)-te chu master plan-ah a dah hran emaw inremna (agreement) hmangin a humhim emaw a ni; ram lak theih a ni ang tih a ring lo. Sixth Schedule paragraph-te hi he Kaihhruaina Bu tan chhiar a ni lo va, quote pawh a ni lo; ṭhen dan hi a nghawng hmangin sawi a ni, State Act-te huam chin clause leh CAG audit aṭangin.

Hmingte. Pawl, hmun, luipui, gauge leh instrument ṭhenkhat hian statute-ah, thu hnar-ah leh IMD leh CWC station-ah hming emaw ziah dan emaw pakhat aia tam an nei:

- **Aizawl Municipal Council** hi October ni 15, 2015-ah Municipalities Act amendment palina hmangin **Aizawl Municipal Corporation** a lo ni ta. Act thuhmahruai (preface)-in Council din ni chu July ni 1, 2008 a ti a, CAG-in 2010 a ti; thu hnarte a inang lo. Building regulation-te hian 2023 amendment-in hming a thlak thlengin an hmingah "Council" an vawng. Thu hnarte hian Corporation hi "AMC" tiin an ziak a; **he Kaihhruaina Bu hian kimchangin a ziak**, "Aizawl Municipal Corporation" tiin, chumi hnuah "Corporation" tiin, **he Kaihhruaina Bu-ah AMC hi Bung 2, 3 leh 5-a antecedent moisture condition (ruahpui hma lei hnawnna dinhmun) chauh a nih avangin**. "AMC" hi quotation chhungah chauh Corporation hming angin a lang;

- **AMCBR** hi Aizawl Municipal Corporation Building Regulations, 2012, siam ṭhat angin, tan he Kaihhruaina Bu thumal tawi a ni a, a ruahmanna chu "AMCBR reg. 33" tiin sawi a ni. **SD&SM** hi Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 a ni a, 2025 amendment ngeiin a hman thumal tawi a ni a, a ruahmanna chu "SD&SM reg. 27" tiin sawi a ni. Bung inṭawm (shared chapter)-te hian an pahnih hi kawp angin, **AMCBR/SD&SM** tiin, an sawi, site phuar drainage dan-te hi a pahnihnaah a awm avangin. Bung 1 leh 10-a **"MBBL 2016"** hi 2016-a ram pum huap Model Building Bye-Laws a ni a, Mizoram dan a ni lo;
- **Master Plan for Aizawl: Vision 2030** hi Aizawl Development Authority (hman hlui) tan buatsaih a ni a, chu Authority chu "tunah AMC-ah tel tawh" ("now absorbed in AMC") a ni, CAG ziak angin. "Aizawl Master Plan 2030" hi he plan hi a ni a, thuziak hrang a ni lo. A phalna notification hmuh a ni lo; thu hnar pakhatin sawrkarin March 2013-ah phalna a pe a ti a, chu chu finfiah a ni lo; leh 2023-a AMCBR amendment hian online permit system chu regulation-te "leh Master Plan for Aizawl, Vision-2030" (and the Master Plan for Aizawl, Vision-2030) mil lo rawtna reng reng hlam kir turin a siam. He Kaihhruaina Bu hian hman mek plan angin a sawi a, phalna ni tel lovin;
- **Tlawng** hi CWC table-a Dhaleswari a ni; **Tuirial** hi Sonai a ni a, CWC-in a site hi "Turial" tiin a chhuah; **Khawthlangtuipui** hi Karnaphuli a ni a, Bangladesh lamah a luang; **Chhimtuipui** hi Kaladan (CWC table-a Kolodyne) a ni a, Myanmar lamah a luang. Champhai district-a **Tuipui** hi Chhimtuipui nen luipui hrang a ni. Subzone 2(b) tan CWC flood estimation report-a subzone list hian subzone 2(c) luipuite zingah Barak leh "Kalden" a tarlang; "Kalden" hi Kaladan a ni, he Kaihhruaina Bu chhiar danin;
- **Siaha** hi Saiha tiin pawh ziah a ni a, **Lawngtlai** hi IMD gauge list-ah "Lwangtlai" tiin a lang;
- **Hlimen** leh **Melthum** hi Aizawl chhim lam kawnah an awm. August ni 9, 1992-a **South Hlimen** lung laihna (quarry) chim leh May ni 28, 2024-a Cyclone Remal laia Melthum leh Hlimen inkara quarry hman tawh loh chim hi thil thleng hrang an ni. 2013-a lungpui tlak (rockslide) chu **Laipuitlang**-ah a ni a, 1992-ah a ni lo;
- **IMD Meteorological Centre Aizawl** hian State-a IMD gauge-te a vawng; IMD khawpui phêk-ah Aizawl (42726) leh thlawhna tumna hmun (airport) Aizawl-Lengpui (42727) an tarlang. IMD hian district khawpui tam zawkah automatic weather station (AWS) a kalpui a, a list-a automatic rain gauge (ARG) tam zawk hi **"Mz-SWIC"** tia chhuah operator, thu hnar-in a hming kimchang a sawi loh, in a kalpui [TBC];
- **Directorate of Geology and Mineral Resources** (DG&MR) hi chanchinbu-a "Directorate of Geology and Mining" hi a ni, pawl inang, he Kaihhruaina Bu chhiar danin;
- Aizawl kal tlang **NH-6** hi NH-54 hlui a ni a, chanchinbu-in number pahnih hi an hmang;
- CWC flood estimation report-te hian State zawng zawng hi **subzone 2(c), "Barak and others"**-ah an dah a, chu tan CWC-in report a tlangzarh ngai lo. Heng subzone-te hi Belhchian 2A-a he Kaihhruaina Bu-in a ruat ruahtui zone pali (MZ-Z1 aṭanga MZ-Z4 thleng) leh hydrologic sub-area pasarih (MZ-A, MZ-A1, MZ-B, MZ-C, MZ-C1, MZ-D leh MZ-D1) an ni lo va, Bung 7-a tui awmna (waterbody) setback (tui kam aṭanga hmun kalhlen tur) Zone 1 leh 2 pawh an ni lo va, Corporation map-a leimin hlauhawm zone pawh an ni lo va, Rivers Ordinance leh Bill, 2023 hnuaia River Conservation Zone, pakhat mah notify a nih loh, pawh an ni lo; leh
- he Kaihhruaina Bu-ah **"monsoon" leh "monsoon season" hi fûr leh fûr hun, April ni 1 aṭanga October ni 31 thleng ruah tlak hun, tihna a ni**. Chu chu IMD hman dan a ni lo: IMD chuan April leh May hi fûr hma (pre-monsoon) thla angin a chhiar a, south-west monsoon hi a hnuah a lo thleng: 2026-ah June ni 6 vel-ah Mizoram a thleng, chanchin tlangzarh angin, leh Aizawl-a IMD-in a lo thlen (onset) leh a kir leh (withdrawal) ni pangngai hmuh a ni lo [TBC]. He Kaihhruaina Bu fûr hun hi April ni 1-ah a ṭan, kum hnai lama ni chiang nei ruahtui thil thleng thihna tam ber, 2013 Laipuitlang lungpui tlak leh 2024 Cyclone Remal leimin-te, an pahnih hian May-ah, a lo thlen hmaah, an thleng a, May tawp leh June ṭan 2025-a leimin 598-te pawh chutiang bawk (Bung 2).

He Kaihhruaina Bu hian hming hmasa ber a hmang a, a dangte chu thupui, thu hnar emaw station-in an hman lai chuan a vawng. Pawl leh dan hming ṭhenkhat hi hrilhfiah a ngai:

- **AMCBR** hi UD&PA Notification No. B.13017/8/2012-UD&PA, December ni 20, 2012 (Mizoram Gazette Extraordinary Vol. XLII, Issue No. 4, January ni 10, 2013) hmangin tlangzarh a ni a, 2019 Amendment Regulations (No. B.13017/8(2)/2018-UD&PA; objection dawn nana draft tlangzarh chauh chhiar a ni a, Gazette tawp endik tur a ni [TBC]), 2023 (No. B.13017/8/2021-UD&PA/Pt, August ni 14, 2023, August ni 28,

2023 aṭanga hman mek) leh 2025 (No. B.13017/8/2021-UD&PA/Loose, November ni 21, 2025) hmangin siam ṭhat a ni. **SD&SM** hi No. B.13017/75/2016-UD&PA, April ni 4, 2017 (Gazette Extraordinary Vol. XLVI, Issue No. 161, April ni 11, 2017) hmangin tlangzarh a ni a; siam ṭhat a ni em tih hriat a ni lo [TBC]. Corporation Board of Councillors hian Municipalities Act section 371 hnuaiah an pahnih hi a siam a, UD&PA-in a notify ṭhin. SD&SM hian "building permit bakah" (in addition to a building permit) site development permit a phut a, a permit kawng-te chu Corporation **Landslide Hazard Maps** (leimin hlauhawmna map), "2014 emaw a hnu lama Landslide Policy Committee for Aizawl City-in a pawm standard anga siam" (created in 2014 or later to the standards adopted by the Landslide Policy Committee for Aizawl City) nen a phuar a, civil-engineer licensee-te chu "hydrology leh hydraulic chhutna tiamin, drainage structure design" (Design of drainage structures, including hydrology and hydraulic calculations) tan thiamna nei angin a ruat (Schedule I). Building permit hi Corporation online permit system (**OBPAS**), June 2018 aṭanga hman mek, hmangin dil a ni;

- **Aizawl Municipal Corporation** hian Twelfth Schedule hna 18 zinga 15 a nei; "Roads & Bridges, Water supply … leh Fire Services hi hlan a ni lo" (Roads & Bridges, Water supply … and Fire Services were not devolved), leh ram hman dan (land use) hi Land Revenue & Settlement Department-in a enkawl reng, CAG hmuh danin. A **Local Council**-te, veng tin tan pakhat, chuan no-objection certificate an pe a, regulation-te hi "khauh taka zawm" (are strictly observed) an en (AMCBR reg. 15). Vantlang drain zawng zawng leh "vantlang kawng reng reng chhungah, a sirah emaw a hnuaiah emaw" (in, alongside, or under any public street) drain zawng zawng hi a ta a ni (Municipalities Act section 289(1)). **LMC** hi November 2021-ah din a ni a, March ni 29, 2023-ah a vawikhatna atan thlan a ni, CAG ziak angin;
- **UD&PA** hian Corporation regulation-te a notify a, 2019 Allocation of Business Rules hnuaiah urban area master plan leh town development plan-te a vawng, CAG-in a quote angin. Mizoram Urban and Regional Development Act, 1990 hi he Kaihhruaina Bu-in a hming chauh a hriat [TBC];
- **PWD** hian State kawng-te, Corporation hnena hlan ngai loh, a enkawl a, chuvangin a kawng sir drain-te pawh a hman dan takah a enkawl, chung drain-te chu statute angin Corporation ta ni mah se; he Kaihhruaina Bu hian an inbelhna hi a sawi a, a chinfel lo. **SIPMIU** hian State ek tui tihfaina plant (STP) awm chhun, Chite-a mi, a sa a, **PHED** hian sewerage leh bio-digester-te a vawng; **IWRD** hi WARDMA member secretary a ni a, he Kaihhruaina Bu-ah State leihnuai tui (groundwater) agency angin sawi a ni, State observation well network hmuh a ni lo na a, hmuh chhun chu CGWB ta, a North Eastern Region-a mi a ni; **EF&CC** hian riverine reserve leh wetland-te a vawng;
- **Water Resources Act, 2024** (Act No. 1 of 2024) hian MISWARC, WARDMA, Deputy Commissioner-te hnuaia District Water Resources Committee (DWRC) leh Village Council President-te leh Local Council Chairman-te hnuaia Village leh Local Water Resources Committee (VWRC leh LWRC) a din a, tuikhur, dil tê (pond), dil (lake) leh "tui khawl khawmna hmanraw pangngai" (traditional water harvesting structures) chu "khawtlang tui hnar" (community water resources) zingah a chhiar. MISWARC leh WARDMA dinna notification-te hmuh a ni lo [TBC];
- **MSDMA** hi State disaster management authority a ni; a notification hmuh a ni lo [TBC]. He Kaihhruaina Bu-a leimin leh thihna zat quote-te hi **DM&R** ta, chanchin tlangzarh angin, emaw CAG ta an ni. District Disaster Management Authority-te hi kimchangin ziah an ni;
- **Gauhati High Court (Aizawl Bench)** leh **NGT** hian State tlang pang leh tui-te chungchang an la a: July 2024-ah High Court-in Bawngkawn–Durtlang kawng sir lehlam leh lehlamah sak thar a khap, chanchin tlangzarh angin (case number hmuh a ni lo [TBC]); January ni 27, 2021-ah riverine reserved forest-te innghahna 1965 notification chu a paih (quash), chanchin tlangzarh angin; leh NGT-a OA-te (OA 593 of 2017, OA 673 of 2018 leh OA 606 of 2018)-a State report-te hian State drain-a ek tui an chhinchhiah. He Kaihhruaina Bu hian court leh tribunal order-te hi an dinhmun nen a tarlang; leh
- clause inṭawm (shared clause)-in revenue subdivision a sawi apiangah, he Kaihhruaina Bu hian **sub-division** a hmang. District hi **Deputy Commissioner**-in a hotu.

Clause inṭawm-in chhinchhiahna (sign), form field emaw basin hming atan khawtlang ṭawng a phut apiangah, he Kaihhruaina Bu hian "Mizo" a ziak. Mizoram Official Language Act, 1974 (Act No. 3 of 1975) hian Mizo hi State official language-ah a siam a, August ni 1, 1977 aṭanga hman ṭan, May ni 6, 1996 notification (No. H.12017/14/90-LJD, scan ṭha lo aṭanga number chhiar)-in a ruat angin; official hna atan English pawh hman

theih a ni tih hi thu lak chhawn anga chauh hriat a ni, section chhiar a ni lo [TBC]; English leh Mizo ṭawng pahnihin notification tichhuak tura June 2021 thupek (direction) hi chanchin tlangzarh angin a ni; leh Corporation Local Council Rules 2010 hi ṭawng pahnihin chhuah a ni. **He Kaihhruaina Bu hi English ṭawnga ziah a ni.** Chuvangin, he Kaihhruaina Bu-in a ruat angin, **chhinchhiahna (sign) leh tuilian thuk zawng chhinchhiahna (flood-depth marker) hi Mizo leh English ṭawngin a ni ang; Lai, Mara leh Chakma Autonomous District Council ram-ah chuan, District Council emaw competent authority-in a thupek chuan, chu hmuna ṭawng hman mek pawhin.** Chung ram-a ṭawng hmante hi he Kaihhruaina Bu tan zirchian a ni lo [TBC], leh chhinchhiahna hi a vaukhan mite chhiar theih a ni tur a ni. Mizo hi Roman hawrawpin ziah a ni a, chuvangin clause inṭawm-in "Mizo script" a tih apiangah Mizo standard Roman ziah dan a kawk a ni. Belhchian 7A leh 11-ah GIS field NAME_LUS leh WB_NAME_LUS hian Mizo ṭawnga hming an keng; LUS hi he Kaihhruaina Bu-a Mizo tan code a ni, a ISO 639 code, lus, aṭanga lak. He Kaihhruaina Bu Mizo ṭawng version a la chhuak dawn.

Mizo thumal ṭhenkhat hi thuziakah hman a ni a, an lan hmasakna apiangah hrilhfiah leh an ni. Heng thumal awmzia hi Lorrain leh Savidge-te *A Grammar and Dictionary of the Lushai Language* (1898, a hnuaiah L&S tia tawi) leh Pachuau *English–Mizo Dictionary* (1997) leh an ziah dan an zui; tunlai Mizo hian thumal inzawm tam zawk hi inthen lovin a ziak, tuikhur leh tuihawr ang hian.

- **dil** (lake emaw pond; *dil té*, dil tê emaw tank tê) hi he Kaihhruaina Bu-in dil lian, dil tê emaw tank, a pianphung emaw laih, a tihna thumal a ni: L&S-in *dil* "a lake" leh *dil té* "a pond, a tank" a pe (pp. 81–85), Pachuau-in "lake: dil" leh "pond: dil, tui tling reng" a pe. State dil hriat lar berte hian he thumal hi an pai, Palak Dil leh Tam Dil ang hian. Mizo hian plural chu *-te*-in a chhinchhiah a, chu chu *té*, "tê" (small) nen a inpawlh thei, chuvangin English plural "dils" hi he Kaihhruaina Bu inremna (convention) a ni a, chhut hmain Mizo editor-in finfiah tur a ni. He Kaihhruaina Bu hian khawlna siam (engineered storage) hi **detention pond** (ruahtui dah rihna dil siam) a ti a, dil emaw tuikhur emaw a ti ngai lo, leh dil pangngai hian amah hming ngei a vawng;
- **tuikhur** (spring emaw tui lakna hmun) hi tui chhuahna emaw tui chhuahna aṭanga tui lakna hmun a ni: L&S-in "a well, a waterhole" a pe (pp. 213–215), Pachuau-in "fountain: tuikhur", leh Village Councils Act, 2025-in "tui pekna lak theihna hmun reng reng" (any place wherein water supply is obtained) tiin a hrilhfiah (section 2(29)). He Kaihhruaina Bu hian he thumal hi tui chhuahna leh tui chhuahna aṭanga tui lakna hmun chauh atan a hmang a, ruahtui laka a humhalh a, khawlna atan a hmang ngai lo. Tui chhuahna, lui hnar anga, hi **hna** (L&S, pp. 99–103) emaw **tuihna** (Pachuau) tih a ni bawk;
- **lui** hi lui tê emaw luipui a ni (L&S, pp. 137–139; Pachuau-in "stream: lui te" a pe), Aizawl tui luan chhuahna Chite lui leh Ser lui ang hian, leh **lui-pui** chu luipui a ni (L&S, pp. 137–139). He Kaihhruaina Bu hian tlang lui-te tan "lui" a ziak a, luipui lian zawkte tan "river" a ziak;
- **tui luankawr** (Pachuau: "drain: tui luankawr") leh **tui-hawr** (L&S: "a gutter, a ditch", pp. 213–215) hi drain emaw laihchhuah (ditch) a ni. Thuziak hian English "drain" a vawng;
- **tui lian** hi tuilian a ni (Pachuau); L&S-in a hlui zawk *tui lét* a pe (pp. 215–217);
- **lei min** hi leimin (landslide emaw landslip) a ni (L&S, English–Lushai part, pp. 289–291); leh
- **kor** hi tlang inkar thuk (ravine) a ni (L&S, English–Lushai part, pp. 313–315).

L&S phêk number-te hi scan text-a running head aṭanga ngaihtuah chhuah a ni a, Pachuau phêk-te chhinchhiah a ni lo; an pahnih hi endik tur a ni [TBC]. Lorrain *Dictionary of the Lushai Language* (1940) hi chhiar a ni lo. Mizoram tan hmun dang-a thumal pek ṭhenkhat, *minpui*, *tuikawng* leh *kawr* (gully tan) ang chi, hi dictionary pahnih zingah hmuh a ni lo va, hman a ni lo. Chhut hmain heng thumal awmzia hi Mizo editor-in a finfiah tur a ni.

Thumal tawi ṭhenkhat hian awmzia pakhat aia tam an nei:

- AMC hi Bung 2, 3 leh 5-a antecedent moisture condition a ni; he Kaihhruaina Bu hian Aizawl Municipal Corporation tan a hmang lo, kimchangin a ziak;
- AMCBR leh SD&SM hi Corporation regulation pahnih an ni a, bung inṭawm-ah kawp angin sawi an ni, leh "MBBL 2016" hi ram pum huap Model Building Bye-Laws 2016 a ni. Pakhat mah State dang building dan an ni lo;
- ADC hi Autonomous District Council a ni: LADC, MADC emaw CADC. LMC hi Lunglei Municipal Council a ni a, VC hi Village Council;

- HFL hi gauge-a tuilian sang ber chhinchhiah, CWC hman angin, a ni. Design level a ni lo. State-a CWC site tan HFL chhuah chhun chu "Turial"-a Tuirial ta, 149.0 m (June ni 17, 1995), ziak chhawn (transcription) chauhva hmuh, datum sawi lovin, a ni; State-a CWC site pakhat mahin warning emaw danger level a nei lo; leh
- FRL (full reservoir level), MDDL (minimum draw-down level) leh MWL (maximum water level) hi Tuirial leh Serlui B reservoir (tui khuah) tan hman an ni.

Awmzia hi context aṭangin a chiang.

Fimkhur takin hmang rawh. Endik hnuah Clause leh value-te a danglam thei. Design siamtu (designer)-te hi an design leh an data hman endik chungchangah mawh an phur reng. Neer-in he draft innghaha thutlukna siam chungchangah mawh a phur lo.

Inpuanna. Neer hian India Flood Atlas, 1% AEP tuilian thuk zawng model ram pum huap map, a tlangzarh. Clause 6.11.3 hian floor level atan Approving Authority (phalna petu Authority)-in a pawm theih regional map entirna pakhat angin a sawi. He Kaihhruaina Bu hian Atlas a phut lo; Clause 7.3.4 hnuaia pawm map reng reng hman theih a ni.

Rawtna. Rawtna leh tihdikna-te info@neer.ai-ah thawn theih a ni.

Thuhmahruai

Mizoram khawpui-te hi ruahpui-ah chhan pathum avangin an tlawlh. Aizawl-in a hmasa ber chu May ni 28, 2024-ah a lantir a, Cyclone Remal ruah-in Melthum leh Hlimen inkara lung laihna (quarry) hman tawh loh a tichim a, khawpui pumah leimin a tichhuak a, chanchin tlangzarh angin; State zawng zawngin a pahnihna a lantir, gauge record, CWC report emaw IDF inzawmna pakhat mahin a hmun reng reng a huam loh avangin, Aizawl-ah ni khatah 148 mm a sur a, June 2018-ah ni a rinawm, Serchhip district-ah June 2018 ni 13 hmasaah 677 mm a sur bawk, chanchin tlangzarh angin; leh Aizawl-in a pathumna chu ni tin a lantir, a ruahtui drain-te hian a ek tui a phur avangin: State-in NGT hnenah ek tui 51.81 MLD a siam a, tihfaina capacity 10 MLD "Aizawl khawpui tan chauh" (only for Aizawl city) a awm tih a hrilh.

1. **Tlang chhipa khawpui, tlang panga tui luh tir hian tlang pang a tihchet ṭhinna.** State-a khawpui deuh zawng zawng hi tlang chhip emaw tlang pangah an awm a, Aizawl, khawpui ber, hi amah ngei phai (valley floor) nei lo tlang chhip khawpui a ni: a master plan-in a tlang pang chu 30° aṭanga 45° (copy chhiarah "300 to 450" tia chhuah, degree chhinchhiahna bo) a ti a, a lei chu "a la naupang a, a bawrh" (young and in a loose state) a ti. MIRSAC-in Serchhip khawpui zonation a siamah khawpui 89% vel hi 30° aia chhoh zawk tlang pangah a awm, he Kaihhruaina Bu-in a slope class-te belhkhawm danin. "Ram zawng zawng 71 per cent aia tam hi Very High aṭanga Moderate Hazard Zone-ah a awm" (More than 71 per cent of the total area is in Very High to Moderate Hazard Zone), CAG hmuh danin, leh 2017-18 aṭanga 2021-22 thleng leimin-in khaw 661 a tuar a, mi 41 a thi. A tichhuaktu hi tui a ni fo: DG&MR-in 2022-23-a hmun 55 a endik hnuah "leimin lian ṭhena thum ṭhena hnih … chu tui luanna ṭha lo avanga thleng a ni" ("two-thirds of large-scale landslides … were due to improper drainage") tih a hmu, chanchin tlangzarh angin, leh SD&SM chuan "tlang panga leihnuai tui lut zat tihpun, leh sewerage leh tui luanna chu thunun ṭha lova tlang pangah paih" (increasing the amount of groundwater penetrating into slopes, and disposing of sewerage and drainage onto slopes in a poorly controlled manner) hi "tlang pang nghet lohna a tipung nasa thei" (can greatly increase slope instability) mihring thiltih zingah a sawi hmasa ber. Record hi a sei: August ni 9, 1992-a South Hlimen quarry chim, "mi 100 deuhthaw nunna a la" (claimed the lives of almost 100 people), 2013-a MIRSAC paper-in hna hmasa aṭanga a ziak angin; Aizawl-a Laipuitlang lungpui tlak, in 15 a tichhia a, mi 17 a thi a, 8 chhanchhuah, paper pakhat chhiar danin, leh review dang chhiar danin mi 8, chanchinbu angin May ni 11, 2013-ah, paper pakhat angin May ni 15-ah; Durtlang housing complex block 20 zinga pathum July ni 2, 2019-a a chim, mi 3 thi leh 11 hliam, CAG ziak angin; leh May ni 28, 2024-a Cyclone Remal, Aizawl district-a a thihna chu May ni 29-ah mi 29 thi leh 7 bo tiin, report dangah quarry-ah 15 leh Hlimen-ah 5 tiin, leh a hnu lama report-ah Aizawl-a hmun pasarihah 34 tiin report a ni, thu hnarte a inang lo. May ni 24, 2025 aṭanga June ni 3, 2025 thleng State-ah leimin 598 leh thihna panga chhinchhiah a ni, DM&R figure, chanchin tlangzarh angin.
2. **Record, report emaw curve pakhat mahin a huam loh ruahtui tlak.** IMD extremes table-ah Mizoram station pakhat mah a lang lo va, chuvangin khawpui eng mah tan official darkar 24 record a awm lo. State zawng zawng hi CWC subzone 2(c)-ah a awm a, chu tan flood estimation report tlangzarh a ni ngai lo va, chuvangin a hmun reng reng tan CWC plate, ratio emaw synthetic unit hydrograph (hun hrang hranga tui luang zat) a awm lo. IMD ram pum huap rainfall intensity curve set (Das et al., 2022) hian Mizoram station tan panel a nei lo va, Mizoram gauge eng mah tan IDF inzawmna hmuh a ni lo; State ruahtui tlak chungchang peer-review frequency study awm chhun (Lallawmzuali and Muniyan, 2024) hian thla tin leh kum tin belhkhawm chauh a fit. NIH-DHAARA reanalysis grid-te hi spatial hnar awm chhun an ni: kum 50 ni khat ruahtui tlak Aizawl-ah 220 mm, Lunglei leh Tlabung-ah 295 mm, hmar lama Bairabi leh Vairengte-ah 315 aṭanga 338 mm, leh Champhai vel chhak lam tlangsangah 157 aṭanga 181 mm an pe a, gauge record pakhat mahin an la enchhin lo. Ni lian ber hmuhte hi chanchinbu value an ni: Aizawl 148 mm, chumi ni-a "India-a sang ber" (the highest in India) tia report, June ni 12, 2018-ah ni a rinawm, he Kaihhruaina Bu-in report a chhiar danin; May tawp leh June ṭan 2025 ruahpui laia ni khatah Serchhip-ah 104.6 mm leh Aizawl-ah 97.4 mm; leh October 2025-ah Chawngte-ah 130 mm, a zawng zawng chanchin tlangzarh angin. Mizoram gauge eng mah tan darkar khat sang ber hmuh a ni lo.

3. **Sewer ni ve ruahtui drain-te.** Aizawl-a sewer nei catchment pakhat pawn lamah chuan, in tin hian septic tank tui bal chu soak pit-ah a luan tir a, a in chhunga tui bal (sullage) chu drain hnai berah: "in chhunga tui bal [chaw siamna leh inbualna tui bal] chu drain-ah luan tir a ni a, a tawpah tui thianghlim hnar a tibawlhhlawh" (the sullage [i.e. kitchen and bathroom waste] is discharged into drains which ultimately pollutes the fresh water sources), master plan-in a ziak angin, leh septic tui bal chu "drain leh cross drain kaltlangin luipui, tui pek chhuahna hnar ni, ah a luang thleng" (its way through drains and cross drains to the rivers, which are the sources of water supply). State 10 MLD plant Chite-a awm, February ni 6, 2021 aṭanga trial run, hian khawpui ber catchment pakhat a enkawl a, State-in 2025-ah "Tlang ram topography danglam avangin, Grey Water tihfai hi harsatna lian tak a la ni" (Due to peculiar topography of the hilly regions, treatment of Grey Water remains a huge challenge) tih a report. CPCB-in plant hnuaia Chite lui leh Tuikual lui chu Priority II-ah, biochemical oxygen demand (BOD) 29 leh 29.1 mg/L nen, leh Lawibual lui chu Priority III-ah a dah. Aizawl Urban Area 67%-ah drain-te hi kutcha (leia laih mai) a ni a, 18%-ah drain reng a awm lo va, 15% chauhin pucca (lung emaw cement-a siam) drain a nei, master plan hmuh danin, leh drain-te hi "hydraulic design a tlachham avangin leidipin a khat fo" (silted up frequently due to insufficiency in the hydraulic design).

Heng pathum chungah hian pali dang a awm leh. **Drainage geometry nei mahse design ruahpui nei lo tlang pang regulation**: SD&SM reg. 27 hian lei laih leh lei vur pang tinah terrace (tlang panga hmun zawl siam), a zau zawng 2 m tal, a sang zawng 10 m aia hla lo inkarah, a ruat a, reinforced concrete terrace swale (terrace kawnga ruahtui luanna), gradient 1 in 20 tal, swale run pakhatin down-drain (tlang pang zawh chhuk drain)-a a luan chhuah hmaa a hruai theih hmun 400 m²-a chin, lei laih pang tin chhip zawh, a chung lam drainage kawng 10 m aia sei apiangah paved interceptor drain (cut chung lama ruahtui dangtu drain), phalna nei drainage lam pan 1 in 50-a tiphei (graded) building pad, leh tlang hnuai lama site siam tinin a chung lama site drainage chu "drainage kawng hnai ber, hman theih ber thlengin him takin" (in a safe manner to the nearest practicable drainage way) phur tura mawhphurhna a ruat; design ruahpui, return period (kum engzat zelah nge a lo thlen ṭhin) emaw runoff coefficient a pe lo va, "hydrology leh hydraulic chhutna" (hydrology and hydraulic calculations) chu license nei civil engineer-te kutah a dah. **Size ruat lo mawhphurhna nei building regulation**: AMCBR reg. 33 hian "In zawng zawngah ruahtui khawl khawmna facility ṭha tak siam bawk tur a ni" (A suitable rain water harvesting facility shall also be provided in all buildings) a ti a, chu regulation vek hian latrine tin tan "septic tank a tawk zawng soak pit nen" (a septic tank of appropriate capacity with soak pit) a phut a, Landslide Policy Committee *Roadmap to Stability* (2014) erawh chuan tlang pang an tihhnawn avangin "Aizawl City chhunga septic tank, leach field leh soak pit zawng zawng paih bo" (eliminate all septic tanks, leach fields and soak pits within Aizawl City) a duh. **Dan lam ram (legal geography) pathum**, pakhat chauhin building dan a nei: Corporation ram, Village Council ram, 2025 Act-in a ruahman model building bye-laws hmuh a nih lohna, leh Autonomous District Council ram pathum, State municipal, village-council, water-resources leh rivers dan zawng zawng pawn lama awm. Leh **sawrkarin tuilian phai (flood plain) a nei lo a tih State-a, luipui aṭanga tuilian tuar phai khawpui-te**: "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" (Mizoram being a hilly state, there is no flood plain zone in the catchment area), MPCB-in NGT hnenah a ti a, mahse Khawthlangtuipui-in June 2017-ah Tlabung a tuilian a, sub-division-ah in 350 vel tui chhung a pil tih report a ni a, emaw disaster official-te chhiar danin 9 a pumin leh 60 aia tam a ṭhenin, July 2019-ah leh, in 400 vel tuilian tih report a ni a, leh August 2023-ah leh, chanchin tlangzarh angin; June 2018-ah Tlawng kama Sairang-ah chhungkua an tang, Tiperabagh leh Serhuan-a in-te tuilian a nih laiin, chanchin tlangzarh angin; leh June 2025 leimin leh tuilian-ah Champhai hi tuar nasa ber zingah a tel, chanchin tlangzarh angin. Flood plain zoning dan hmuh a ni lo va, SD&SM reg. 6-in site plan-in a lantir tura a phut "Aizawl Municipal Corporation-in a ruat leh a hrilhfiah tuilian hlauhawm hmun" (flood hazard areas as designated and defined by Aizawl Municipal Corporation) hi ruat a nih hmuh a ni lo.

Heng zawng zawng hnungah hian tuikhur, ruahtui tank, dil leh reservoir pahnih an awm. "Mizoram hi tuikhur awmna a ni" (Mizoram is an abode of springs), CGWB-in a ti a, tlang chhip-te hi shale, siltstone leh sandstone "ruahtui luang chhuahna zone" (run off zone), "tui luh theihna leh infiltration hniam lutuk" (very low permeability and infiltration) nei an ni; State-in a leihnuai tui lak theih zat 3.95% a la, 2024 assessment aṭanga (thu lak chhawn angin), leh hmun engmah regulation atan notify a ni lo. Tui hi tuikhur leh in chung aṭangin a lo kal: Aizawl Urban Area chhungkua 27.16%-in ruahtui an hmang a, 1.01%-in tuikhur tui, master plan ziak angin, khawpui pipe tui erawh Tlawng aṭanga pump-a chawi chhoh a ni. Village Councils Act, 2025 hian tuikhur hi statute thumal-ah a siam a, Water Resources Act, 2024 hian tuikhur-te hi a Village leh Local Water Resources Committee-te bawlhhlawh laka an vawn tur khawtlang tui hnar zingah a chhiar. Dilte zinga Pala Wetland (Palak Dil), Mara District Council ram-a awm, hi Ramsar site no. 2484 a ni a, a information sheet

angin August ni 31, 2021-ah thlan a ni a, July ni 26, 2022-ah puangchhuah a ni, chanchin tlangzarh angin; Saitual bula Tam Dil chu sangha vulhna reservoir atan siam ṭhat a ni, chanchin tlangzarh angin. Tuirial-ah NEEPCO dam (tui khuahna) hian full reservoir level 90.5 m leh minimum draw-down level 68.0 m nei reservoir a khuah a, zirchianna pakhatin a hnuaia lui inpawlhna bulah dam-break tuilian 3,035.34 m³/s a route, chanchin tlangzarh angin; Serlui B reservoir level-te hmuh a ni lo.

Chuvangin Mizoram tan design hian south-west monsoon a lo thlen hmaa (2026-ah June ni 6 vel, chanchin tlangzarh angin) April leh May ruahpui-a ṭan, October-a a tawp thlenga ruah tlak hun a huam tur a ni; chu chu he Kaihhruaina Bu fûr hun, April ni 1 aṭanga October ni 31 thleng, a ni. April ni 27–28, 2026 ruahpui-in district panga aṭanga pakua thlengah school chawlh tir a ni a, Serchhip-ah 70.5 mm a sur, chanchin tlangzarh angin, leh 2013 Laipuitlang lungpui tlak, 2024 Cyclone Remal leimin leh May tawp 2025 leimin-te hi May-ah an thleng vek. Ruahpui hi fûr hun pawn lamah pawh a lo thleng: "fûr hnu hun (October aṭanga December) cyclone-te hi fûr hma hun (April leh May) cyclone-te aiin an nasa zawk" (the cyclones of the Post Monsoon season [October to December] are more intense than those of Pre-Monsoon season [April & May]), 2016-a State thuziak pakhatin a ziak angin, chuvangin design statistics hian thla tin kum tin sang ber a hmang. Thu hnarte hian State kum tin ruahtui tlak mean hi 2,057 mm vel aṭanga 2,794 mm thleng an pe; kum tin belhkhawm hian drain size a ruat lo va, he Kaihhruaina Bu hian pakhat mah a thlang lo. Vur a tla ngai lo. Lei hnuaiah, tlang lung hian tui a dawng lo va, tlang panga ruahtui luh tir chuan a tichet thei: ruahtui hi hman nan khawl a hlu a, leiah luh tir a hlu lo.

Ram pum huap kaihhruaina (national guidance) hian vantlang drain size a ruat a, mahse building thar-in a belh ruahtui luang (runoff) a thunun lo. He Kaihhruaina Bu hian ruahtui hi **development phalna condition** atan a siam. Size tlem tak aia lian development tinin:

- ruahtui tlak fo chu site-ah a khawl tur a ni, thal (dry season) hman nan tank-ah, tlang pang lei-ah erawh ni ngai lovin;
- ruahpui lian chu hmasawnna hma lama ram aia chak lovin, catchment tuilian tawh-ah chuan a muang zawkin, a luan chhuah tir tur a ni a, a hnuaia tlang pang tihhnawng lovin outfall (drain tui luan chhuahna) nghet takah a hruai tur a ni; leh
- drain chu leimin bal, leidip emaw bawlhhlawhin a khat laiin, a dawngtu lui a lian (spate) laiin, leh phai-ah chuan, luipui a sang a, a flap gate a khar laiin emaw a chung lama dam-in tui a chhuah laiin, a outfall-in hna a la thawk tih a lantir tur a ni.

He Kaihhruaina Bu hian vantlang drain, kawng leh an drain, tlang kawng, terrace, swale, interceptor drain leh down-drain, lui leh luipui, phai-a outfall, dil, tuikhur leh basin pum huap master plan-te design dan, leh drain-te bal leh leidip laka humhalh dan a ruat bawk a, chutiang chuan site mimal leh vantlang hna-te hian standard inang an tum ang.

He Kaihhruaina Bu hian India leh ram dang ruahtui standard lar berte a innghah. Chung zinga tin hi Mizoram tan siam rem a ni: April aṭanga October thleng a ruah tlak hun, a fûr hma ruahpui nen; Surma-group shale, siltstone leh sandstone tlang chhip chhoh nasa, tlang panga tui luang lut hian a tihchet theihna; a drain-te chhoh nasa lui-ah, Aizawl Chite lui leh Ser lui ang, tla thla tlang chhip khawpui-te; Tlawng, Tuirial, Khawthlangtuipui leh Tiau phai zim leh lui kam zawl, Sairang, Bairabi, Vairengte, Tlabung leh Champhai phai-ah; Tuirial leh Serlui-a reservoir-te; khaw-te tui petu tuikhur leh khawpui ber chhungkua ṭhena li ṭhena khat tui petu ruahtui tank; leh ek tui phur ruahtui drain-te.

1. **Ram pum innghahna.** CPHEEO *Manual on Storm Water Drainage Systems* (2019). He Kaihhruaina Bu hian a innghah a, State-in a tih a phalnaah standard sang zawk a ruat. IRC kawng drainage code-te, hill road chungchang IRC:SP:42-2014 tiamin, leh NDMA urban tuilian inkaihhruaina (guidelines) pawh hman a ni.
2. **A ruangam.** Kansas City Metro APWA Section 5600 (Version 2025.01), regional standard kimchang thar ber. Humhalh, khawl, dah rih, luan tir leh enkawl (preserve, retain, detain, convey and maintain) indawt dan leh khawl tur tui zat (required retention volume) a pe.
3. **Design ruahtui tlak.** Station record, CWC report emaw IDF tlangzarh pakhat mahin State hmun reng reng a huam lo va, chuvangin Mizoram-a design ruahtui tlak value zawng zawng hi he Kaihhruaina Bu-in a ruat a ni, ruahtui zone pali leh hydrologic sub-area pasarihah. Sub-area tinah design ni chu site tan NIH-DHAARA value leh NIH-DHAARA Aizawl cell aṭanga lak State pum huap a hniam ber (floor) (kum 2-ah 85 mm aṭanga kum 100-ah 250 mm thleng) zinga a sang zawk a ni, chutiang chuan grid-a hmun tê hniamna hian khawpui ber ta aia hniam thuk

zawng a ruat ngai lo; chhak lam tlangsangah, NIH-DHAARA cell State-a hniam ber leh gauge pakhat mahin a finfiah loh hmunah, floor hian a thunun. Hmar lam tlang leh phai, Barak phai lam pan luangah chuan, design ni hi 2% AEP-ah 320 mm leh 1% AEP-ah 360 mm aia tlem lo a ni bawk, he series-a a kianga Barak-headwater edition value, a kianga Barak-valley dan floor pai, chutiang chuan ruahpui pakhat hian State ri lehlam leh lehlamah a inang. Duration tawi zawk hian interim ratio, subzone 2(a) CWC report ta aia hniam ngai lo leh site-a duration inang tan NIH-DHAARA ta aia hniam thuk zawng pe ngai lo, a hmang; darkar 72 thuk zawng hi ni 3 series zirchian a nih hma chu darkar 24 thuk zawng let 1.70 a ni. Design ni hi 25 km chhung leh zone inang chhunga ni lian ber rinawm chhinchhiah nen endik a ni, mahse State chhung emaw a bul hnaiah record pakhat mahin a la tling lo, leh IMD leh State ni tin series lak hi Bung 2 data dilna hmasa ber a ni.

4. **Fûr hun hmanna.** PUB Singapore *Code of Practice on Surface Water Drainage* (7th ed., 2025), site tê tan fixed-coefficient route leh drainage reserve atan. Malaysia MSMA 2 (2012), fûr hun design ruahpui leh on-site detention awlsam zawk atan.
5. **Ruahtui luang tihtlem leh tihfai.** Georgia Stormwater Management Manual (2016), ruahtui luang tihtlem leh luanna hnuailam zirchianna (downstream analysis) atan. CIRIA C753 *The SuDS Manual* (2015), treatment train atan. Mile High Flood District criteria manual, outlet leh khawlna design atan.
6. **State leh khawpui dan.** AMCBR leh a 2019, 2023 leh 2025 amendment-te; SD&SM; Mizoram Municipalities Act, 2007, Ward Committee and Local Council Rules, 2010 nen; Mizoram (Village Councils) Act, 2025; Mizoram Water Resources (Management and Regulation) Act, 2024; Mizoram (Protection of Rivers) Ordinance leh Bill, 2023, enact a nih finfiah a ni lo; Master Plan for Aizawl: Vision 2030 leh 2015-a draft zonal regulation-te; *Roadmap to Stability* (2014); Mizoram Official Language Act, 1974; CAG Report No. 1 of 2025; leh State-in NGT hnena report-te. He Kaihhruaina Bu hian an zui a, emaw, a sawi chiannaah, a tikhauh zawk. 2019 amendment Gazette tawp, LMC regulation reng reng, Village Councils Act model building bye-laws, District Council pathumte building emaw drainage instrument reng reng, MSDMA, MISWARC leh WARDMA dinna notification-te, lui belt chungchang April 2021 notification, Mizoram Urban and Regional Development Act, 1990, Mizoram Ground Water (Control and Regulation) Bill, 2023 a title page bak, State Action Plan on Climate Change leh Sixth Schedule paragraph-te hi chhiar a ni lo. Dan sawi apiang hi a text tunlai ber nena endik tur a ni.

He Kaihhruaina Bu a ṭul chhan

India-ah ruahtui design standard inang a awm lo. CPHEEO *Manual on Storm Water Drainage Systems* (2019) hi ruahtui drainage tan bik ram pum huap manual hmasa ber a ni a, mahse thurawn (advisory) mai a ni. Ministry of Housing and Urban Affairs hian advisory guideline zingah a dah a, khawpui tuilian hi State sawrkar leh urban local body-te hna angin a ngai. He Kaihhruaina Bu tana endik ram pum huap dan emaw State building dan reng rengin ruahtui luang thunun hi building phalna condition atan a siam lo va, Model Building Bye-Laws 2016 pawhin a siam hek lo.

Ram pum huap thuziak-te hian value pawimawh an hawng ruak a, emaw chhanna hrang hrang an pe.

- **Return period.** CPHEEO hian Class I khawpui-a drain tan kum 5 leh hmun dangah kum 2 a rawt a, State committee-in value sang zawk a hman a phal. 2023 CPHEEO presentation-in table dang a lantir. IRC:SP:50-2013 hian khawpui kawng drain tan kum 1–2 a rawt; IRC:SP:42-2014 hian kawng drain tan kum 5–25 leh culvert tan kum 10–50, kawng class leh culvert size zelin a rawt. Mizoram-a drain design siamtu engineer hian code a thlan azirin kum 1, 2, 5, 10 emaw 25 a sawi thei.
- **Detention.** CPHEEO hian peak outflow pre-development rate-a chin hi tih dan pangngai (general practice) angin a sawi. "Shall" a hmang lo va, ruahpui frequency a sawi lo.
- **Boruak dinhmun (climate).** NDMA Urban Flooding Guidelines (2010) hian detention leh retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) facility leh climate change avanga siam rem ruahtui tlak curve a phut a, mahse size ruatna dan emaw return period a pe lo. State Action Plan on Climate Change (SAPCC) chhiar a ni lo. National Adaptation Fund for Climate Change (NAFCC) tan 2016-a State thuziak pakhat, State remote sensing report sawi chhawng, hian district ṭhenkhatah "ruahtui tlak 25% deuhthaw a pung ang" (nearly 25%

increase in rainfall) leh ruahtui tlak nasa thil thleng zat "26% vel" (about 26%) a pung ang a beisei; heng hi belhkhawm leh zat chungchang an ni a, intensity factor an ni lo va, he Kaihhruaina Bu hian pakhat mah design value atan a hmang lo.

- **Design ruahtui tlak.** Ram pum huap thuziak pakhat mahin design siamtu-in khawpui pakhat tan hman nghal theih design ruahtui tlak a pe lo. Project tinin an hnar ngei an thlang. Mizoram hi report tlangzarh ngai loh CWC subzone-ah a awm vek a; IMD 2022 ram pum huap rainfall intensity curve set hian Mizoram station tan panel a nei lo va; leh NIH-DHAARA reanalysis grid-te, State huamtu hnar awm chhun, hi Mizoram gauge pakhat mah nena enchhin an la ni lo.

Mizoram hian amah ngei drainage design standard a nei lo. He Kaihhruaina Bu tan zirchianna hian khawpui ruahtui drain tan return period, runoff coefficient emaw design ruahtui tlak ruat UD&PA, Aizawl Municipal Corporation, LMC, PWD, PHED emaw IWRD standard, IDF inzawmna emaw circular a hmu lo va, State-a station eng mah tan IDF inzawmna a hmu hek lo. Master plan drainage bung hian drain-te a sawi a, check dam pariat a rawt a, mahse design ruahpui a ruat lo; Aizawl Smart City ruahtui drain project hmuh a ni lo va, ADB ṭanpuina North Eastern Region Capital Cities Development Investment Program (NERCCDIP) State tranche tan thuziak hmuhte hian tui pek chhuahna, bawlhhlawh khawh (solid waste) leh sewerage an sawi a, ruahtui drain an sawi lo. AMCBR leh SD&SM hian site, tlang pang leh outfall an thunun a, mahse pakhatin mah drain size ruat nan ruahpui eng ang nge a sawi lo. He Kaihhruaina Bu hi AMCBR, SD&SM leh Municipalities Act, Village Councils Act-in a ruahman model building bye-laws, Water Resources Act, 2024, Rivers Ordinance leh Bill, 2023 enact a nih chuan, leh master plan ṭanpuitu technical thuziak atan a pe chhuak a ni: design ruahpui, detention, tailwater (outfall hnuailama tui sang zawng), setback leh tuikhur humhalhna value an hawn ruak-te a pe. UD&PA, Corporation, LMC, District Council reng reng, Village Council reng reng emaw pawl dang reng rengin pawm a ni lo. A bik takin:

- **Tlang pang regulation hian drain geometry a ruat a, mahse an phur tur tui a ruat lo.** SD&SM reg. 27 hian terrace (tlang panga hmun zawl siam), swale, interceptor drain leh pad-te chu an size-in a ruat a, swale run tin chu 400 m²-ah a chin a, a engineered track hian "drain reng reng-in a enkawl area drainage area leh a ruahtui luang ngaihtuah zat lantirna map" (A map showing the drainage area and the estimated runoff of the area served by any drains) a phut; mahse design ruahpui, return period, runoff coefficient emaw freeboard (tui sang ber chunga zau dah) a sawi lo va, "hydrology leh hydraulic chhutna" (hydrology and hydraulic calculations) chu license nei civil engineer chungah a nghat, kalphung zui tur awm lovin;
- **Building regulation hian ruahtui khawl khawm a phut a, mahse engmah size a ruat lo.** AMCBR reg. 33 hian in zawng zawngah "ruahtui khawl khawmna ṭha tak" (A suitable rain water harvesting facility) a phut a, reg. 5(6)(ix) hian plan-in a lantir a phut; 2025 amendment hian ruahtui khawl khawm leh "Hardscape tihtlem" (Reduction of Hardscape) chu 100 m² aia lian plot tan incentive-ah a siam; leh reg. 37(ii) hian "vantlang drain hnai ber thlenga a tawk drain" (of adequate capacity to the nearest public drain) drain emaw conduit a phut. Pakhatin mah khawlna zat, luan chhuah tir zat (release rate) emaw design ruahpui a pe lo;
- **Dan-te hian septic tui bal tlang pangah an luh tir.** AMCBR reg. 33 hian septic tank tin nen soak pit a phut a, tui hnar aṭanga 15 m-ah a dah; leimin thleng thei tlang pangah chuan chu chu *Roadmap to Stability*-in a titawp duh tih dan a ni. He Kaihhruaina Bu hian an inkalh dan hi a sawi a, soak pit-ah ruahtui a luh tir lo va, tlang pangah infiltration (lei-a tui luh) a dah lo va, regulation chu a hnuaichhiah lo;
- **Lui ri-te hi rawtna mai an ni, emaw an innghahna an hloh tawh.** Master plan hian drainage channel lian-te tan "a sir lehlam zawngin metre 15 zau green buffer" ("a 15 meters wide green buffer on both sides") a rawt a, Mizo District (Forest) Act, 1955 hnuaiah Tlawng sir lehlam leh lehlamah 800 m green belt a vawng; riverine reserved forest innghahna 1965 notification chu High Court-in January ni 27, 2021-ah a paih (quash), chanchin tlangzarh angin, leh 800 m restricted zone ruat anga report April 2021 notification chu chhiar a ni lo, chuvangin he Kaihhruaina Bu hian 800 m belt hi statutory line angin a ngai lo. SD&SM reg. 28 hian "riverine reserve chu vawn tur a ni" (the riverine reserve shall be maintained) a ti a, hrilhfiah lovin, leh River Conservation Zone pakhat mah notify a ni lo. Regulation pakhat mahin lui emaw tuikhur aṭanga metric setback a nei lo;
- **Tuilian ri (flood line) pakhat mah ziah a ni lo.** Mizoram khawpui eng mah tan flood plain zoning dan, tuilian hlauhawm hmun ruat leh tuilian sang zawng tlangzarh hmuh a ni lo va, State ngei thusawi chu flood plain zone a nei lo tih a ni. He Kaihhruaina Bu hian phai-ah design tuilian ri ziah dan kalphung, nakina ruatna reng reng tan input atan, a rawt (Bung 7); notify a nih ri, plan-in a ziak ri emaw court-in a thupek ri a thlak lo va, chutiang ri chuan a phuar a, a zau zawk chuan, a thunun; leh

- **Outfall design nan luipui emaw reservoir tui sang zawng ruat thuziak a awm lo.** CWC hian State-ah level-monitoring site pasarih a nei a, chung zinga panga hman a ni lo, flood-forecasting site leh warning emaw danger level a nei lo, SANDRP (2018)-in a ziak chhawn angin; tuilian sang ber (highest flood level) chhuah chhun chu "Turial"-a Tuirial ta, 149.0 m (June ni 17, 1995), datum sawi lovin, a ni a, reservoir full level 90.5 m nen a inzawm dan sawi a ni lo. Phai-a flap gate inventory, leh khawpui-in design a theih Tuirial emaw Serlui B dam aṭanga tui chhuah tir chungchang dan reng reng hmuh a ni lo.

Chuvangin agency tin leh local body tinin central manual hi an duh danin an hrilhfiah. Corporation leh a Local Council-te, LMC, UD&PA, PWD leh national-highway agency-te, PHED leh SIPMIU, IWRD, EF&CC, Land Revenue & Settlement Department, Village Council-te leh District Council pathumte, Aizawl Smart City Ltd, an consultant leh sum petu agency-te hian a awm lohna an hrang hrangin an tikhat. Notification pakhat mahin drain-te hi an zingah a sem lo. Aizawl-a drain pakhat hi statute angin Corporation kawng drain a ni thei a, a hman dan takah PWD kawng sir drain, a chung lama in-te in chhunga tui bal (sullage) a phur thei a, SD&SM hnuaia neitu mimal-in tui a luan chhuah tir reng tur lei laih pang a kal tlang thei a, EF&CC-in a vawn riverine reserve chhunga lui, CPCB list-a lui chhung lam pan luangah a tla thei. Corporation ram pawn lamah building dan reng reng a hman a ni lo. Leh endiktu (reviewer) hian design endik nan innghahna inang a nei lo.

He Kaihhruaina Bu-in chu chungchangah a tih. Chung thlan tur awm ruakte chu State standard pakhatah a chantir:

- State pum huapa design ruahtui tlak tan hnar leh kalphung pakhat, ruahtui zone pali leh hydrologic sub-area pasarihah: NIH-DHAARA, hmun tinah State pum huap floor nen, hmar lam tlang leh phai-ah Barak-valley value, ruahpui tawi tan interim ratio, leimin tichhuak ni tam ruahpui tan darkar 72 thuk zawng, leh design ni chu bul hnaia ni lian ber rinawm chhinchhiah nena endikna, zone ri emaw tlang chhip lian pakhat mah kal tlang ngai lo (Bung 2);
- tui luanna thil tin tan return period ruat (Bung 2 leh 6);
- site mimal tan pre- leh post-development phut dan, AMCBR reg. 33 ruahtui khawlna-te size ruat leh chhiar tel nen (Bung 4);
- outfall tin endik phut: tlangah, lui-a outfall zalen, energy dissipation (tui chakna tihnemna) nen, leh lui capacity leh nghehna lui inpawlhna dawt thlenga endikna; phai leh lui kam zawl-ah, design luipui tui sang zawng nena endikna, darkar 72 design ruahpui pum chhung outfall khar angin ngaih, leh Tlabung-ah tuilian chhinchhiahna-in luipui a sang rei zawk tih a lantir avangin a rei zawk; leh Tuirial leh Serlui B dam hnuaiah, tui chhuah tir (release) nena endikna (Bung 5);
- phai-ah design tuilian ri, leh lui leh luipui tin sir zawhah leh dil leh tuikhur tin velah corridor leh setback, he Kaihhruaina Bu-in a zau zawk phuar awm lohnaa hman tura a rawt: catchment 8 ha emaw a aia tam nei channel pangngai tin sir tinah kam chhip (top of bank) aṭanga 15 m tal corridor, a kam hi 10° aia chhoh zawk tlang pang a nih lui laih thukah chuan tlang pang chhip aṭanga teh, emaw phai-ah 1% AEP tuilian zau zawng belh 10 m, a zau zawk zawk; tuikhur aṭanga 15 m chhungah ruahtui outfall, soakaway emaw drain tui luan chhuah a awm lo; leh master plan buffer leh notify a nih River Conservation Zone reng reng a zau zawk apiangah (Bung 7 leh 8);
- 10° aia chhoh zawk tlang pangah, Surma-group shale, siltstone emaw mudstone-ah tlang pang eng ang pawhin, colluvium, lei vur emaw leimin bal-ah, Moderate, High emaw Very High leimin hlauhawm zone map-ah emaw lei laih emaw retaining wall chung hnaiah, geotechnical certificate tel lovin, tum taka infiltration a awm lo va, High leh Very High hlauhawm zone-ah chuan a awm reng reng lo; recharge (leihnuai tui tihpun) chu 1% AEP tuilian sang zawng chunga phai alluvium leh lui kam zawl enchhin tawhah chauh; in chung ruahtui luang chu khawlnaah, a lian liam chu drain lined-ah; leh drain-in ek tui a phur hmunah, CPCB list-a lui, dil emaw tuikhur catchment-a outfall tin hmaah ruah sur lohna hun tui luang dan leh screen (Bung 4 leh 8);
- SD&SM-in engineer kutah a dah hydrology, a terrace, swale, interceptor drain leh down-drain tan; debris rack (bal dangna), leidip (sediment), bulking leh tihtawp (blockage) tan allowance, leh kawng chhoh nasa leh tlang kawng tan drain lined, stepped leh baffled (Bung 6 leh 9), drain, swale, interceptor drain, weep hole, rack leh gate-te chu March ni 31 thlengin, April ruahpui hmaah, tihfai, endik leh a inpeih tih certificate pek, April ni 30 thlengin, Laipuitlang leh Remal leimin thlen May ruahpui hmaah, tihfai leh, leh November ni 15 thlengin fûr hun hnuah, lei laih pang leh retaining wall survey nen, leh April ni 1 aṭanga October ni 31 thleng standby vawn (Bung 10); leh
- basin pum huap master plan-te, chutiang chuan lui catchment inṭawm agency-te, tlang chhip khawpui aṭanga a hnuaia luipui thleng, an ruahman dun ang (Bung 11).

CPHEEO manual ngei hian a pek kawng a hmang: State hian ram pum huap value aia standard sang zawk a pawm thei (CPHEEO 2019, Table 4.1, Note 2). Corporation-in a regulation-ah, UD&PA-in Village Council-te tan model building bye-laws-ah, LMC-in amah regulation-ah, emaw District Council-in amah instrument hmangin standard khauh zawk a pawm thei reng (Bung 1).

Thu lakna: CPHEEO (2019) Part A §4.4–4.5 and Table 4.1; CPHEEO presentation to CSE (August 2023); IRC:SP:50-2013 §6; IRC:SP:42-2014 cl. 7.1.4 and 8.5.1; NDMA (2010) Urban Flooding Guidelines, para 6.6.2; MoHUA Model Building Bye-Laws (2016); Aizawl Municipal Council (tunah Corporation) Building Regulations, 2012, UD&PA Notification No. B.13017/8/2012-UD&PA of 20 December 2012 (Mizoram Gazette Extraordinary Vol. XLII, Issue No. 4, 10 January 2013), regs. 1, 5, 15, 21, 26, 33 and 37, with the Amendment Regulations of 2019 (public notification No. B.13017/8(2)/2018-UD&PA of 10 April 2019, draft), 2023 (No. B.13017/8/2021-UD&PA/Pt of 14 August 2023; Gazette Extraordinary Vol. LII, Issue No. 459, 28 August 2023) and 2025 (No. B.13017/8/2021-UD&PA/Loose of 21 November 2025); Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017, No. B.13017/75/2016-UD&PA of 4 April 2017 (Gazette Extraordinary Vol. XLVI, Issue No. 161, 11 April 2017), regs. 1, 4–6, 14 and 24–29 and Schedule I; Mizoram Municipalities Act, 2007 (Act No. 6 of 2007), ss. 1, 80, 288–300 and 371, and the Mizoram Municipalities (Ward Committee and Local Council) Rules, 2010; Mizoram (Village Councils) Act, 2025 (Act No. 7 of 2025; Gazette Extraordinary Vol. LIV, Issue No. 178, 20 March 2025), ss. 1, 2, 13–15; Mizoram Water Resources (Management and Regulation) Act, 2024 (Act No. 1 of 2024), ss. 1–6, 9–12, 14, 16 and 24; Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) and Bill, 2023; Mizoram Official Language Act, 1974 (Act No. 3 of 1975) and notification No. H.12017/14/90-LJD of 6 May 1996; Master Plan for Aizawl: Vision 2030 (Aizawl Development Authority; Chief Minister's message of 11 September 2012; phalna notification hmuh a ni lo), chapters 4, 8 and 12; Draft AMC (Master Plan and Strategic Zonal/Ward Development Plan) Regulations, 2015; Landslide Policy Committee for Aizawl City, Roadmap to Stability: Actions to Reduce the Landslide Risk in Aizawl (February 2014); CAG, Report No. 1 of 2025 (Government of Mizoram), Chapters I and V and Appendix 5.3; NGT, OA 593/2017 and OA 673/2018, report of the Mizoram Pollution Control Board (February 2021), and OA 606/2018, Government of Mizoram, six-monthly report (January–June 2025); CPCB, Polluted River Stretches for Restoration of Water Quality (2025); CGWB, Ground Water Scenario of Mizoram (State profile) and Ground Water Information Booklets, Lunglei and Serchhip districts; MIRSAC, micro-level landslide hazard zonation of Serchhip town, Science Vision 13(1) (2013); Lallawmzuali and Muniyan (2024), MAUSAM 75(3); Mizoram Agriculture Department, DPR for the NAFCC (February 2016); CERC, Petition 125/MP/2021 (NEEPCO, Tuirial HEP); CWC, Flood Estimation Report for South Brahmaputra subzone 2(b) (Revised), Annexure 1.1, and Flood Estimation Report for North Brahmaputra subzone 2(a) (NB/18/1991); IMD, Extremes of Temperature and Rainfall for Indian Stations (up to 2012), and the Meteorological Centre Aizawl's list of rain gauges (14 November 2026); Das et al. (2022), MAUSAM 73(4); NIH-DHAARA (November ni 14, 2026-a zawh); J. H. Lorrain and F. W. Savidge, A Grammar and Dictionary of the Lushai Language (1898); L. Pachuau, English–Mizo Dictionary (1997); CWC levels as transcribed by SANDRP (2018); 1992, 2013, 2019, 2024 leh 2025 leimin, Tlabung, Sairang leh Champhai tuilian, 2018, 2025 leh 2026 ruahpui, High Court order-te leh Pala Wetland chungchang report-te (chanchinbu leh thu hnar dang).

He Kaihhruaina Bu hman dan

Clause leh Hrilhfiahna. Clause number nei (entirnan 4.5.2) hi he Kaihhruaina Bu phut dan an ni a, "tur a ni" (shall) an hmang. **Hrilhfiahna** thupui nei paragraph-te hian clause chhan an hrilhfiah a, a entawn tur (precedent) an sawi. Kaihhruaina (guidance) an ni a, phut dan an ni lo. Value-in hmun dangah entawn tur nghet a neih loh chuan, hrilhfiahna chuan chu chu a sawi a, he Kaihhruaina Bu-in a ruat chhan a hrilhfiah.

Return period. Ruahpui hi annual exceedance probability (AEP, kum khatah a lo thlen theih dan) leh return period (kum engzat zelah nge a lo thlen ṭhin) hmangin sawi a ni. Entirnan, "1% AEP (kum 100)" tih chu kum tinah a tluk emaw a pel theihna 100-a 1 chance nei ruahpui tihna a ni.

Entirna value. Entirna chhutna leh milem "Entirna chauh — design value a ni lo" tia chhinchhiahte hian kalphung leh a lian zawng chauh an lantir. Design value-te hi Bung 2-a hnar ruat aṭangin a lo chhuak.

Belhchian leh Form. Bung tinin a innghahna belhchian leh form-te a tarlang. Bung-te hnuah, bung zelin ṭhen khawmin an awm a, thehluh tur form, entirna chhutna, template, model text leh standard drawing an keng. Data la khawn loh mamawh belhchian-te hi *Buatsaih tur* tiin chhinchhiah an ni. An keng tur an sawi a, an chunga innghat clause chuan chu chhung hman tur dan a sawi.

Milem. Milem zawng zawng hi he Kaihhruaina Bu tan ngei siam an ni. Milem-in concept tlangzarh tawh a zui chuan, a caption-in a hnar a sawi.

Khawi aṭanga ṭan tur.

I nih chuan…	A hmasain chhiar rawh
Developer emaw architect	Bung 1 (a huam em?), Bung 4 (eng nge pek tur), Bung 10 (eng nge thehluh tur)
Design engineer	Bung 2–6, chumi hnuah 8 leh 9
Local body emaw approving authority (phalna petu authority)	Bung 1, 10 leh 11
Planner emaw tui awmna (waterbody) enkawltu	Bung 7 leh 11

A chhunga thu awmte

Bung	Thupui	Belhchian leh Form
1	Policy, A Huam Chin leh Pawmna	Belhchian 1
2	Design Ruahtui Tlak leh Design Ruahpui	Belhchian 2
3	Hydrology Kalphungte	Belhchian 3
4	Site Ruahtui Luang Thunun: Retention leh Detention	Belhchian 4
5	Luanna Hnuailam leh Tailwater Zirchianna	Belhchian 5
6	Tui Luanna System Tenau leh Lian	Belhchian 6
7	Tui Awmnate, Dil (Dil Lian leh Dil Tê) leh Setback	Belhchian 7
8	Tui Ṭhatna leh Recharge	Belhchian 8
9	Structure-te Hydraulic Design	Belhchian 9
10	Thehluh tur, Endikna, Kalpui leh Enkawl, leh Dan Zawm Tirna	Belhchian 10
11	Basin leh Khawpui Ruahtui Luanna Master Plan	Belhchian 11

Table tarlanna

Table	Thupui
1.1	Tier A leh Tier B authority-te inkara danglamna
1.2	Policy supplement: pawm theih tur thlan dang S-1 aṭanga S-5 thleng

Table	Thupui
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1.4	He Kaihhruaina Bu hnuaia hna leh mawhphurhna
1.5	He Kaihhruaina Bu hnuaia tui luanna peng-te hnathawh semna
2.1	Design return period (tlangpui)
2.2	Climate factor hman rih turte
2.3	Mixed-frequency dan lian zawng entirna (design value a ni lo)
3.1	Hydrology kalphung hman phalte
3.2	Runoff coefficient C (AEP 10% emaw a aia zing zawk tan)
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3.4	Sheet flow tan Manning's n (USDA SCS TR-55, 1986, Table 3-1)
3.5	Ruahtui luang curve number-te, AMC II, Ia = 0.2S (USDA SCS TR-55, 1986, Table 2-2a leh 2-2c)
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4.3	Tier B site aṭanga luan chhuah phal zat leh site khawl tur tui zat (template)
4.3A	Fixed release coefficient-te (provisional, a rih chhung atan)
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5.2	Tidal leh luipui outfall-te tana joint-probability case-te
6.1	Conveyance tana design AEP (Clause 2.4 nen a inmil)
6.2	Kawngpui tui luang limit
6.3	Kawngpui leh overland flow path tana tui luan hlauhawmna limit
6.4	Tuilian hlauhawmna class inzawm (entawn tur atana tarlan)
6.5	Inlet clogging factor (tihfai lai theihna hloh nia ngaih zat)
6.6	Design tana Manning's n (CPHEEO 2019 aṭanga lak)
6.7	Drain khuh lo leh drain khuh-a freeboard tlem ber
6.8	Pipe run dik chunga manhole inkar sang ber
6.9	Drainage reserve zau zawng tlem ber (PUB Singapore aṭanga lak)
7.1	1% AEP zau zawng a awm loh chuan setback zau zawng nghet
8.1	Pollutant pawimawhte, an hnar leh thununna ber
8.2	Siam ṭhatna ni lo site tana Level of Service mamawh
8.3	BMP Value Rating leh Mizoram-a a inhmeh dan
9.1	Entrance loss coefficient ke (outlet control, a khat emaw a khat lo)
9.2	Channel-a velocity chawhrual phal sang ber
9.3	Riprap class leh apron lenzawng (HEC-14)
9.4	Manhole chhung size tlem ber

Table	Thupui
9.5	Mizoram hmun tana IS 456 exposure class tlem ber
10.1	Thehluh tur stage-te leh inzawm phalna
10.2	Thehluh turah form hmante
10.3	Neitu endik zat tlem ber
10.4	Dan zawm tirna hmalakna indawt
11.1	BSMP tana data leh survey mamawh tlem ber
11.2	Level of service tlem ber
1A.1	Clause 1.6.1-a hrilhfiah anga Tier A authority-te
1A.2	Tier A authority-te register (layout)
1B.1	Clause 4.5.3.2-a tuilian hlauhawm catchment tarlante
1B.2	Tuilian hlauhawm catchment layer attribute-te (layout)
1C.1	He resolution-in thlan dang a pawmte
1D.1	Schedule: thlan dang pawmte (layout)
2A.1	Benchmark hmuna design zat khaikhinna (layout)
2A.2	Ruahtui zone (layout)
2B.1	Zone zela ratio P(t)/P(24h) (layout)
2B.2	Fixed-interval siam remna factor (Clause 2.6.3)
2C.1	Grid-to-point factor-te (layout)
2D.1	Ruahpui hun then belhkhawm nena ruahpui zat then belhkhawm (layout, zone, duration class leh quartile tinah table pakhat)
2E.1	Zone zela retention zat P_R (layout)
3A.1	Soil series leh HSG inmilna (layout)
3A.2	Hun bik-a leihnuai tui sang ber, mapping unit zelin (layout)
3B.1	Land cover dangte, AMC II (layout)
3B.2	CN calibration catchment-te (layout)
3C.1	Problem 3C-1 chhanna
3C.2	Problem 3C-2 chhanna
3C.3	Problem 3C-3 chhanna
3C.4	Problem 3C-4 chhanna
3C.5	Problem 3C-5 stage–storage–discharge inzawmna
3C.6	Problem 3C-5 route hnua luan chhuah
3C.7	Dilna thehluhtu (applicant)-in a tarlan tur benchmark result
3D.1	Calibrate peak rate factor-te (layout)
3E.1	Subzone zela SUH inzawmna (layout)
3E.2	Entirna chhutna tlangpui (layout)

Table	Thupui
4A.1	Leihnuai tui thuk lohna zone layer attribute-te (layout)
4B.1	Belhchian 4B chhunga thu awmte leh an dinhmun
4B.2	Tier B PSD leh SSR (Table 4.3 layout)
4B.3	Retention credit factor C_R (layout)
4B.4	Head pek-a discharge phal tan orifice diameter lian ber (mm) (Cd = 0.60, free discharge)
4B.5	Fixed release coefficient C_10 leh C_2 (provisional, Table 4.3A)
4C.1	Inputs (Entirna chauh — design value a ni lo)
4C.2	Design ruahtui tlak zat, mm (Entirna chauh — design value a ni lo)
4C.3	Curve number leh abstraction (Entirna chauh — design value a ni lo)
4C.4	Ruahpui ruahtui luang thuk zawng Q, mm (Entirna chauh — design value a ni lo)
4C.5	Unit hydrograph parameter-te (Entirna chauh — design value a ni lo)
4C.6	Stage–storage–discharge, outlet enchhinna (Entirna chauh — design value a ni lo)
4C.7	Outlet enchhinna kal tlanga kum 100 darkar 72 ruahpui routing, peak vel (Entirna chauh — design value a ni lo)
4C.8	Outlet enchhinna kal tlanga kum 100 darkar 72 ruahpui routing, darkar tin (Entirna chauh — design value a ni lo)
4C.9	Outlet enchhinna (orifice 120 mm leh 470 mm) result (Entirna chauh — design value a ni lo)
4C.10	Stage–storage–discharge, outlet siam ṭhat (Entirna chauh — design value a ni lo)
4C.11	Outlet siam ṭhat (orifice 170 mm leh 460 mm) result (Entirna chauh — design value a ni lo)
4C.12	Routing hmanga retention credit, outlet siam ṭhat (Entirna chauh — design value a ni lo)
4C.13	Outlet endikna, outlet siam ṭhat (Entirna chauh — design value a ni lo)
4C.14	Design siam ṭhat tlangpui (Entirna chauh — design value a ni lo)
5A.1	Design tailwater-a (Table 5.1) Belhchian 5A value hman dan
5A.2	Coastal segment zela tidal datum, surge leh still-water level (layout)
5B.1	Bung 5-a tui awmna sawi lante
5B.2	Belhchian 5B layer-te attribute (layout)
5C.1	Input-te (Entirna chauh — design value a ni lo)
5C.2	Outfall khar endikna result (Entirna chauh — design value a ni lo)
5C.3	Tui zat inmilna, 1% AEP darkar 48 ruahpui, Run B (Entirna chauh — design value a ni lo)
5C.4	Stage hydrograph, 1% AEP darkar 48 ruahpui, Run B (Entirna chauh — design value a ni lo)
5C.5	A tlangpui (Entirna chauh — design value a ni lo)
6A.1	Belhchian 6A tlangzarh hma chhunga inlet tana interim thupekte (Bung 6 leh 9 ataṅga)
6A.2	Standard inlet chi register (layout)
6A.3	Grade chunga theihna (layout; inlet chi tin tan table pakhat)
6A.4	Sag-a theihna (layout; inlet chi tin tan table pakhat)
6B.1	Bung 6-in a ruat tawh sediment allowance-te (provisional, calibrate tur)

Table	Thupui
6B.2	Ram hman dan leh drain chi zela sediment yield (layout)
6B.3	Sediment allowance calibration (layout)
6C.1	Standard drawing-a lenzawng-te leh an Clause hnar
7A.1	Tui awmna inventory attribute field (WB_POLY)
7A.2	Code list
7A.3	Structure-te attribute field (WB_STRUCT)
7B.1	Tui awmna class zela zau zawng nghet setback (alternative S-3)
7B.2	Clause 7.4.6-a hnar buffer tarlan (KC APWA 5600, 2006, §5605.3)
7C.1	Hun zela dan level (dil tin tan dah khah tur)
7C.2	Level zela outlet setting (dil tin tan dah khah tur)
7C.3	Trigger leh hmalakna (dil tin tan dah khah tur)
7D.1	Leidip laih chhuah leh siam ṭhat lehna hna tan hold point
7E.1	Tui awmna leh tuikhur
7E.2	Lui, drain leh tuilian
7E.3	Ram leh hna
7E.4	Thumal leh ziah dan finfiah loh
8A.1	Zone zela tui ṭhatna ruahtui tlak zat (layout)
8A.2	Duration zela 3-month ARI intensity (layout)
8B.1	Siam ṭhatna tana LoS mamawh (layout)
8B.2	Chhut dan entirna: composite VR (entirna)
8B.3	Treatment train composite VR (layout)
8C.1	Monitoring site register (layout)
8C.2	Event record (layout; Clause 8.13.2 parameter-te)
8C.3	Hnathawh tlangpui leh VR rawt (layout)
8D.1	Pretreatment (BMP zawng zawng)
8D.2	Bioretention leh rain garden (Milem 8.2)
8D.3	Vegetated swale
8D.4	Vegetated filter strip
8D.5	Permeable pavement
8D.6	Infiltration trench leh basin (Milem 8.3)
8D.7	Wet pond (extended wet detention)
8D.8	Constructed wetland
8D.9	Gross pollutant trap leh outfall screen
8D.10	Oil-grit separator

Table	Thupui
8D.11	Infiltration leh recharge tehna (infiltrating BMP zawng zawng)
8D.12	Bioretention filter media leh layer-te
8D.13	Bioretention, swale leh filter strip tana thing leh hnim kawhhmuhna
8D.14	Constructed wetland leh wet pond tana thing leh hnim kawhhmuhna
8D.15	Phun loh tur thing leh hnim chi
8E.1	Hmalakna thlan dan (Clause 8.12.3)
8E.2	ESC hun leh endikna (Clause 8.12.2 leh 8.12.5)
9A.1	Inlet pangngai tana HDS-5 inlet-control coefficient
9A.2	Entirna chhutna tana input-te
9A.3	Critical depth leh specific head (D = 1.2 m)
9A.4	Inlet-control headwater
9A.5	Outlet-control headwater
9A.6	Headwater thununtu leh endikna
9A.7	Riprap apron size ruatna
9A.8	Entirna chhutna tlangpui (Entirna chauh — design value a ni lo)
9B.1	Standard drawing-a lenzawng leh dan-te leh an hnar clause
9C.1	Pump station design checklist
9C.2	Control level (value-te chu design-ah ruat tur)
10A.1	Calculator input-te
10A.2	Calculator-in a chhut tur-te
10B.1	Layer-te
10B.2	SW_FAC (facility-te) attribute-te
10B.3	SW_OUTF (outfall-te) attribute-te
10B.4	SW_CATCH (catchment-te) attribute-te
10B.5	SW_FLOW leh SW_CONV (tui luan kawng leh tui luan tirna) attribute-te
10B.6	Metadata (SW_META)
10B.7	Facility chi code-te (FAC_TYPE)
10B.8	Dinhmun code-te (STATUS)
10B.9	Endikna result code-te (INSP_RES)
10C.1	He Kaihhruaina Bu-in a ruat luhna zau zawng-te
10C.2	He Kaihhruaina Bu-in a ruat loh luhna zau zawng-te (design-ah finfiah tur)
10D.1	O&M plan-in a keng tur-te
10D.2	Retention leh infiltration (soakaway, trench, bioretention, permeable paving)
10D.3	Lei chung detention basin emaw hman tam theih open space area

Table	Thupui
10D.4	Leihnuai emaw podium detention tank, gravity outlet
10D.5	Pump hmang detention, pump leh control-te
10D.6	Flap emaw tide gate, non-return valve
10D.7	Gross pollutant trap emaw first-flush device
10D.8	Mimal drain leh inlet-te
11A.1	Pek tur
11B.1	Clause 11.3.3-a basin hming tarlan (rih)
11B.2	Basin boundary layer attribute-te (layout)
11C.1	Depth–damage curve (layout, building chi tin tan table pakhat)
11D.1	Tlangzarh tur item-te

Milem tarlanna

Milem	Thupui
1.1	Ruahtui enkawl dan indawt
1.2	A huam leh huam loh thutlukna flowchart
2.1	Design ruahtui tlak thu hnar indawt dan leh siam remna
2.2	Design hyetograph
2.3	Design ruahtui tlak thu hnar aṭanga design ruahpui thleng
3.1	Hydrology kalphung thlan dan
3.2	Time of concentration: tui luan kawng rei ber zawh flow segment-te (schematic)
3.3	Ruahtui tlak zat nena SCS-CN ruahtui luang thuk zawng
3.4	Step pahnih continuous simulation: dil ṭan tui sang zawng (schematic)
3.5	Pre- leh post-development hydrograph-te
4.1	Pre-development kum 10, post-development kum 100 thunun loh, leh dah rih hydrograph-te (entirna)
4.2	Detention khawlna chhawp leh multi-stage outlet (schematic)
4.3	Fixed-coefficient route: luan chhuah tir cap-te, mass-curve kalphung hmanga khawlna leh stage pahnih outlet (schematic)
5.1	Luanna hnuailam zirchianna huam chin
5.2	Flap gate leh design tailwater level nei tidal outfall cross-section
5.3	Tide-locked outfall hun indawt (entirna)
6.1	Kerb nei kawngpuia tui luanna system tenau leh lian
6.2	Gutter spread, inlet-in a man leh clogging
6.3	Drain cross-section: freeboard, sediment allowance leh luhna kawng

Milem	Thupui
6.4	Drainage reserve: cross-section (schematic)
6.5	Coastal band: floor level innghahna leh band zau zawng (schematic)
7.1	Tui awmna setback zone-te
7.2	Sanzawng band zela compensatory storage (schematic)
7.3	Tlang chhip khawpui: a terrace, swale, tuikhur leh lui. Tlang chhip khawpui cross-section, kawng drain lined, in chung tui khawlna tank-a luang, lei laih pang interceptor drain nen, terrace-te lined swale nen kai kawng anga siam down-drain-ah luang a, lui-ah energy dissipator (tui chakna tihnemna) nen, hnuailam plot-in chunglam plot tui luanna conduit khuh-ah a phur, leimin hlauhawm band infiltration (lei-a tui luh) tel lo; leh a hnuaia tlang pang plan, tuikhur, a catchment humhalh leh a 15 m tui luan chhuah phal lohna circle, lui leh a kam pang chhip aṭanga he Kaihhruaina Bu-a 15 m corridor, outfall-a ruah sur lohna hun tui luang (DWF) interceptor, lung laihna (quarry) hman tawh loh hmai cut-off drain nen, leh lui chu phai luipui thlenga a luang thla a, flap-gate nei outfall hnunga lui kam zawl khua nen
8.1	Treatment train
8.2	Bioretention cell
8.3	Infiltration trench
9.1	Culvert hydraulics: inlet control leh outlet control
9.2	Pipe emaw culvert outlet-a riprap apron (schematic)
9.3	Ruahtui pump station: wet well, screen, level leh outfall
10.1	Thehluh tur, endikna leh phalna kalphung
10.2	Phalna aṭanga hlan thleng sakna hold point-te
10.3	Enkawlna cycle leh mawhphurhna
11.1	Basin master plan kalphung
11.2	BSMP model schematic
6C.1	Cover sawn theih nei kawng sir drain khuh
6C.2	Drain khuh chunga access leh junction chamber
6C.3	Silt sump nei kerb inlet
8E.1	Silt fence: cross-section leh plan (schematic)
8E.2	Surface dewatering outlet nei sediment basin: cross-section (schematic)
8E.3	Stabilised construction exit: plan leh cross-section (schematic)
8E.4	Drain inlet protection (schematic)
9B.1	Culvert headwall, wingwall leh cut-off wall
9B.2	Drop ding dik structure
9B.3	Conduit luhna-a trash rack
9B.4	Detention outlet riser leh emergency spillway

Thumal tawi

Thumal tawi	A kimchang
ABC Waters	Active, Beautiful, Clean Waters (PUB Singapore design inkaihhruaina)
ADA	Aizawl Development Authority (hman hlui; "tunah AMC-ah a lut ta" ["now absorbed in AMC"], CAG ziak angin)
ADB	Asian Development Bank
ADC	Autonomous District Council (LADC, MADC emaw CADC, Sixth Schedule hnuaia mi)
AEP	Annual exceedance probability (kum khatah a lo thlen theih dan)
AIDR	Australian Institute for Disaster Resilience
AMC	Antecedent moisture condition (ruahpui hma lei hnawnna dinhmun) chauh (he Kaihhruaina Bu hian Aizawl Municipal Corporation hi kimchangin a ziak)
AMCBR	Aizawl Municipal Corporation Building Regulations, 2012, siam ṭhat angin
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
APWA	American Public Works Association
ARF	Areal reduction factor (catchment zau zawng avanga point ruahtui tlak tihhniamna)
ARG	Automatic rain gauge (amah ngeiin ruah a teh)
ASABE	American Society of Agricultural and Biological Engineers
ASTM	ASTM International (standard-te)
AWS	Automatic weather station (amah ngeiin khawchin a teh)
BOD	Biochemical oxygen demand
BRE	Building Research Establishment (UK)
BSMP	Basin Stormwater Master Plan (Basin Ruahtui Luanna Master Plan)
BSUP	Basic Services to the Urban Poor (Durtlang BSUP complex-a ang)
CADC	Chakma Autonomous District Council
CAG	Comptroller and Auditor General of India
CGP	Construction General Permit (US EPA)
CGWB	Central Ground Water Board
CN	Curve number (SCS/NRCS kalphung)
COD	Chemical oxygen demand
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
CSE	Centre for Science and Environment
CWC	Central Water Commission
DG&MR	Directorate of Geology and Mineral Resources (chanchinbu-a "Directorate of Geology and Mining")
DM&R	Disaster Management & Rehabilitation Department

Thumal tawi	A kimchang
DPR	Detailed project report
DST	Directorate of Science and Technology (a State Meteorological Centre hian ruahtui tlak series a vawng)
DWF	Dry-weather flow (ruah sur lohna hun tui luang)
DWRC	District Water Resources Committee (Water Resources Act, 2024)
EF&CC	Environment, Forests & Climate Change Department
EN	European Standard (Norme Européenne)
EPD	Environmental Protection Division (Georgia, United States)
ESC	Erosion and sediment control (lei khawh leh bal thununna)
EV1	Extreme value type I (Gumbel) distribution
FAR	Floor area ratio
FER	Flood Estimation Report (CWC)
FRL / MWL / MDDL	Full reservoir level / maximum water level / minimum draw-down level (reservoir tui sang zawng)
FRP	Fibre-reinforced plastic
GHI	GeoHazards International
GWRA	Ground water resource assessment (CGWB; leihnuai tui awm zat chhutna)
HAT / MHWS	Highest astronomical tide / mean high water springs (tuifinriat kam thumal; Mizoram-ah a awm lo)
HEP	Hydro-electric project
HFL	High flood level (gauge-a tuilian sang ber chhinchhiah)
HGL	Hydraulic grade line
HSG	Hydrologic soil group
HY-8	FHWA culvert hydraulic analysis program
IDF	Intensity–duration–frequency (ruahtui tlak chakna, a rei zawng leh a lo thlen ṭhin dan inzawmna)
IIT	Indian Institute of Technology
IMD	India Meteorological Department
IMDAA	Indian Monsoon Data Assimilation and Analysis (regional reanalysis pakhat)
IRC	Indian Roads Congress
ISO	International Organization for Standardization
IST	Indian Standard Time
IWRD	Irrigation & Water Resources Department
KC	Kansas City (Kansas City Metro APWA Section 5600)
LADC	Lai Autonomous District Council
LiDAR	Light detection and ranging (laser survey)
LMC	Lunglei Municipal Council
LWRC	Local Water Resources Committee (Water Resources Act, 2024; Local Council nei veng-ah)

Thumal tawi	A kimchang
MADC	Mara Autonomous District Council
MBBL 2016	Model Building Bye-Laws 2016 (MoHUA; State dan a ni lo)
MIRSAC	Mizoram Remote Sensing Application Centre
MISWARC	Mizoram State Water Resources Council (Water Resources Act, 2024)
MLD	Million litres a day (ni khatah litre maktaduai)
MoEF&CC	Ministry of Environment, Forest and Climate Change
MoHUA	Ministry of Housing and Urban Affairs
MPCB	Mizoram Pollution Control Board
MSDMA	Mizoram State Disaster Management Authority
Mz-SWIC	IMD Mizoram list-a automatic rain gauge tam zawk kalpuitu (thu hnar-in a hming kimchang a sawi lo)
MZU	Mizoram University
NAFCC	National Adaptation Fund for Climate Change
NDMA	National Disaster Management Authority
NEEPCO	North Eastern Electric Power Corporation Ltd (Tuirial HEP kalpuitu)
NERCCDIP	North Eastern Region Capital Cities Development Investment Program (ADB)
NGT	National Green Tribunal
NH	National highway
NHIDCL	National Highways and Infrastructure Development Corporation Ltd
NIH	National Institute of Hydrology, Roorkee
NIT	National Institute of Technology
NOC	No-objection certificate
NPDES	National Pollutant Discharge Elimination System (United States)
NRSC	National Remote Sensing Centre
NWIA	National Wetland Inventory and Assessment (ISRO)
OA	Original Application (NGT)
OBPAS	Aizawl Municipal Corporation online building permission system
OGC	Open Geospatial Consortium
ORG	Ordinary rain gauge (ruah tehna pangngai)
PHED	Public Health Engineering Department
PIL	Public interest litigation
PSD	Permissible site discharge (site aṭanga luan chhuah phal zat)
PWD	Public Works Department, Mizoram
RDSO	Research Designs and Standards Organisation (Railways)
RMSE	Root-mean-square error

Thumal tawi	A kimchang
RRV	Required retention volume (khawl tur tui zat)
RWH	Rainwater harvesting (ruahtui khawl khawm)
SANDRP	South Asia Network on Dams, Rivers and People
SAPCC	State Action Plan on Climate Change
SBM-U	Swachh Bharat Mission (Urban)
SD&SM	Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017
SH	State highway
SIPMIU	State Investment Programme Management and Implementation Unit
SLA	Sea-level allowance (tuifinriat kam thumal; Mizoram-ah a awm lo)
SRRG	Self-recording rain gauge (amah ngeiin a chhinchhiah ruah tehna)
STP	Sewage treatment plant (ek tui tihfaina)
SUH	Synthetic unit hydrograph (CWC)
TBC	To be confirmed (finfiah tur): thu hnar-ah la hmuh loh thil emaw value
TCPO	Town and Country Planning Organisation (MoHUA)
TR-55	Technical Release 55 (USDA SCS/NRCS)
TWL	Tailwater level (outfall hnuailama tui sang zawng)
UD&PA	Urban Development & Poverty Alleviation Department
UH	Unit hydrograph
ULB	Urban local body (Mizoram-ah, Aizawl Municipal Corporation leh LMC)
USACE	US Army Corps of Engineers
UT	Union Territory
UTM	Universal Transverse Mercator
VC	Village Council (Mizoram (Village Councils) Act, 2025; emaw, ADC ram-ah, District Council hnuaia mi)
VR	Value rating (WQv tihfaitu BMP ta)
VWRC	Village Water Resources Committee (Water Resources Act, 2024)
WARDMA	Water Resources Development and Management Authority (Water Resources Act, 2024)
WQv	Water quality volume
WSUD	Water-sensitive urban design
YMA	Young Mizo Association

BUNG 1

Policy, A Huam Chin leh Pawmna

1.1 Thiltum leh tum tur

1.1.1 He Kaihhruaina Bu hian Mizoram-a ruahtui system-te ruahmanna, design, sakna, kalpui leh enkawl atana standard hniam ber a siam. Clause 1.5-a tarlan angin, mimal hmasawnna hna (private development) leh public works (sawrkar hnathawh) chungah hman a ni.

1.1.2 He Kaihhruaina Bu thiltumte chu heng hi an ni:

- (a) ruahtui enkawl dan (stormwater management) hi **development phalna pek nana thil tih ngei ngei tur (condition)** a nih tir, chutiang chuan development thar leh siam ṭhatna (redevelopment) hian luanna hnuailam (downstream)-ah tuilian sang ber emaw ruahtui luang (runoff) zat emaw a tihpun loh nan;
- (b) ruah tlak fo ṭhin chu site-ah khawl, chutiang chuan leihnuai tui tihpun (recharge) a chhunzawm theih nan leh bawlhhlawh zat (pollutant load) a tlem theih nan;
- (c) fûr hun ruahpui rei tak tak, Mizoram-ah shale leh lei bawrh tlang pangah ni tam tak chhung a sur ṭhin (Serchhip district-ah June ni 1–13, 2018 chhungin 677 mm, SANDRP, chanchin tlangzarh angin; May ni 24, 2025 aṭanga June ni 3, 2025 thleng ruahpuiah State pumah leimin 598, DM&R chhiarna, chanchin tlangzarh angin), leh fûr hma April leh May ruahpui aṭanga (chung zingah May ni 28, 2024-a Cyclone Remal) October aṭanga December thleng fûr hnu cyclone thleng, lei tihhnawng a, leimin thlen a, lui leh phai luipuite tisang reng ṭhin atan, duration tawi ruahtui tlak chakna (intensity) atan pawh, khawlna (storage) zat ruat;
- (d) khawpui zawng zawng deuhthaw tui luan lutna tlang lui (hill stream) chim tak takah outfall (drain tui luan chhuahna) design; chung zingah chuan Chite lui, Aizawl "chhak lam ṭhena thum ṭhena hnih aia tam" ("more than two-third of eastern portion") tui Tuirial-a phurh luttu, leh Ser lui leh a lui tête, khawpui thlang lam tui Tlawng-a phurh luttu (Master Plan for Aizawl: Vision 2030) an tel a, chung luite chu darkar khat chhungin an lian a, "fûr hun chhungin tui luan chak tak nen an luang buai" ("turbulent with high velocities of currents during the monsoon season") a, leimin bal leh bawlhhlawh an phur ṭhin, chuvangin outfall tam berte chu a tla thla zalen a, an tui chakna tihnem ngei ngei tur a ni; phai leh lui kam zawl sira sang taka ding luipuite, Sairang, Bairabi leh Vairengte-a Tlawng, Champhai phai luipuite leh Chawngte-a Kau leh Tuichawng; Tlabung-a Khawthlangtuipui (Karnaphuli), luipui tuilian khawpui, a inte 2017, 2018, 2019 leh 2023-ah tuilianin a chim (chanchin tlangzarh angin); Tuirial dam reservoir leh a hnuai lam lui chhungte leh Serlui B dam hnuai lam lui chhung, tuilian an thlahna; leh State chhuahsan a Bangladesh leh Myanmar-a luang luipuite, Karnaphuli, Kaladan (Chhimtuipui) leh Tiau, luanna hnuailam tui sang zawng hriat theih lohna, outfall khar dinhmun nen;
- (e) dil (tank), hmun hnawng (marsh), luipui, tui pekna kawng (supply channel) leh tui tam luan chhuahna (surplus course) te chu tui luanna system peng angin humhalh;
- (f) tui luanna network peng tin hnenah 1% AEP (kum 100) ruahpui atan lei chunga tui luan kawng (overland path) him tak pek;
- (g) design-a thil hman (design input), phalna leh facility record-te vantlangin an hriat theih turin tlangzarh, chutiang chuan design-te endik leh tih nawn theih a nih nan; leh
- (h) facility-te an sak zawh hnuah enkawl an nih leh hna an thawh ṭha zel theih ngei nan.

1.1.3 He Kaihhruaina Bu hian ruahtui khawl khawm (RWH) thupek (mandate), Aizawl Municipal Corporation Board of Councillors-in Mizoram Municipalities Act, 2007 section 371 hnuaia an siam a, Urban Development & Poverty Alleviation Department-in a notify (Gazette-a tarlan) building leh site-development regulation-te (Aizawl Municipal

Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017), emaw tui awmna (waterbody) chungchang dan (statute) te a thlak lo. Chung chungah chuan ruahtui luang thunun (runoff control) phut a belh a ni (Clause 1.8).

Hrilhfiahna. Mizoram-a chhiatna (disaster) te hi hnar pathum aṭangin a lo chhuak a, a tam zawkah an rual ṭhin. A hmasa ber, mi tam ber thihna thlentu chu, tlang chhip khawpuite tlang pangah ruah leh tui luanna-in a thlen leimin hi a ni. August ni 9, 1992-ah Aizawl chhim kawn, South Hlimen-a lung laihna (quarry) chu "leimin hmuh ngai loh ang" ("unprecedented landslides") (Senhri Journal) avangin a chim a, chu chuan "mi 100 deuhthaw nunna a la" ("claimed the lives of almost 100 people") (MIRSAC, 2013, hma lama zirna a lakchhawn); chanchin indawt ziakna (chronology) pakhat chuan August 1992-ah Mizoram khua hming tarlan loh pakhatah ruang 30 chhar chhuah a ni a, mi 68 phum hlauh an ni tiin a tarlang a, chu chu thil thleng inang a ni thei (chanchin tlangzarh angin; finfiah a ni lo). 1995-ah leimin-in mi 25 tal an thi (chanchin tlangzarh angin), 1994-a Bawngkawn leh Vaivakawn leimin-te chu geotechnical zirchianna neih a ni (MIRSAC, 2013). Chanchinbu leh AGU Landslide Blog-in May ni 11, 2013, dar 3 a.m. vel-ah, emaw paper pakhatin May ni 15, 2013-ah (thu hnarte a inang lo), Aizawl Laipuitlang–Ramhlun Venglai-ah, "ruahpui, khawpui ri nen thlipui" ("heavy rainfall, thunderstorm") hnuah, lungpui tlak (rockslide)-in in 15 a tichhia a, PWD building mi chhuahsan tawh chu mi pakua chungah a tlu; paper chanchin angin ruang 17 laih chhuah a ni a, mi 8 chhanhim an ni a, review dang chuan mi 8 nunna a chan tiin a ziak (Laldinpuia et al., 2013; chanchin tlangzarh angin; thu hnarte a inang lo). Paper-in a tarlan "8 Mm³ vel" ("about 8 Mm³") zat chu leimin 1,025 m² zau tan a rintlak lo va, hman a ni lo [U]. July ni 2, 2019-ah Durtlang-a BSUP hnuaia sak in khawm (housing complex) block 20 zinga pathum a chim a, mi 3 an thi a, 11 an hliam a, chhungkua 140 sawn chhuah an ni; 2020-a rawtna, rock bolt, wire net leh toe wall chak zawk (buttressed) te chu siam a ni lo: "rawtna pakhat mah hlen chhuah a ni lo" ("none of the suggestions were carried out") (CAG). 2017-18 aṭanga 2021-22 thleng leimin-in khua 661 a nghawng a, mi 41 an thi a, 15 an hliam a, kawng km 219 a tichhia a, tuilian-in khua 434 a nghawng a, mi 12 an thi (CAG). 2022-23-ah Directorate of Geology and Mineral Resources pawl pakhatin hmun 55 an endik a, leimin lian zinga ṭhena thum ṭhena hnih chu "tui luanna ṭha lo" ("improper drainage") avang a ni an ti (chanchin tlangzarh angin). May ni 28, 2024-ah, Cyclone Remal laiin, May ni 27 aṭanga ruahpui a sur hnuah, Melthum leh Hlimen inkara lung laihna hman tawh loh chu dar 6 a.m. vel-ah a chim a, leimin dangin Aizawl a deng a, NH-6 chu Hunthar-ah a chat. Thih zat chu ni chhungin a pung zel: 10, chumi hnuah 23, chumi hnuah 29 Aizawl district-ah, mi 7 hmuh loh (May ni 29); report pakhat chuan lung laihna-ah 15 leh Hlimen-ah 5 a ti a, a hnu lama report chuan Aizawl hmun pasarihah mi 34 thi a ti a, State pum thih zat chu chhiar dan hrang hrangin 27 aṭanga 29 a ni (a zavaia chanchin tlangzarh angin; thu hnarte a inang lo). July 2024-ah Bawngkawn–Durtlang kawngah leimin a thleng a, High Court-in a sir lehlam leh lehlamah sak thar a khap (chanchin tlangzarh angin). May ni 24, 2025 aṭanga June ni 3, 2025 thleng leimin 598-in mi panga an thi a, in 171 a tichhia a, hmun 257-ah kawng a dal a, a tam ber Champhai district-ah (209), chumi hnuah Serchhip (116), Khawzawl (75), Lunglei (61) leh Aizawl (21) (DM&R chhiarna, chanchin tlangzarh angin). August 2026 leimin-in Aizawl, Champhai, Lawngtlai leh Hnahthial a deng a, mi thi an awm lo, September 2026-ah Vairengte-ah leimin-in naupang mipa pakhat a thi a, mi pali an hliam (chanchin tlangzarh angin).

A pahnihna chu phai leh lui kam zawla luipui tuilian a ni a, State-in a awm lo angin a sawi: "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area") (MPCB, OA 593/2017-a National Green Tribunal hnena report). Khawthlangtuipui kama Tlabung hi a luipui aṭangin tuilian a thleng ṭhin. June 2017-ah sub-division-ah in 350 vel tuiin a chim tih report a ni a, district officer-te chuan in 9 a kim leh 60 aia tam a ṭhen a chim an ti a, mi 8 aṭanga 10 an thi a, chhungkua 1,500 aia tam an nghawng (chanchin tlangzarh angin; thu hnarte a inang lo). June 2018-ah, Serchhip district-in June ni 1–13 chhungin 677 mm leh Aizawl-in ni khatah 148 mm a dawn laiin, Tiperabagh-ah in 100, Serhuan-ah 70 leh Tlabung-ah 30 tuilianin a chim a, Tlawng kama Sairang-ah chhungkua an khung bet a, Hunthar-a NH-54 lei laihte a nghet lo va, June ni 5-ah leimin-in mi sawm an thi (SANDRP; chanchin tlangzarh angin). July 2019-ah in 400 vel, Tlabung khawpuiah 150 telin, tuilianin a chim a, chhungkua 350 aia tam sawn chhuah an ni a, State pumah mi 3 an thi a, August 2023-ah Tlabung-ah chhungkua 40 sawn chhuah an ni (chanchin tlangzarh angin). Tlawng kama Bairabi leh Tiau kama Champhai pawhin tuilian a tuar ṭhin (chanchin tlangzarh angin). State thusawi leh heng tuilianahte hi an inmil lo va, phai sirah chu thusawi chu a dik lo.

A pathumna chu khawpui drain (tui luanna; Pachuau: tui luankawr) ngei hi a ni. "Aizawl Urban Area 67% hi kutcha drain a ni a, 18% hi tui luanna system reng reng a nei lo. Hmun 15% chauhin pucca drain a nei" ("67% of Aizawl Urban Area is having kutcha drains and 18% are without any drainage system at all. Only 15% of the area is provided with pucca drains"); drain-te chu "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design"); "Aizawl hi hmun pangah a awm avangin tui khawlh lian a awm lo" ("there is no major water logging in Aizawl as it is situated in sloppy ground") ni mahse, Aizawl W-I ṭhena thum ṭhena khat chu "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") tui a khawlh ṭhin a, chu chu plan-in kawng sir drain-a bawlhhlawh khawh (solid waste) avangin a ti (Master Plan for Aizawl: Vision 2030). Chung drain-te bawk hian khawpui ek tui (sewage) tam ber a phur (Bung 8). Heng thil thlengte DM&R thih zat tawp ber chu hmuh a ni lo [TBC], a chunga thih zatte hi an chhiar dan leh report ni-ah a inang lo.

Design awm lo hian pathumte hi a tichhe zual. State-a khawpui reng reng drain-te tan design ruahpui, return period (kum engzat zelah nge a lo thlen ṭhin) emaw drain standard emaw hmuh a ni lo, Aizawl Municipal Corporation tlang pang regulation chuan terrace (tlang panga hmun zawl siam) leh drain-te pianphung (geometry) a ruat a, design ruahpui erawh a ruat lo. Thiltum (b) aṭanga (e) thleng hian khawlna, outfall leh building lama hlawhchhamna, drain zau zawng ruatna kaihhruaina bu chauhin a siam ṭhat theih loh te a chhang a; tlang pang hnar chu Bung 2, 4, 6 leh 7-a hmun thlan dan, endikna (screening), infiltration (lei-a tui luh) leh bal (debris) dan-in a chhang, drain reng reng leimin phur turin design a nih loh avangin; luipui hnar chu Bung 5 outfall endikna leh Bung 6 leh 7-a corridor (lui leh drain kama humhalh tur ram zau) leh chhuat sang zawng (floor level) te-in a chhang.

Ram pum (national) dan reng rengin site-a detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) a phut lo. CPHEEO (2019) hi thurawn (advisory) chauh a ni a, peak control (tui luang sang ber thunun) hi hman ṭhin dan angin chauh a sawi. NDMA (2010) chuan detention leh retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) "tel ang" ("will") a ti a, zau zawng ruatna dan erawh a pe lo. MBBL 2016 leh Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 chuan RWH chauh an phut. Chuvangin thiltum (a) hi he Kaihhruaina Bu-in hmalakna thar pawimawh ber a lak a ni.

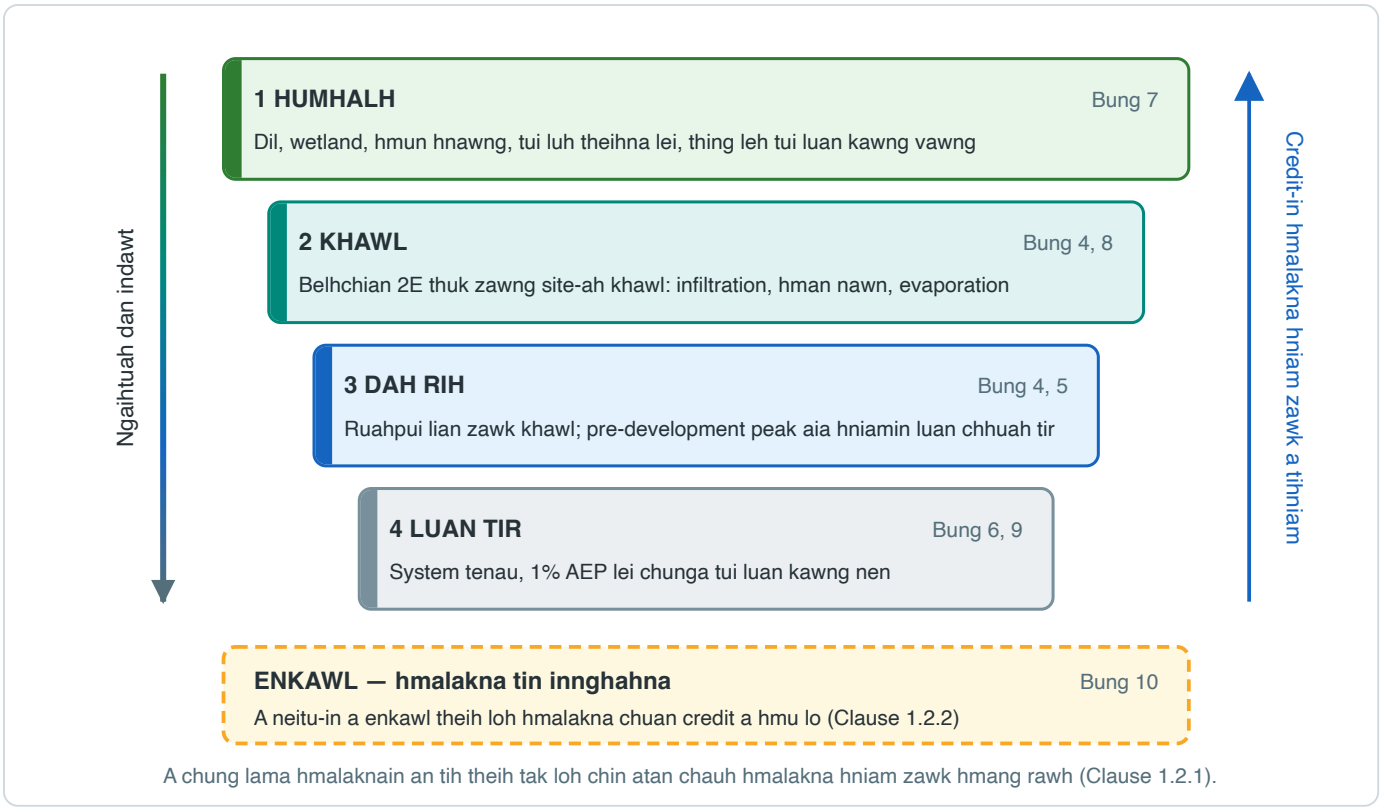
1.2 Ruahtui enkawl dan indawt (hierarchy)

1.2.1 Bung 4 hman tlak development tin hian ruahtui hmalakna te hi heti hian indawtin a ngaihtuah tur a ni. Designer chuan site-a tih theih hmalakna sang zawk aiah hmalakna hniam zawk a hman loh tur a ni.

1. **Humhalh** — pianphung tui luanna (natural drainage), dil, wetland, lei tui luh theih (permeable soil), thingte leh lei chunga tui luan kawng (overland flow path) te vawng emaw siam ṭha leh (Bung 7).
2. **Khawl** — Belhchian 2E retention thuk zawng (depth) aṭanga ruahtui luang chu site-ah khawl, infiltration, hman nawn (reuse) emaw evapotranspiration (lei leh thing aṭanga tui chhuak) hmangin (Bung 4 leh 8).
3. **Dah rih** — ruahpui lian zawk chu rei lo te chhung khawl a, Bung 4-a luan chhuah zat chin emaw a hnuai lamah luan chhuah tir, luanna hnuailam leh tailwater (outfall hnuailama tui sang zawng) dinhmun nena endik (Bung 4 leh 5).
4. **Luan tir** — tui la awm chu tui luanna system tenau (minor)-ah him takin luan tir a, 1% AEP tui luang chu tui luanna system lian (major)-ah (Bung 6 leh 9).

1.2.2 **Enkawl** hi hmalakna pali zawng zawng innghahna a ni. Bung 10 hnuaia a neitu-in a enkawl theih loh hmalakna chu credit pek loh tur a ni.

1.2.3 Hmalakna sang zawk aṭanga credit chuan hmalakna hniam zawk phut zat a tihniam. Humhalh hmun leh khawl tui zat chuan Bung 4-a tarlan angin detention khawlna a tihniam.



Milem 1.1 — Ruahtui enkawl dan indawt: humhalh, khawl, dah rih, luan tir, hmalakna tin innghahna atan enkawl nen. He Kaihhruaina Bu tana milem siam thar, Mid-America Regional Council / Kansas City Metro Chapter APWA, "Layers of Stormwater Management", APWA 5600 Manual Factsheet, 2025 (ngaihdan) aṭanga siam danglam.

Hrilhfiahna. He indawt hi Kansas City Metro APWA Section 5600, Version 2025.01 "layer" ("layers") te zawm a ni: humhalh emaw siam ṭha leh, khawl, dah rih, luan tir, enkawl (MARC factsheet, 2025). Chu ngaihdan bawk chu Georgia ruahtui luang tihtlem (runoff-reduction) standard leh CSE "a hmasain tihtlem leh lei-a luh tir" ("attenuate and infiltrate first") thupui (CSE, 2023) bul a ni. Mizoram tan chuan layer chung lam pahnih hian awmzia bik a nei. Tlang chhipah a hmasa bera humhalh ngei ngei tur chu tlang pang pianphung tui luanna a ni: khawpui tui luipuia phurh luttu luite, khaw-in tui an lakna tuikhur (spring) te, dil tlemte, leh "khawpui leh a chhehvela lei hi a la naupang a, a bawrh" ("The soil in and around the city is young and in a loose state") (Master Plan for Aizawl: Vision 2030) tlang pangte-a ramngaw leh lei khuh (cover) te. Aizawl Municipal Corporation tlang pang regulation hian hlauhawmna a sawi chiang: "tlang pang laih, lei vur, tlang panga leihnuai tui luh zat tihpun, leh sewerage leh tui luanna tlang pangah thunun ṭha lova paih ang chi mihring thiltih hian tlang pang nghet lohna a tipung nasa thei" ("human activities such as slope cutting, filling, increasing the amount of groundwater penetrating into slopes, and disposing of sewerage and drainage onto slopes in a poorly controlled manner can greatly increase slope instability") (SD&SM, reg. 1). Dan hian heng zinga ṭhenkhat a humhalh. Master plan chuan "khawpui ram pum zinga 52% vel chu khawpui ni lo hmanna, Loneih/Ramngaw, Tui Awmna, Hmasawnna theih loh Tlang Pang ang chi hnuaiah" ("Around 52% of total urban area … under non-urban uses like Agriculture/Forest, Water Bodies, Undevelopable Slopped Lands") a vawng a, tui luanna lian (major drainage channel) sir lehlam leh lehlamah green buffer 15 m a rawt; tlang pang regulation chuan pianphung lui sirah "riverine reserve" ("the riverine reserve") a vawng a, hrilhfiah erawh a hrilhfiah lo (reg. 28), 60° chung lamah phalna a pe lo (reg. 14); leh Mizoram Water Resources (Management and Regulation) Act, 2024 chuan tuikhur-te chu "khawtlang tui hnar" ("community water resources") (s.2(1)(i)) zingah a chhiar a, chungte chu a Village leh Local Water Resources Committee-te-in bawlhhlawh laka an vawn tur a ni. Regulation pahnih hian lui emaw tuikhur emaw aṭanga metre-a setback (tui kam aṭanga hmun kalhlen tur) an ruat lo, heng dan zinga pakhat mah hian Autonomous District Council-te ram a thleng lo. Tlang ramah layer pahnihna hi a danglam. Chutah chuan retention chu khawlna leh hman nawn a ni a, infiltration a ni lo: CGWB chuan shale tlang chhipte chu "tui luh theihna leh infiltration hniam" ("characterized by low permeability and infiltration"), "ruahtui luang chhuahna zone" ("run off zone") (CGWB, Lunglei) a ti a, State

assessment unit tin chu "Him" ("Safe"), 2011-ah lak chhuah zat (stage of extraction) 3.52% (CGWB, State profile) leh 2024-ah 3.95% (GWRA 2024, thu lak chhawn angin) a ti a, chuvangin recharge hi design thiltum a ni lo. Chuvangin he Kaihhruaina Bu hian pianphung tlang pang 10° aia chim, Surma group shale, siltstone leh mudstone-ah tlang pang eng zat pawhin, colluvium, lei vur, lei laih bal emaw leimin bal chungah, Moderate, High emaw Very High leimin hlauhawm zone map-a tarlanah leh cut emaw retaining wall chung lama a sanzawng let hnih chhungah, geotechnical certificate-in a phal loh chuan, tum taka infiltration a khap a, High leh Very High hlauhawm zone-ah chuan engtik lai mahin a phal lo (Clause 4.11, tlang dan); recharge chu phai lei (valley alluvium) endik tawh leh lui kam zawlah, 1% AEP tuilian sang zawng chunga hmun zawlah, leihnuai tui sang zawng (water table) lei hnuai 2.0 m tal a nihnaah chauh a phal (Clause 4.11, recharge dan); leh tuikhur tin aṭangin ruahtui a hrang a, a 15 m chhungah ruahtui outfall, soakaway emaw drain tui luan chhuah a phal lo (Bung 8 tuikhur dan) (a zavaia he Kaihhruaina Bu-in a ruat). Ruahtui khawl khawm hi tui pekna a ni: Aizawl Urban Area chhungkaw 27.16% chuan ruahtui an hmang (Master Plan for Aizawl: Vision 2030). Heng tlang pangah hian lei-a tui luh tir drain chuan tlang pang a tichim thei.

1.3 Dan innghahna leh dinhmun

1.3.1 **Notification.** He Kaihhruaina Bu hi Mizoram sawrkar-in heng hmangin dan anga thuneihna (statutory effect) a pek tur a ni:

- (a) Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 amendment, Clause 1.5 hman tlak development tan, he Kaihhruaina Bu zawm hi planning permission, building permit, layout phalna leh completion certificate pek nana thil tih ngei ngei tur (condition) a nih tirtu; leh
- (b) urban local body (ULB) tin bye-laws emaw standing order emaw, chu ULB-in a thawh emaw phalna a pek hna, ULB drain leh kawngte pawh telin, tan he Kaihhruaina Bu pawmtu.

1.3.2 **State standard sang zawk.** He Kaihhruaina Bu design return period leh hnathawh tehna (performance criteria) te hi CPHEEO Manual on Storm Water Drainage Systems (2019)-a ram pum thurawn hniam ber (national advisory minimum) aiin a sang zawk. State chuan heng standard sang zawkte pawm turin notification hmangin committee thuneitu (high-powered committee) (**State Stormwater Technical Committee**, Clause 1.9) a din tur a ni. Hei hi CPHEEO (2019)-in return period sang zawk atana kawng a siam a ni.

1.3.3 **Pawimawh zawk dan (precedence).** A huam chinah, he Kaihhruaina Bu hian CPHEEO (2019), IRC:SP:42-2014, IRC:SP:50-2013 emaw Department standard reng reng aia a khauh zawkna-ah thu a nei. Dan (statute) emaw dan anga rule-in phut khauh zawk a siam chuan (entirnan tui awmna setback), chu dan chuan thu a nei.

1.3.4 **Public works tana design hman dan standard.** Tui luanna, kawng emaw tui awmna hna lei (procure) Department leh ULB-te chuan Clause 1.11-a ni tarlan aṭangin, detailed project report (DPR) leh contract-ah he Kaihhruaina Bu zawm an phut tur a ni.

Hrilhfiahna. Mizoram-ah site chunga thuneitu tui luanna dan chu tlang pang regulation-ah a awm a, building regulation-ah a awm lo, he Kaihhruaina Bu hian chu pahnih chu AMCBR/SD&SM tiin a kawp a tarlang. A hmasa chu Aizawl Municipal Corporation Building Regulations, 2012 a ni (UD&PA Notification No. B.13017/8/2012-UD&PA, December ni 20, 2012; Mizoram Gazette Extraordinary Vol. XLII, Issue No. 4, January ni 10, 2013), Aizawl Municipal Council Building Regulations anga siam, 2019 Amendment Regulations (No. B.13017/8(2)/2018-UD&PA; April ni 10, 2019-a objection dil tura tlangzarh draft chu chhiar a ni a, gazette tawp ber chhiar a ni lo [TBC]), 2023 (No. B.13017/8/2021-UD&PA/Pt, August ni 14, 2023, August ni 28, 2023 aṭanga hman mek, "Council" chu "Corporation"-a thlaktu) leh 2025 (No. B.13017/8/2021-UD&PA/Loose, November ni 21, 2025) hmanga siam ṭhat angin. A pahnihna chu Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 a ni (No. B.13017/75/2016-UD&PA, April ni 4, 2017; Gazette Extraordinary Vol. XLVI, Issue No. 161, April ni

11, 2017), GeoHazards International nena Landslide Policy Committee for Aizawl City tana buatsaih (chanchin tlangzarh angin); amendment a neih leh neih loh hriat a ni lo [TBC]. Pahnih hi Mizoram Municipalities Act, 2007 section 371 hnuaiah Board of Councillors-in "a hmaa tlangzarh hnuah" ("after previous publication") a siam a, UD&PA-in a notify. Pahnih hian "Aizawl Municipal Council-in a huam ram zawng zawngah" ("all the areas covered by the Aizawl Municipal Council") (AMCBR reg. 1(2)) chauh an huam a, 2012 Regulations chu "Aizawl Municipal Council-in a notify ni-ah hman ṭan a ni ang" ("shall come into force on such date as the Aizawl Municipal Council may notify"), chu ni chu hmuh a ni lo [TBC]. State pum huap building regulation hmuh a ni lo a, Lunglei Municipal Council (LMC) regulation pawh hmuh a ni lo [TBC].

Building regulation hian site chu "tui luanna ṭha nei emaw tui luan tir theih" ("properly drained or capable of being drained") leh "leimin, lei tlak, lei che ang chi hlauhawm hmun a ni lo" ("not an active hazard-prone area such as landslide, subsidences, mass movement") (AMCBR reg. 21(ii), (iv)) a nih a phut; plan-ah "sewerage leh leilung chung drain, septic tank leh soak pit awmna leh a lian zawng" ("sewerage and surface drains, position and sizes of septic tank and soak pit"), roof plan-ah "tui luanna leh inchung pang lantir" ("indicating drainage and roof slope"), "site development leh structure nghet, retaining wall, leilung chung drain ang chi" ("site development and permanent structures like retaining wall, surface drain") leh "ruahtui khawl khawmna ṭha tak siamna" ("provision for a suitable rain water harvesting facility") lan a phut (regs. 5(5)(v), 5(6)(iv), (viii) leh (ix)); plinth chu "0.45 metre aia hniam lo ni se a ṭha" ("may preferably be not less than 0.45 metre"), tui luanna a fel theih nan, leh inchung tui chu ruahtui gutter leh pipe khuh (closed conduit)-in phur a, "pipe hmangin lei chungah luan chhuah tir" ("discharged at ground level by pipe"), "kawng emaw vantlang hmun emaw a kianga compound chhunga luan tur spout reng reng awm lo" ("no spout … to drain into the road or public area or within the adjacent compound") (reg. 26(2)); water closet tin tan septic tank "soak pit nen" ("with soak pit"), "tui hnar aṭanga metre 15 chhungah" ("within a radius of 15 metres from a water source") awm lo, leh "building zawng zawngah ruahtui khawl khawmna ṭha tak" ("A suitable rain water harvesting facility … in all buildings") (reg. 33); leh "vantlang himna avangin" ("in the interest of public safety") tui chu vengte ram kal tlang ngei a ngaih chuan pipe khuh, leh "vantlang drain hnai ber thlenga a tawk drain" ("of adequate capacity to the nearest public drain") emaw pipe khuh emaw (reg. 37). 2023 aṭang khan online building permission system (OBPAS) chuan "AMC Building Regulations, 2012 leh Master Plan for Aizawl, Vision-2030 dan ang ni lo" ("not as per the provisions of the AMC Building Regulations, 2012 and the Master Plan for Aizawl, Vision-2030") rawtna reng reng a kirtir ṭhin; 2025 aṭang khan ruahtui khawl khawm leh "Hardscape tihtlem" ("Reduction of Hardscape") te chu 100 m² chung plot tan incentive a ni a (Chapter VIIIA), technical personnel empanel-te chuan "plot 93 square meter aia tê, geo-hazard zone hniam leh moderate chhunga awm" ("on plots measuring less than 93 square meters and located within low and moderate geo-hazard zones") chunga building pangngai chu anmahni ngeiin an certify thei (Annexure B-I). Tlang pang regulation hian "building permit bakah" ("in addition to a building permit") site development permit a phut (SD&SM reg. 5(1)); Landslide Hazard Maps-a Moderate, High leh Very High zone-ah, map-a tarlan loh tlang pang 24° emaw a chung lamah, cut 3 m emaw a chung lamah, hna 200 m³ aia tamah leh structure chelhtu hnaah geotechnical report nen engineered track a phut a, "site development pangngai chu leimin hlauhawm Low zone-ah CHAUH phal a ni" ("Regular site development" being "allowed ONLY in zones of Low landslide hazard"); 60° chung lamah phalna a pe lo (reg. 14); leh site tui luanna (reg. 27): cut leh fill tlang pangah sanzawng 10 m aia sang lo zelah zau zawng 2 m tal terrace, swale lung phah 1 in 20 tal nen, chung swale pakhat mah "tui luan lutna hmun (projected horizontally) 400 square meter aia zau aṭanga ruahtui down drain-a luan lut tir lovin a khawm tur a ni lo" ("shall … collect runoff from a tributary area exceeding 400 square meters (projected horizontally) without discharging into a down drain"); chung lam tui luan kawng 10 m aia sei cut slope tin chung lamah interceptor drain (cut chung lama ruahtui dangtu drain) lung phah; building pad chu phalna pek drain lam panin 1 in 50 tal pang; "lei khawrh lo downdrain" ("non-erosive downdrains"); leh hnuai lama site siam chuan "a chung lama site aṭanga tui luang, ek tui emaw tui chiar … tui luan kawng hnai ber thlengin him takin a phurh chhuah" ("convey drainage, sewage or seepage from the adjacent site uphill … in a safe manner to the nearest practicable drainage way") tur a nihna. A engineered plan-te chuan "drain reng reng thlen chin hmun ruahtui luang chhut zat" ("the estimated runoff of the area served by any drains") a lantir (reg. 6(4)), a Schedule I chuan licensed civil engineer-te chu "hydrology leh hydraulic chhutna tiamin, drainage structure design" ("Design of drainage structures, including hydrology and hydraulic calculations") tan thiam a ti. Regulation pahnih hian design ruahpui, return period, runoff coefficient, luan chhuah tir zat (release rate) emaw detention tui zat, lui emaw tuikhur aṭanga setback, emaw ruahtui khawl

khawm zau zawng an ruat lo. Clause 1.1 Hrilhfiahna chuan ram pum Model Building Bye-Laws leh AMCBR/SD&SM chuan "RWH chauh an phut" ("mandate RWH only") a ti: chu chu 2012 Regulations (reg. 33) tan a dik a, 2017 Regulations erawh chuan ruahtui khawl khawm a phut lo va, site tui luanna pianphung (geometry) a ruat thung, detention, peak-flow emaw design ruahpui dan erawh a la nei lo (NEER chhiar dan). He Kaihhruaina Bu hian tlang pang regulation-in engineer kutah a dah te a pe: design ruahpui, intensity, capacity endikna, freeboard (tui sang ber chunga zau dah) leh bal (debris) atana hmun dah.

Chuvangin Clause 1.3.1(a) kawng chu Board of Councillors leh UD&PA kaltlangin a kal. UD&PA-in he Kaihhruaina Bu hi AMCBR regs. 5(6), 26, 33 leh 37 leh SD&SM regs. 6 leh 27 amendment-ah a dah lut thei ang a, chu chu Board of Councillors-in section 371 hnuaiah a hmaa tlangzarh hnuah a siam ang a, UD&PA-in a notify ang (Belhchian 1D); Corporation-in OBPAS, site development permit leh a kuta awm amah kawng drain-te (Municipalities Act, ss.288–289) hmangin a hmang thei ang; LMC-in ama regulation ngei hmangin chu bawk chu a pawm thei ang; leh UD&PA-in Mizoram (Village Councils) Act, 2025 section 13(6) model building bye-laws chu tui luanna annex nen a siam thei ang. Mizoram Urban and Regional Development Act, 1990 (Act 12 of 1990, 2004-a siam ṭhat) hi he Kaihhruaina Bu-in a hming chauh a hria (tarlan angin) a, regulation pahnih zinga pakhat mah siamna Act a ni lo; Belhchian 1D-in a hming a tarlan chhan chu core text-in State planning Act a zawh vang chauh a ni. Master Plan for Aizawl: Vision 2030 chu Aizawl Development Authority hman hlui, "(tunah AMC-ah tel tawh)" ("(now absorbed in AMC)") (CAG)-in a buatsaih a ni; a phalna notification hmuh a ni lo a, March 2013-a phalna pek a ni tih report chu finfiah a ni lo [TBC], mahse OBPAS chuan rawtna tin chu chumi nen a khaikhin ṭhin.

Chu kawng chu Corporation ram chauh a thleng. **Mizoram-ah dan anga ram hran pathum a awm.** (i) **Municipality-te.** Mizoram Municipalities Act, 2007 (Act No. 6 of 2007) hi "Mizoram State pumah a huam ang, Panchayat emaw Village Council anga puan tawh emaw puan leh tur emaw, a chhunga tel emaw ram erawh chu a huam lo … mahse Sixth Schedule paragraph 20 PART III-a tarlan Mizoram Tribal Areas a huam lo ang" ("shall extend to the whole of the State of Mizoram except the area which has been or may hereafter be declared as, or included in, a Panchayat or a Village Council … but shall not extend to the Mizoram Tribal Areas, as referred to in PART III of the paragraph 20 of the Sixth Schedule") (s.1(2)); a tak takah Aizawl Municipal Corporation leh LMC a thleng. (ii) **Village Council ramte.** Mizoram (Village Councils) Act, 2025 (Act No. 7 of 2025; March ni 12, 2025-a assent; Gazette Extraordinary Vol. LIV, Issue No. 178, March ni 20, 2025), Lushai Hills District (Village Councils) Act, 1953 thlaktu hi "Municipality-te leh Lai, Mara leh Chakma Autonomous District Council-te thuneihna hnuaia ram tih loh Mizoram pumah a huam ang" ("shall extend to the whole of Mizoram except the areas under the jurisdiction of the Municipalities and the Lai, Mara and Chakma Autonomous District Councils") (s.1(2)), chuvangin khaw te leh urban local body nei lo notify a nih khawpuite, chung zinga 13-ah mi 5,950 aṭanga 32,734 an awm (CAG), a thleng. A Village Council-te chuan "State sawrkar-in a siam model building bye-laws chu an pawm ang a, an zawm tir ang" ("shall adopt and enforce the model building bye-laws as may be framed by the State Government") a, "District Disaster Management Authority-in phalna a pek chuan" ("subject to the approval of the concerned District Disaster Management Authority"), "leimin tihziaawm nan an thuneihna chhunga hmun ṭhenkhat chu in sak atan him lo hmun angin an puang thei" ("may declare certain area within their jurisdiction as unsafe site for house construction for mitigation of landslide") (s.13(6)); model building bye-laws hmuh a ni lo (NEER chhiar dan). (iii) **Autonomous District Council-te.** Chhim lama Sixth Schedule hnuaia Lai (Lawngtlai), Mara (Siaha) leh Chakma (Kamalanagar leh Chawngte) Autonomous District Council-te chu Act pahnih aṭang hian, Mizoram Water Resources (Management and Regulation) Act, 2024 ("Autonomous District Council-te tih loh" ("except the Autonomous District Councils")) aṭangin leh 2023 Rivers Bill aṭangin chhuah an ni a, 74th Amendment thu te chu "Sixth Schedule ramah hman a ni lo" ("are not applicable in the Sixth Schedule areas") (CAG). District Council reng reng building emaw tui luanna regulation hmuh a ni lo. Chakma District Council-in Kamalanagar Town Planning Committee aṭanga no-objection certificate a phutna (2018), kawng sir building phalna hmasa chungchanga a notification (November ni 20, 2020) leh "Village Council ziak phalna tel lovin" ("without the written permission from the Village Council") in sak khapna 2002 dan te chu hming leh thu ṭhenkhat (snippet) aṭangin chauh hriat a ni a, Lai Autonomous District Council (Land Holding and Settlement) Act, 2002 chu snippet aṭangin, Mara District Council tan engmah hmuh a ni lo (tarlan emaw tawi fel taka sawi emaw angin). He Kaihhruaina Bu hian Sixth Schedule, he Kaihhruaina Bu tana chhiar loh, a lakchhawng lo; Act-te extent clause leh CAG hmangin ram ṭhenna chu a sawi.

Corporation ram pawn lama he Kaihhruaina Bu thlen theih chin chu a zim hle: State Department leh agency-te-in State-a khawi hmunah pawh an thawh public works, chung zingah kawng, culvert (kawng hnuaia tui kalna), drain, tui pekna, sewerage leh tuilian hna (Clause 1.5.1(b)); a pawmtu pawl reng reng; Village Council ramah, State-in a siam hnuah section 13(6) model building bye-laws, leh District Disaster Management Authority phalna nena Village Council-te hmun him lo puanchhuahna; leh Autonomous District Council ramah, District Council-in a pawm loh chuan engmah. District Council chuan ama ram tan ama dan (instrument) ngei hmangin, a Executive Committee kaltlangin a pawm thei ang, North-East State dang District Council pakhatin ama building regulation ngei a siam ang khan; pakhatin mah a pawm lo. Corporation ram pawn lama chhungkua tan chuan he Kaihhruaina Bu hi kaihhruaina (guidance) chauh a ni (Clause 1.5 Hrilhfiahna). He Kaihhruaina Bu hi draft a ni: Mizoram sawrkar, UD&PA, Aizawl Municipal Corporation, a Board of Councillors emaw a Local Council-te, LMC, Village Council reng reng, Lai, Mara emaw Chakma Autonomous District Council, emaw authority dang reng rengin pawm a ni lo. MoHUA chuan July 2026-ah Parliament hnenah khawpui tuilian hi "State sawrkar leh ULB-te thuneihna hnuaiah a awm" ("falls under the purview of the State Governments and the ULBs") a ti a, CPHEEO manual chu "thurawn inkaihhruaina" ("advisory guidelines") zingah a tarlang (Lok Sabha AU1847). Chuvangin State hian standard sang zawk pawm turin sawrkar laipui phalna a mamawh lo. CPHEEO Table 4.1 Note 2 (§4.4.1.4) chuan "notification hmanga State/UT sawrkar-in a din committee thuneitu" ("a high powered committee constituted by State/UT Government through a notification") chu return period sang zawk pawm turin a phal. Clause 1.3.2 hian chu kawng chu a hmang a, sawrkar laipui sum hmanga scheme-te tan standard sang zawk chu record-ah a awm theih nan.

1.4 Thumal hrilhfiahna

1.4.1 He Kaihhruaina Bu pumah heng thumalte hi hman a ni. Bung tin thumal bik chu bung tinah hrilhfiah a ni (entirnan Clause 2.2).

Thumal	He Kaihhruaina Bu-a a awmzia
Approving Authority (phalna petu Authority; Authority)	Development tan planning permission, building permit emaw layout phalna petu, emaw public work sanction-tu pawl: chu hmun tana competent authority: Aizawl Municipal Corporation ramah, Corporation, Aizawl Municipal Corporation Building Regulations, 2012 hnuaia a online building permission system (OBPAS) hmanga building permit pek tan, Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017-in "building permit bakah" ("in addition to a building permit") (reg. 5(1)) a phut site development permit tan, drain inzawmna (Mizoram Municipalities Act, 2007 section 295 leh 296) tan leh amah drain leh hnate tan, a Local Council-te nen, an no-objection certificate pek tan; Lunglei Municipal Council (LMC) ramah, Mizoram Municipalities Act, 2007 hnuaiah LMC (LMC building regulation hmuh a ni lo [TBC]); Village Council ramah, Village Council, building tan chuan State sawrkar-in Mizoram (Village Councils) Act, 2025 section 13(6) model building bye-laws a siam hnuah chauh (pakhat mah hmuh a ni lo), leh District Disaster Management Authority phalna nena in sak atana hmun him lo puanchhuahna tan; khawpui ram leh notify a nih khawpuite master plan tan Urban Development & Poverty Alleviation Department (UD&PA); Autonomous District Council-te pawn lamah, Mizoram Water Resources (Management and Regulation) Act, 2024 hnuaia tui hnar (water resources) tan, Irrigation & Water Resources Department (IWRD) leh Water Resources Development and Management Authority (WARDMA), District leh Village emaw Local Water Resources Committee-te nen; riverine reserve leh wetland tan Environment, Forests & Climate Change Department (EF&CC); River Conservation Zone-ah Mizoram River Protection Authority, Rivers dan hman mek a nih a, zone notify a nih chauhin (pakhat mah finfiah a ni lo); public work tan, a thawktu Department (Public Works Department (PWD), Public Health Engineering Department (PHED), IWRD emaw hna thawktu agency dang); leh Lai, Mara emaw Chakma Autonomous District Council ramah, District Council (a Executive Committee) leh a Village Council-te, District Council-in he Kaihhruaina Bu a pawm chauhin (pakhatin mah a pawm lo), emaw Department-in amah hna tan.
Dilna thehluhtu (Applicant)	Phalna dil neitu (owner), developer emaw Department, leh a hnua a neitu ni tur (successors in title) te.
Hmasawnna hna (Development)	Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 hnuaia phalna ngai, emaw public work anga thawh, building, layout, ram ṭhen (sub-division), kawng, lung phah (paving) emaw ram hman dan (land use) danglamna reng reng.

Thumal	He Kaihhruaina Bu-a a awmzia
Siam ṭhatna (Redevelopment)	Tui luh theih lohna hmun (impervious cover) awm sa site chunga development.
Lei tihbuai (Land disturbance)	Ram tihfai, tihzawl (grading), laih, lei vur emaw lung phah, development plan inzawm (common plan of development) pum chhunga plan area-a teh (Clause 1.5.5).
Tui luh theih lohna hmun (Impervious area)	Inchung, lung phah, lungvar tihnghet (compacted gravel), deck leh infiltration (lei-a tui luh) dangtu leilung chung dangte. Bung 8 anga design permeable paving chu a tihfai chin area tan chauh tui luh theihna hmun (pervious) angin chhiar a ni.
Tui luh theih lohna hmun thar emaw thlak (New or replaced impervious area)	Development-in a siam, emaw subgrade thlenga a paih a siam thar, tui luh theih lohna hmun. A bul (base) dah reng a, a chung chauh siam thar (resurfacing) chu "thlak" ("replaced") a ni lo.
Retention	Site-a tui luanna system aṭanga ruahtui luang (runoff) chu chatuan atan paih bo, infiltration, hman nawn emaw evapotranspiration hmangin (Bung 4).
Detention	Outlet (luan chhuahna) thunun nena ruahtui luang khawl rih, ruahpui zawh hnua tihruak (Bung 4).
Ruahtui khawl khawm (RWH)	RWH thupek (mandate) hnuaia tui pekna emaw recharge atana ruahtui khawl khawm. Bung 4-in a phal loh chuan RWH khawlna hi detention a ni lo.
Tui luanna system tenau (Minor system)	Bung 6 tui luanna system tenau AEP atana design drain, pipe leh inlet (luan lutna) te.
Tui luanna system lian (Major system)	1% AEP (kum 100) tui luang phurtu lei chung kawng leh floodway (tuilian luan kawng) (Bung 6).
Hmasawnna hma lam dinhmun (Pre-development condition)	Greenfield: map-a tarlan hydrologic soil group tan dinhmun ṭha taka awm ram ruak. Tui luh theih lohna hmun awm sa chu chhiar a ni lo (Bung 3).
Tuilian hlauhawm catchment (ruahtui luan khawmna hmun; flood-sensitive catchment)	Aizawl chhak lam, Chite lui leh a lui tête Tuirial thleng catchment; Aizawl thlang lam, Ser lui, Khatla, Tuikual, Vaivakawn leh Chanmari thlang lui nen, Tlawng thleng; Aizawl chhim kawn Hlimen–Melthum lung laihna belt; Hunthar Veng leh Aizawl-a NH-6 corridor; Durtlang leh Bawngkawn–Durtlang kawng; Tlawng kama Sairang; Bairabi leh Vairengte; Khawthlangtuipui kama Tlabung; Lunglei khawpui; Serchhip khawpui; Champhai khawpui leh Champhai phai; Siaha leh Lawngtlai; leh Tuirial dam hnuaia tui thlahna lui chhung catchment-te, leh Authority-in a notify catchment reng reng (Bung 4; Belhchian 1B).
Tui awmna (Waterbody)	Luipui, lui, canal, dil (tank), dil lian (lake), dil tê (pond), hmun hnawng (marsh), tui pekna kawng emaw tui tam luan chhuahna, kumtluan emaw season-a awm (Bung 7).
Regional facility	Development pakhat aia tam rawngbawltu detention, retention emaw dil khawlna facility, basin plan hnuaia sak emaw siam ṭhat leh (Bung 4).
Tier A / Tier B authority	Clause 1.6 hnuaia ṭhen Approving Authority.
Policy supplement	Clause 1.7 leh Belhchian 1C-a clause thlan dang pawm theih turte.
Drainage report	Bung 10-in a phut report hmasa (preliminary) emaw tawp ber (final).
Registered professional	Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 hnuaia plan inzawmte buatsaih leh sign tura register-a ziak lut mi, Clause 10.6-in thiamna dang a phut chuan chu nen.
Compliance calculator	Dan zawm (compliance) chhut leh report nana State-in a siam tool (Clause 10.5).

Thumal	He Kaihhruaina Bu-a a awmzia
Maintenance declaration	Neitu-in ruahtui facility enkawl tura register-a a thutiam (undertaking) (Clause 10.10).
Variance	Number-a phut aṭanga danglam phalna, hnathawh inang lantir nen (Clause 1.10).
Waiver	Clause 1.10-a chhan tarlan hmangin, phut pakhat chu site pakhat chungah hman a nih loh phalna.
Notify a ni (Notified)	Sawrkar emaw State Stormwater Technical Committee-in Mizoram Gazette-a tlangzarh.
Chu hmun tana competent authority (Competent authority for the area)	Chu hmuna dan hman (instrument) hnuaiah site tan phalna petu, emaw hna remtihna petu pawl: Aizawl Municipal Corporation ramah, Corporation, Aizawl Municipal Corporation Building Regulations, 2012 hnuaia a online building permission system (OBPAS) hmanga building permit pek tan, Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017-in "building permit bakah" ("in addition to a building permit") (reg. 5(1)) a phut site development permit tan, drain inzawmna (Mizoram Municipalities Act, 2007 section 295 leh 296) tan leh amah drain leh hnate tan, a Local Council-te nen, an no-objection certificate pek tan; Lunglei Municipal Council (LMC) ramah, Mizoram Municipalities Act, 2007 hnuaiah LMC (LMC building regulation hmuh a ni lo [TBC]); Village Council ramah, Village Council, building tan chuan State sawrkar-in Mizoram (Village Councils) Act, 2025 section 13(6) model building bye-laws a siam hnuah chauh (pakhat mah hmuh a ni lo), leh District Disaster Management Authority phalna nena in sak atana hmun him lo puanchhuahna tan; khawpui ram leh notify a nih khawpuite master plan tan Urban Development & Poverty Alleviation Department (UD&PA); Autonomous District Council-te pawn lamah, Mizoram Water Resources (Management and Regulation) Act, 2024 hnuaia tui hnar (water resources) tan, Irrigation & Water Resources Department (IWRD) leh Water Resources Development and Management Authority (WARDMA), District leh Village emaw Local Water Resources Committee-te nen; riverine reserve leh wetland tan Environment, Forests & Climate Change Department (EF&CC); River Conservation Zone-ah Mizoram River Protection Authority, Rivers dan hman mek a nih a, zone notify a nih chauhin (pakhat mah finfiah a ni lo); public work tan, a thawktu Department (Public Works Department (PWD), Public Health Engineering Department (PHED), IWRD emaw hna thawktu agency dang); leh Lai, Mara emaw Chakma Autonomous District Council ramah, District Council (a Executive Committee) leh a Village Council-te, District Council-in he Kaihhruaina Bu a pawm chauhin (pakhatin mah a pawm lo). He Kaihhruaina Bu-in "Authority" ("the Authority") a tih chuan, chu hmun tana competent authority sawina a ni. He Kaihhruaina Bu hian Autonomous District Council ram chu chu District Council kaltlang chauhin a thleng.
Municipal ram; Village Council ram; Autonomous District Council ram	State-a dan anga ram hran pathumte. **Municipal ram** chu Aizawl Municipal Corporation emaw Lunglei Municipal Council ram, Mizoram Municipalities Act, 2007-in a huam (s.1(2)) a ni. **Village Council ram** chu Autonomous District Council pathum pawn lama State ram dang zawng zawng, urban local body nei lo notify a nih khawpuite telin, Mizoram (Village Councils) Act, 2025-in a huam (s.1(2)) a ni. **Autonomous District Council ram** chu State chhim lama, Constitution Sixth Schedule hnuaia Lai, Mara emaw Chakma Autonomous District Council ram a ni a, municipal, village-council leh water-resources Act-te leh 2023 Rivers Bill-in an chhuah vek; he Kaihhruaina Bu tan District Council building emaw tui luanna regulation hmuh a ni lo [TBC].
Building regulation; site development permit	Aizawl Municipal Corporation Building Regulations, 2012, siam ṭhat angin (AMCBR), leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 (SD&SM), Mizoram Municipalities Act, 2007 section 371 hnuaia Board of Councillors-in a siam a UD&PA-in a notify, Aizawl Municipal Corporation ramah chauh hman. SD&SM hnuaia site development permit chu "building permit bakah" ("in addition to a building permit") (reg. 5(1)), track pangngai (regular) emaw engineered track-ah phut a ni (Bung 10).
Landslide Hazard Maps; hlauhawm zone	"Landslide Policy Committee for Aizawl City-in a pawm standard anga 2014 emaw a hnua siam, Aizawl Municipal Corporation Landslide Hazard Maps version tuna hman mek" ("The currently adopted version of the Aizawl Municipal Corporation Landslide Hazard Maps, created in 2014 or later to the standards adopted by the Landslide Policy Committee for Aizawl City") (SD&SM, definitions), leh a Low, Moderate, High leh Very High hlauhawm zone-te. Corporation ram pawn lamah, khawpui chungchang MIRSAC hlauhawm zone ṭhenna (hazard zonation), a awm chuan, chutiang bawkin hman a ni (he Kaihhruaina Bu-in a ruat).
Lui	Lui emaw luipui (Mizo thumal; *lui te*, lui tê). Ha 8 emaw a aia tam tui luan khawmna lui chu, kumtluanin tui a luan emaw luan lo emaw, Bung 7 hnuaia pianphung tui luanna (natural channel) a ni. State-a outfall tam berte chu lui chim takah an luang chhuak (Clause 5.8.5(a)).
Phai ram (Valley-floor land)	Luipui 1% AEP tuilian sang zawng hnuai lama ram, Belhchian 2A-a sub-area MZ-A1 (Hmar lam phai), MZ-C1 (Champhai phai) leh MZ-D1 (Tlabung phai)-ah emaw hmun dangah, Tlawng kama Sairang leh Kau leh Tuichawng kama Chawngte ang chi, Bung 2, 4, 5 leh 7-a phai dinhmun dan hman tlakna (he Kaihhruaina Bu-in a ruat).

Thumal	He Kaihhruaina Bu-a a awmzia
Ram record; in hmun; khawtlang ram	Ram record leh ram hman dan chu Land Revenue & Settlement Department kutah a awm a, Corporation ram chhungah pawh (CAG); Village Council-te chuan Mizoram (Village Councils) Act, 2025 hnuaiah in hmun an sem; Autonomous District Council rama ram chu District Council-te hnuaiah a awm [TBC]. He Kaihhruaina Bu-in mimal ram emaw pass hnuaia neih ramah tui luanna corridor, easement (mi ram kal tlanga hman phalna) emaw regional facility hmun a hauh (reserve) chuan, master plan-ah hauh a ni emaw thuthlung (agreement) hmangin vawn a ni, lak a ni lo (he Kaihhruaina Bu-in a ruat).

> **Hrilhfiahna.** Tui luh theih lohna hmun "thlak" ("Replaced") chu subgrade thlengin hrilhfiah a ni a, chutiang chuan lung phah vek site siam ṭhatna chu a huam a, a chung chauh siam thar pangngai erawh a huam lo. Hei hi APWA 5600 (2025.01) redevelopment trigger (phut ṭanna) kalphung zawm a ni (MARC Supplement, 2025).

1.5 A huam chin

1.5.1 **Tute nge huam.** He Kaihhruaina Bu hi heng chungah hian hman a ni:

- (a) Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 hnuaia planning permission, building permit emaw layout phalna ngai development zawng zawng;
- (b) ULB, State Department, board emaw State undertaking-in a thawh tui luanna, kawng, bridge, culvert, tui awmna leh tuilian tihziaawmna hna zawng zawng; leh
- (c) Mizoram chhunga sawrkar laipui agency emaw an contractor-te-in an thawh hna, Authority phalna emaw no-objection a ngaih chin chinah.

1.5.2 **Retention leh detention phut ṭanna (threshold).** Bung 4 leh 5 (retention, detention, luanna hnuailam leh tailwater zirchianna) hi development plan inzawm pum chhungah heng a huam development reng rengah hman a ni:

- (a) **ha 0.1 emaw a aia tam** lei tihbuai; **emaw**
- (b) **500 m² emaw a aia tam** tui luh theih lohna hmun thar emaw thlak.

1.5.3 **RWH.** Aizawl Municipal Corporation ramah, Aizawl Municipal Corporation Building Regulations, 2012 regulation 33, "In zawng zawngah ruahtui khawl khawmna facility ṭha tak siam bawk tur a ni" ("A suitable rain water harvesting facility shall also be provided in all buildings") hnuaiah, plan-te chuan "ruahtui khawl khawmna facility ṭha tak siam tur a tel tur a ni" ("include provision for a suitable rain water harvesting facility") (reg. 5(6)(ix)) nen, RWH thupek awm sa chu hman zel a ni a, 2025-a Chapter VIIIA belh hnuaiah 100 m² chung plot tan ruahtui khawl khawm leh "Hardscape tihtlem" ("Reduction of Hardscape") chu incentive angin pek a ni a, condition angin a ni lo, mahse khawlna tui zat emaw inchung zau zawng rate a awm lo; Site Development and Slope Modification Regulations, 2017-ah ruahtui khawl khawm dan a awm lo, Corporation ram pawn lamah ruahtui khawl khawm dan hmuh a ni lo, tuna a awm angin. He Kaihhruaina Bu hian chu chu a thlak lo.

1.5.4 **Lian leh tê engpawh ni se hman tur thu.** Clause 1.5.8-in a chhuah (exempt) loh chuan, heng hi Clause 1.5.1 hnuaia development zawng zawng, a lian zawng engpawh ni se, chungah hman a ni:

- (a) ruahtui drain-ah ek tui (sewage) inzawmna awm loh tur (Bung 8);
- (b) mi chenna chhuat hniam ber leh kawngkhar leh tukverhte 1% AEP sang zawng belh 0.5 m emaw a chung lamah, 1% AEP sang zawng map-a tarlan emaw hriat theih a nihnaah (Bung 6);
- (c) tui awmna setback (tui kam aṭanga hmun kalhlen tur) leh lei vur loh tur zone (no-fill zone) (Bung 7); leh
- (d) pianphung tui luan kawng emaw system lian tui luan kawng dal loh tur (Bung 6).

1.5.5 **Development plan inzawm (common plan of development).** Clause 1.5.2 phut ṭanna chu development area pum, dilna thehluh ni-a layout phalna pakhat emaw neitu pakhat hnuaia phase, plot leh ram ṭhen (sub-division) zawng zawng telin hman a ni. Phut ṭanna pumpelh nan development chu ṭhen loh tur a ni.

1.5.6 **Siam ṭhatna (redevelopment).** Siam ṭhatna tan chuan phut ṭanna chu tui luh theih lohna hmun thar leh thlak belh khawmah hman a ni. Retention leh detention chu tui luh theih lohna hmun thar leh thlak pum chungah hman a ni a, hmasawnna hma lam dinhmun chu greenfield a ni (Clause 1.4). Siam ṭhatna site khirh (constrained) takah greenfield thunun a tih theih loh chuan, Clause 4.5.6 tihziaawmna kawng hman a ni: tui luang sang ber awm sa aṭanga site-ah 50% tal tihhniam, a tlakchham zat chu basin khawlna atan fee-in-lieu (site-a tih aia sum pek) angin pek.

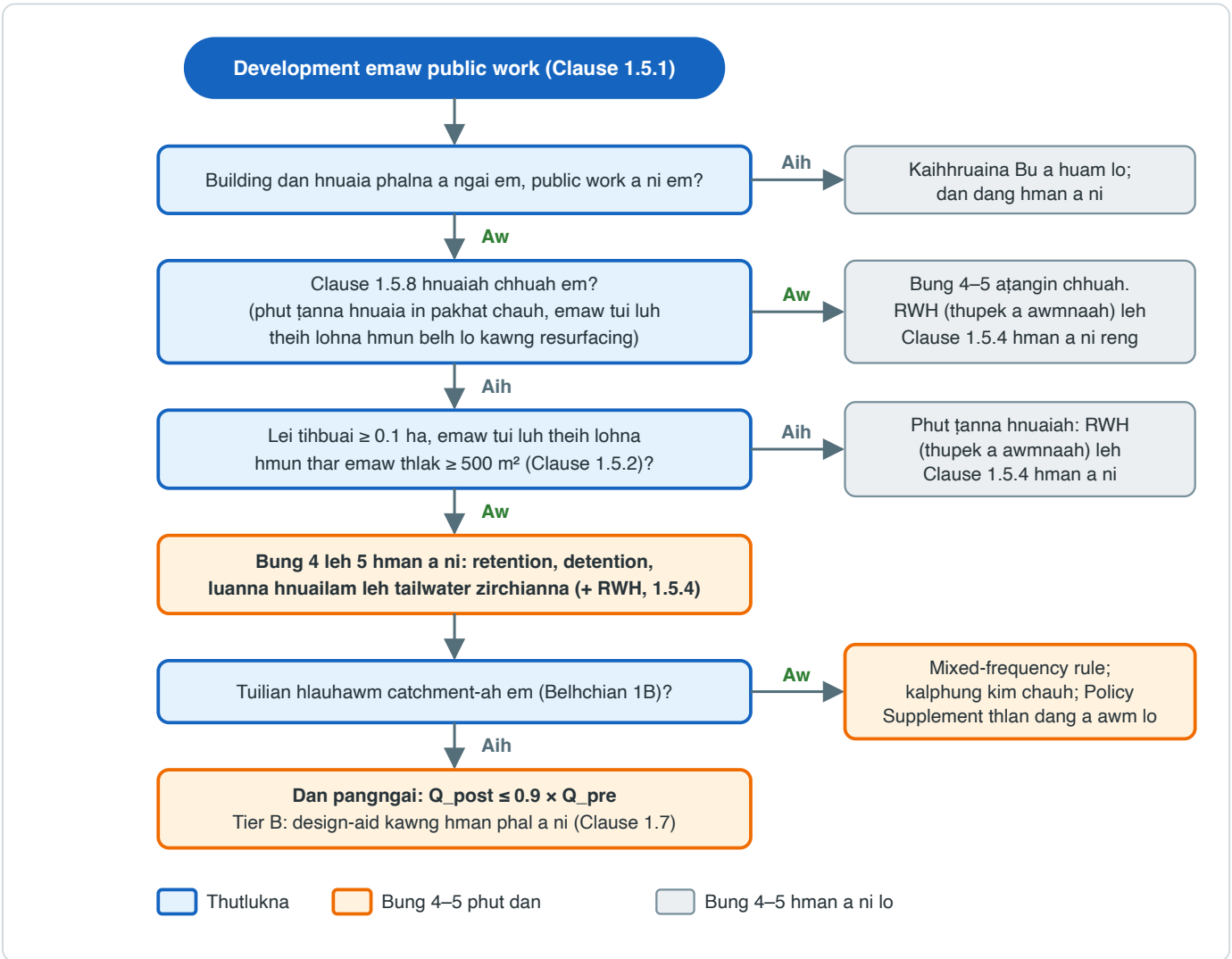
1.5.7 **Public works sei (linear).** Kawng, kawng tihzauh leh hna sei dangte tan, tui luh theih lohna hmun phut ṭanna chu catchment tin kal tlang chhunga tui luh theih lohna hmun belh chungah hman a ni. Retention leh detention chu right of way (kawng ram) chhungah, emaw right of way-in a dawl loh chuan Bung 4 hnuaia regional facility-ah siam tur a ni.

1.5.8 **Chhuahna (exemption).** Heng hi Bung 4 leh 5 aṭangin chhuah an ni:

- (a) Clause 1.5.2 phut ṭanna a tlin loh chuan, ama plot-a in pakhat chauh; leh
- (b) tui luh theih lohna hmun belh lo kawng sei chung siam thar (resurfacing).

Development chhuah pawh hi RWH thupek leh Clause 1.5.4 hnuaiah a la awm reng.

1.5.9 **A huam leh huam loh thutlukna.** Dilna thehluhtu chuan a huam leh huam loh thutlukna chu Bung 10 hnuaia thehluh hmasak berah **Form 1-1** (A Huam leh Huam Loh Thutlukna)-ah a ziak tur a ni. Authority chuan dilna hma (pre-application) stage-ah a nemnghet emaw a siam dik emaw thei.



Milem 1.2 — Clause 1.5 a huam leh huam loh thutlukna flowchart. He Kaihhruaina Bu tana milem siam thar.

> **Hrilhfiahna.** Phut ṭanna te hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Entawn turte chu a inang lo hle:
>
> - Singapore chuan ha 0.2 emaw a aia tam development aṭanga ruahtui luang sang ber a thunun (PUB Code of Practice on Surface Water Drainage, 7th ed., cl. 7.1.5).
> - Malaysia 2008 DID checklist chuan ha 0.1 thleng site-ah site-a detention a hmang a, a aia lian chu khawtlang pond (community pond).
> - APWA 5600 (2025.01) Policy Supplement chuan phut ṭanna thlan dang, acre ¼ (ha 0.1 vel) tihbuai, emaw acre 1 (ha 0.4 vel) leh tui luh theih lohna 10,000 sq ft (930 m² vel) a pe a, agency-te chu acre 1 phut ṭanna aia sang loh turin a hrilh.
> - MBBL 2016 chuan 500 m² chung building-te tan recharge a phut ngei.
>
> Ha 0.1 / 500 m² phut ṭanna hi heng zingah a khauh ber lamah a awm, Mizoram plot pangngaite an tê a, plot tê tam tak nghawng belh khawm hian Aizawl drain-te a tihkhah avangin. Mizoram-a building tête tan chuan, AMCBR/SD&SM chuan Corporation ram chhunga building tin chu "ruahtui khawl khawmna ṭha tak" ("a suitable rain water harvesting facility") (AMCBR reg. 33) siam, inchung tui "pipe hmangin lei chungah luan chhuah tir" ("discharged at ground level by pipe") a, kawng emaw vengte compound-ah luan tir loh (reg. 26(2)(b)), leh site hna chhuah a nih loh chuan, SD&SM reg. 27 terrace (tlang panga hmun zawl siam), swale, interceptor drain (cut chung lama ruahtui dangtu drain) leh down-drain (tlang pang zawh chhuk drain) te mawhphurhna an pe. Chung zinga pakhatin mah tui zat emaw design ruahpui a ruat lo, season ruahpui a lo thlen hunah tank a khat tawh ṭhin, chuvangin pakhatin mah plot aṭanga chhuak a khap lo. 2025 aṭang khan geo-hazard zone hniam emaw moderate-a plot 93 m² aia tê chunga building pangngai chu technical personnel empanel-in an certify thei (Annexure B-I), chuvangin plot tê berte chu tui luanna endik lovin phalna pek an ni; chu chhan avang chuan Clause 1.5.4(b) hi building tin, a lian zawng engpawh ni se, chungah hman a ni. Tlang panga building tê hi soak pit-in chhiatna a thlen nasat berna a ni bawk: AMCBR reg. 33 chuan water closet tin tan "septic tank a tawk zawng soak pit nen" ("a septic tank of appropriate capacity with soak pit") a phut a, chu chu hlauhawm tlang pangah Roadmap to Stability-in a paih bo duh hman dan a ni; he Kaihhruaina Bu hian soak pit-ah ruahtui a dah lut lo va, reg. 33 a thlak lo (Table 1.3). Corporation ram pawn lamah, Village Council ramah emaw Autonomous District Council ramah emaw building dan hmuh a ni lo, building tê tui luanna phuar theihna permit a awm lo. Chutah chuan Bung 4 site tê kalphung leh Clause 4.11 tlang dan, tlang pang 10° aia chim emaw shale chungah soak pit emaw soakaway awm lo, inchung tui chu khawlnaah, a luan liam (overflow) chu drain lined-ah, tlang pang venhim lo zawh chhukin engtik lai mah ni lovin, te chu chhungkua, khaw leh sak hna thawktu agency-te hnenah kaihhruaina (guidance) angin pek a ni a, permit reng reng condition angin a ni lo, SD&SM reg. 27 terrace, swale leh down-drain pianphung chu tlang panga tih theih hniam ber atan.
>
> Clause 1.5.4(b) hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni, chhuat sang zawng hi building-in venhimna a neih theih man tlawm ber a nih avangin, development lian chauh venhim chu a dik lo ang. 1% AEP sang zawng map-a tarlan a nih loh chuan, Bung 6-in site tê tan kalphung a pe.

1.6 Tier hrang hranga pawmna

1.6.1 **Tier A authority-te.** Heng hi Tier A an ni:

- (a) Aizawl Municipal Corporation, a ram pum tan: State-a building leh site-development regulation, online building permission system leh licensed technical personnel (March 2023-ah 484; June 2018 aṭanga April ni 1, 2024 thleng OBPAS-ah dilna 15,162; CAG) nei awmchhun.

1.6.2 **Tier B authority-te.** Municipal Council dang zawng zawng, Village Council-te leh Autonomous District Council-te hi Tier B an ni.

1.6.3 **Tier inkara danglamna.** He Kaihhruaina Bu tehna zawng zawng hi tier pahnihah hman a ni. Tier-te hi kalphung leh endikna-ah chauh an danglam:

Table 1.1 — Tier A leh Tier B authority-te inkara danglamna

Thil	Tier A	Tier B
Hnathawh tehna (Bung 2–9)	A kimin hman	A kimin hman
Khawlna atana hydrology kalphung	Hydrograph (hun hrang hranga tui luang zat) kalphung (Bung 3)	Hydrograph kalphung, emaw a tlin chuan Clause 1.7 design-aid kawng
Compliance calculator (Clause 10.5)	Tlangpui (summary) angin phut	Phut; design-aid kawngah chhutna awmchhun a ni thei
Policy supplement thlan dang (Clause 1.7)	State Stormwater Technical Committee inremna nen chauh	Council thutlukna (resolution)-in a pawm thei
Technical endikna	Authority-in	Authority-in, UD&PA regional ṭanpuina emaw reviewer empanel nen (Clause 10.7)
Tuilian hlauhawm catchment dan	Hman	Hman

1.6.4 **Tier inthlak.** Tier B authority chuan council thutlukna (resolution)-in Tier A a thlang thei. Sawrkar chuan Tier B authority chu Corporation a lo nih, Master Plan for Aizawl: Vision 2030 Aizawl Development Plan Area-a a tel, emaw thil thleng hnu endikna (post-event review) (Clause 10.16)-in kalphung kim a mamawh tih a hmuh chuan, Tier A angin a notify thei.

1.6.5 **Tuilian hlauhawm catchment chuan tier a khum.** Tuilian hlauhawm catchment (ruahtui luan khawmna hmun)-ah, tier engpawh ni se, Clause 1.7 thlan dangte chu Table 1.2-in a phal ang chauhin hman theih a ni: ha 0.5 emaw a aia tê site tan S-1 (design-aid kawng) (Clause 4.14.1), leh basin plan notify a nihnaah S-5 fee-in-lieu (Clause 1.10.3(d)). S-2, S-3 leh S-4 hman theih a ni lo.

> **Hrilhfiahna.** Aizawl Municipal Corporation, June 2018 aṭanga online building permission system (OBPAS) nei, June 2018 aṭanga April ni 1, 2024 thleng a chunga dilna 15,162 leh March 2023-ah licensed technical personnel 484 nei (CAG), mahse he Kaihhruaina Bu tan drain inventory emaw tui luanna design standard hmuh loh, "Aizawl Urban Area 67% hi kutcha drain a ni a, 18% hi tui luanna system reng reng a nei lo" ("67% of Aizawl Urban Area is having kutcha drains and 18% are without any drainage system at all") (Master Plan for Aizawl: Vision 2030) khawpui ramah, leh urban local body nei lo notify khawpui pakhata Village Council, assistant engineer pakhat nei pawh ni se, hydrograph model inang endik turin zawh theih an ni lo. Kansas City chinfelna chu regional standard pakhat vawng reng a, tehna inhnial nasat ber atan thlan dang pawm theih tur tlangzarh a ni, chutiang chuan agency tê zawkte chuan standard chhuahsan lovin "a hniam lam an thlang" ("opt down") thei (MARC Supplement, Nov 2025). Hetah hian tier-te chuan hnathawh tehna chu tier pahnihah a inang reng a, kalphung chauh a danglam, chutiang chuan Tier B khawpuia building chu Aizawl-a building ang bawkin a venhim a ni.

1.7 Policy supplement: pawm theih tur thlan dang

1.7.1 Sawrkar chuan he Kaihhruaina Bu nen clause thlan dang **Policy Supplement** (Belhchian 1C) a tlangzarh tur a ni. Approving Authority chuan Clause 1.7.3 condition hnuaiah thlan dang pakhat emaw a aia tam a pawm thei.

1.7.2 Thlan dangte chu:

Table 1.2 — Policy supplement: pawm theih tur thlan dang S-1 aṭanga S-5 thleng

No.	Thupui laia phut	Pawm theih tur thlan dang	Tlin theihna
S-1	Hydrograph kalphunga khawlna zat ruat (Bung 3)	**Design-aid kawng:** Belhchian 4-a unit-storage table (ha khatah m³, ruahtui zone, soil group leh tui luh theih lohna chanve (impervious fraction) zelin) leh compliance calculator aṭanga retention leh detention tui zat lak	Tuilian hlauhawm catchment pawn lamah site ≤ 2 ha; a chhungah ≤ 0.5 ha (Clause 4.14.1 angin)
S-2	Luan chhuah tir zat Q_post(T) ≤ 0.9 × Q_pre(T), site tan chhut	**Site aṭanga luan chhuah phal zat (PSD):** zone leh AEP zela table-a unit-area luan chhuah tir zat (m³/s/ha), 0.9 × Q_pre dan aṭanga siam	Tuilian hlauhawm catchment pawn lama site reng reng
S-3	Tui awmna setback chu map-a 1% AEP tuilian zau zawng belh margin thlenga tihzauh (Bung 7)	**Zau zawng nghet setback table** tui awmna class zelin, 1% AEP zau zawng map-a tarlan loh hmunah. Clause 7.4.7 Zone 1 hniam ber (kam chhip aṭanga 15 m, emaw lui laih thuk kam chu 10° aia a chim chuan kam pang chhip aṭanga) aia tlem engtik mah ni lo	1% AEP zau zawng map-a tarlan loh tui awmna
S-4	Hydraulic model hmanga luanna hnuailam zirchianna (Bung 5)	**Endikna checklist (screening)** luanna hnuailam capacity leh tuilian hriat sa tan, endikna a hlawhchham chauhin model nen	Site < 1 ha, tuilian hlauhawm catchment pawn lama, tidal outfall-a luang lo
S-5	Site-a detention	Basin master plan neiah regional facility emaw dil khawlna siam ṭhat leh atana **Fee-in-lieu** (Bung 4)	Basin plan notify a nihnaah

1.7.3 **Pawmna condition-te.**

- (a) Thlan dang hian tehna reng reng he Kaihhruaina Bu value aiin a tihhniam loh tur a ni. S-1 leh S-2 hi tehna inang tlin nana kalphung awlsam zawk an ni. Tehna hniam zawk an ni lo.
- (b) Tier B authority chuan council thutlukna hmangin thlan dang a pawm a, ni 30 chhungin State Stormwater Technical Committee hnenah a thawn. Tier A authority chuan pawm hmain Committee inremna a mamawh.
- (c) Thlan dang pawmte chu Authority website-ah leh Clause 10.17 register-ah tlangzarh tur a ni.
- (d) Retention (Belhchian 2E thuk zawng) chu thlan dang reng rengin thlak theih a ni lo, S-5 hnuaia fee-in-lieu-in basin inang chhunga retention inang a sum a pek chauh lo chu.
- (e) S-1, S-2 leh S-3 table-te chu State Stormwater Technical Committee-in a chhuah tur a ni a, Bung 2 nen endik tur a ni (Clause 2.14).

> **Hrilhfiahna.** Supplement hi APWA 5600 (2025.01) Policy Supplement entawn a ni a, chu chuan tehna inhnial nasat ber pali (a huam chin, Rational Method chin, lui setback phut ṭanna, leh Zone 2 setback zau zawng) tan thlan dang a pe. Chung zinga pahnih hi S-3 leh Clause 1.5.2 a huam chin phut ṭanna-ah a inmil. Thlan dang S-3 hian harsatna inang tan APWA chhanna a entawn: tui luan khawmna hmun tê tan 1% AEP zau zawng map-a tarlan a ni lo, chuvangin zau zawng nghet table pek a ni. S-2 hian Kansas City 2011-a "awm sa nen inmil" ("match existing") aṭanga unit-area luan chhuah tir zat nghet lama insawn a zawm. Local agency-te chuan rate ruat sa an duh zawk, dinhmun awm sa chu inang taka hriat a har avangin (MARC Evolution deck). Sydney Water site aṭanga luan chhuah phal zat (PSD) kalphung pawh a lantir. S-1 tana ha 2 / ha 0.5 chin (Clause 4.14.1 nen inmil) leh S-4 tana ha 1 chin hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni.

1.8 Dan (instrument) dangte nena inzawmna

1.8.1 He Kaihhruaina Bu hi a hnuaia dan (instrument) te nen hman tlan tur a ni. An inhuam (overlap) chuan Clause 1.3.3-in thu a nei.

Table 1.3 — Dan (instrument) dangte nena inzawmna

Instrument	Inzawmna
Aizawl Municipal Corporation Building Regulations, 2012 (AMCBR; UD&PA Notification No. B.13017/8/2012-UD&PA, December ni 20, 2012; Mizoram Gazette Extraordinary Vol. XLII, Issue No. 4, January ni 10, 2013), 2019 Amendment Regulations (No. B.13017/8(2)/2018-UD&PA; gazette tawp ber chhiar a ni lo [TBC]), 2023 (No. B.13017/8/2021-UD&PA/Pt, August ni 14, 2023, August ni 28, 2023 aṭanga hman mek) leh 2025 (No. B.13017/8/2021-UD&PA/Loose, November ni 21, 2025) hmanga siam ṭhat angin	Chhunzawm. "Aizawl Municipal Council-in a huam ram zawng zawngah" ("all the areas covered by the Aizawl Municipal Council") (reg. 1(2)) chauhah hman a ni. "Drain" chu "leilung chung tui luan tirna channel khuh lo" ("open channel used for conveying surface water") (reg. 3(17)) tel turin an hrilhfiah; site chu "tui luanna ṭha nei emaw tui luan tir theih" ("properly drained or capable of being drained") leh "hlauhawmna hmun ni lo" ("not an active hazard-prone area") (21), plan-ah drain leh inchung tui luanna (5(5)(v), 5(6)(iv), (viii)), plinth 0.45 m aia hniam lo ni se a ṭha leh inchung tui "pipe hmangin lei chungah luan chhuah tir" ("discharged at ground level by pipe") (26(2)), septic tank leh soak pit "tui hnar" ("a water source") aṭanga 15 m chhunga awm lo leh "building zawng zawngah ruahtui khawl khawmna ṭha tak" ("A suitable rain water harvesting facility … in all buildings") (33), leh "vantlang drain hnai ber thlenga a tawk drain" ("of adequate capacity to the nearest public drain") (37) an phut; leh IS 14458 leh IS 14496 (Part 2) "Leimin Hlauhawmna Venhim nan" ("For Protection of Landslide Hazard") (Annexure F) an tarlang. 2023 amendment chuan OBPAS-in "AMC Building Regulations, 2012 leh Master Plan for Aizawl, Vision-2030 dan ang ni lo" ("not as per the provisions of the AMC Building Regulations, 2012 and the Master Plan for Aizawl, Vision-2030") rawtna a kirtir tir a; 2025 amendment chuan 100 m² chung plot tan ruahtui khawl khawm leh "Hardscape tihtlem" ("Reduction of Hardscape") incentive a siam a, Occupancy Certificate hmain vantlang kawng aṭanga thil bang (excess materials) paih bo a phut a, geo-hazard zone hniam leh moderate-a plot 93 m² aia tê chunga building pangngai anmahni ngeia certify a phal. Lui emaw tuikhur setback, tlang pang chin, detention, ruahtui khawl khawm zau zawng emaw design ruahpui an ruat lo. Reg. 33 soak pit hi hlauhawm tlang pangah Roadmap to Stability leh Clause 4.11 (tlang dan) nen a inkalh: he Kaihhruaina Bu hian soak pit-ah ruahtui a dah lut lo va, reg. 33 a thlak lo. Bung 2–6 design tehna, Clause 4.11 tlang leh recharge dan, Bung 8 tuikhur dan leh Bung 7 corridor, a Zone 1 chu 15 m tal, te hi he Kaihhruaina Bu rawtna an ni; dan anga value an ni lo, authority reng rengin pawm a ni lo. Regulation, master plan emaw dan (statute) a khauh zawk chuan, chungin thu an nei (Clause 1.3.3).
Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 (SD&SM; No. B.13017/75/2016-UD&PA, April ni 4, 2017; Gazette Extraordinary Vol. XLVI, Issue No. 161, April ni 11, 2017; amendment hriat a ni lo [TBC]); Corporation Landslide Hazard Maps	Corporation ramah chhunzawm. Site development permit chu "building permit bakah" ("in addition to a building permit") phut a ni (reg. 5(1)); Landslide Hazard Maps-a Moderate, High leh Very High zone-ah, map-a tarlan loh tlang pang 24° emaw a chung lamah, cut 3 m emaw a chung lamah, hna 200 m³ aia tam leh structure chelhtu hnaah, geotechnical report nen engineered site development (reg. 4 leh permit track-te); "tlang pang 24 degree emaw a chung lam reng reng aṭanga metre thum chhungah" ("within three meters of any slope of 24 degrees or more") chhuahna a awm lo; 60° chung lamah phalna a awm lo (reg. 14); tui luan dan, pianphung lui, riverine reserve leh "Aizawl Municipal Corporation-in a ruat leh a hrilhfiah tuilian hlauhawm hmun" ("flood hazard areas as designated and defined by Aizawl Municipal Corporation") lantirna plan (reg. 6), chung zinga pakhat mah hmuh a ni lo (NEER chhiar dan); lei vur bul chu "energy dissipater (tui chakna tihnemna) nen" ("with energy dissipaters") tui luan chhuah tir (reg. 25); "interceptor drain ngai reng reng atan tihpun a ngai thei" ("may need to be increased for any required interceptor drains") setback leh "leihnuai tui, tuikhur ang chi" ("subsurface water, such as springs") thunun (reg. 26); reg. 27 terrace, swale, interceptor drain, down-drain, pad pang leh hnuai lam phurh chhuahna, he Kaihhruaina Bu-in tui luan tirna layer hniam ber anga a ngaih (Clause 6.3.6); pianphung lui sirah "riverine reserve chu vawn tur a ni" ("the riverine reserve shall be maintained") (reg. 28); leh laih chhuah lei chu "tui luan kawng emaw riverine reserve" ("drainage courses or riverine reserves") aṭanga hlat taka dah (reg. 29). Schedule I chuan licensed civil engineer-te chu "hydrology leh hydraulic chhutna" ("hydrology and hydraulic calculations") tan thiam a ti. Design ruahpui, return period emaw runoff coefficient a ruat lo; he Kaihhruaina Bu hian a pe.

Instrument	Inzawmna
Mizoram Municipalities Act, 2007 (Act No. 6 of 2007; Fourth Amendment 2015); Mizoram Municipalities (Ward Committee and Local Council) Rules, 2010 (No. B.13017/21/2008-UD&PA, November ni 2, 2010; ṭawng pahnihin)	Municipal ramte, Aizawl Municipal Corporation leh Lunglei Municipal Council-ah chhunzawm; Act hian Village Council ram emaw "Sixth Schedule paragraph 20 PART III-a tarlan Mizoram Tribal Areas" ("the Mizoram Tribal Areas, as referred to in PART III of the paragraph 20 of the Sixth Schedule") (s.1(2)) a huam lo. "Vantlang dil, lui, reservoir leh tuikhur zawng zawng" ("all public tanks, streams, reservoirs, and wells") leh kawng sir drain, culvert leh tui luan kawngte chu municipality kutah a dah (s.80(b), (d)); "tui luanna emaw sewerage system leh outfall him leh tawk siam leh enkawl" ("provide and maintain a system of drainage or sewerage as well as a safe and sufficient outfall") turin a ti (s.288); vantlang drain zawng zawng leh vantlang kawng sir drain-te, "Municipal Fund emaw a dang emaw hmanga siam pawh ni se" ("whether made out of Municipal Fund or otherwise") (s.289(1)) a kutah a dah, sewer chu sawrkar agency hnena hlan theihna nen (s.289(3)); drain zawng zawng "Board of Councillors survey leh thunun hnuaiah" ("under the survey and control of the Board of Councillors") a dah (s.290) a, tihfai a phut (s.291); "tui khawlh thut a thlen chuan" ("in the case of sudden water-logging") hriattirna pek lovin mimal ram kal tlanga tui luan tir a phal (s.294); mimal drain inzawm nan Chairman ziak phalna a phut (s.295) a, municipal drain emaw "tui luan kawng reng reng" ("any water-course")-a tui luan lut tir hmain remtihna a phut (s.296); municipality-in tui bal chu "ruahtui nen hrang hranga" ("as distinct from rain-water") luan tir turin a phut thei (s.298); "famkim lo, hlawhtling lo emaw inmil lo" ("imperfect, inefficient or unsuitable") hna chungah State thunun theihna a pe (s.299); leh municipal drain, culvert emaw ruahtui channel chunga structure reng reng a khap (s.300). Regulation-te chu s.371 hnuaiah "a hmaa tlangzarh hnuah" ("after previous publication") siam a ni. Corporation ṭanna chu Act thuhmahruaiah July ni 1, 2008, CAG-in 2010 a ti a, October ni 15, 2015-ah kai chho (upgrade) [U].
Mizoram (Village Councils) Act, 2025 (Act No. 7 of 2025; Gazette Extraordinary Vol. LIV, Issue No. 178, March ni 20, 2025), Lushai Hills District (Village Councils) Act, 1953 thlaktu	Village Council ram, urban local body nei lo notify a nih khawpuite telin, chhunzawm; Act hian municipality-te emaw Autonomous District Council pathumte a huam lo (s.1(2)). "tuikhur" chu "tui pekna lak theihna hmun reng reng" ("any place wherein water supply is obtained") tiin a hrilhfiah (s.2(29), a indawt aṭanga number ngaihtuah chhuah); Village Council-te chu "State sawrkar-in a siam model building bye-laws chu pawm leh zawm tir" ("adopt and enforce the model building bye-laws as may be framed by the State Government") leh District Disaster Management Authority phalna nen in sak atana hmun him lo puanchhuah a phal (s.13(6)); leh an mawhphurhna zingah "khaw chhunga tui hnar humhalh" ("Conserve water resources within the village area") (s.14(6)) leh, an hnena pek angin, tui lak siam hna tenau leh watershed development, kawng leh culvert, "Tihfaina leh tui luanna" ("Sanitation and drainages") leh siam tui awmna (artificial water bodies) (s.15(1)) a tarlang. Model building bye-laws hmuh a ni lo (NEER chhiar dan); he Kaihhruaina Bu hi a tui luanna annex atan pek theih a ni ang.
Sixth Schedule ramte: Lai, Mara leh Chakma Autonomous District Council-te; Lai Autonomous District Council (Land Holding and Settlement) Act, 2002 (snippet aṭanga hriat); Chakma District Council-in Kamalanagar Town Planning Committee (2018), kawng sir phalna (November ni 20, 2020) leh in sak (2002) chungchanga a hriattirna-te (hming leh snippet aṭanga hriat)	An ramah chhunzawm. State municipal, village-council leh water-resources Act-te leh 2023 Rivers Bill-in an chhuah a, 74th Amendment chu chutah hman a ni lo (CAG). District Council building emaw tui luanna regulation hmuh a ni lo [TBC]. District Council-in a pawm loh chuan he Kaihhruaina Bu hian chutah thuneihna a nei lo (Clause 1.3 Hrilhfiahna).

Instrument	Inzawmna
Mizoram Water Resources (Management and Regulation) Act, 2024 (Act No. 1 of 2024; No. H.12018/273/2023-LJD (IWR), March ni 15, 2024; Gazette Extraordinary Issue No. 197); Mizoram State Water Policy 2020 (Act-in a sawi angin)	Chhunzawm, "Autonomous District Council-te tih loh" ("except the Autonomous District Councils") (s.1(2)). Act hian "tuikhur, dil tê, dil lian, dil, tui khawl khawmna structure hlui, tuikhur laih" ("springs, ponds, lakes, tanks, traditional water harvesting structures, wells") te chu "khawtlang tui hnar" ("community water resources") (s.2(1)(i)) zingah a chhiar; MISWARC leh WARDMA a din (ss.3–6), Deputy Commissioner-in a chairman District Water Resources Committee leh Village Council President emaw Local Council Chairman-in a chairman Village leh Local Water Resources Committee-te, "tui hnar hriat tawhte bawlhhlawh laka veng" ("Prevent pollution of identified water sources") tur (ss.9–12); IWRD chu "leihnuai tui recharge tihpun nan ruahtui khawl khawm tihchak" ("promote rain water harvesting to augment ground water recharge") (s.14(1)(b)(viii)) turin a ruat a, WARDMA chu "ruahtui khawl khawm telin tui humhalh leh leihnuai tui recharge" ("water conservation and groundwater recharge, including rain water harvesting") thupek turin a phal (s.16(2)(ix)); kum nga chhunga tui hnar map siam a phut (s.17); leh Deputy Commissioner chu hremna petu (penal authority) atan, hremna a siam (s.20). Tlang ramah he Kaihhruaina Bu hian ss.14 leh 16 chu khawlna leh hman nawn angin a chhiar a, recharge angin a ni lo (Clause 4.11). MISWARC leh WARDMA dinna notification hmuh a ni lo [TBC].
Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023; May ni 26, 2023-a assent) leh Bill, 2023 (Bill No. 70 of 2023, chhut angin), enact a nih finfiah a ni lo	Dan angin tarlan a ni lo. Chhut angin, Bill hian Autonomous District Council-te tih loh State pum a huam ang; Protected River leh River Conservation Zone a siam ang a, chung chhungah chuan State River Protection Authority phalna hmasa tel lovin sak hna, "tui luan kawng emaw channel dal emaw her" ("obstruction or diversion of the water course or channel") emaw land pass phal a ni lo ang, "bridge leh culvert, check dam, tuikhur" ("bridges and culverts, check dams, waterholes") (s.15(1)) tel chhuahna nen; leh State chu "leimin emaw kor leh tui luang chak (torrent) siam lohna atan" ("for the prevention of landslips or of the formation of ravines and torrents") leh "tuikhur, lui leh luipuia tui pekna vawn reng nan" ("for the maintenance of water supply in springs, streams and rivers") catchment thunun a phal ang (s.16). Protected River emaw River Conservation Zone notify a nih hriat a ni lo, Authority din a nih pawh hriat a ni lo. Dan chu hman mek a nih a, zone notify a nih chuan, he Kaihhruaina Bu phalna bakah a phalna a ngai ang.
Mizo District (Forest) Act, 1955 (ss.14 leh 21; thu hnar aṭanga hriat); riverine reserved forest-te	Buffer angin tarlan a ni lo. Act hnuaia 1965 notification pakhat chuan luipui 16 sir lehlam leh lehlama mile chanve chhunga ramngaw chu reserved forest-ah a puang; High Court-in January ni 27, 2021-ah a paih a, State writ appeal chu November ni 9, 2022-ah lak kir angin paih a ni a, special leave petition thehluh a ni a (a rah hmuh a ni lo), April 2021-a General Administration Department notification pakhat, chhiar loh, chuan luipui laili aṭanga 800 m restricted zone a siam a, phalna hmasa nen development a phal tih a ni a, Supreme Court-in April 2024-ah riverine reserved forest-a hnate chungchangah notice a chhuah (a zavaia chanchin tlangzarh angin). Master plan-a Tlawng sira 800 m green belt chu Act-ah a innghat a, dan (statutory law) a ni lo; he Kaihhruaina Bu hian a hmang lo (Bung 7).
Master Plan for Aizawl: Vision 2030 (Aizawl Development Authority; IIT Kharagpur; Chief Minister thuchah, September ni 11, 2012); draft Aizawl Municipal Corporation (Master Plan and Strategic Zonal/Ward Development Plan) Regulations, 2015; Mizoram Urban and Regional Development Act, 1990 (Act 12 of 1990, 2004-a siam ṭhat) leh Aizawl Development Authority Act, 2005 (tarlan anga hming)	OBPAS-in rawtna tin a khaikhinna plan angin chhunzawm (2023 amendment). Plan phalna notification hmuh a ni lo a, March 2013-a phalna report chu finfiah a ni lo [TBC]; a buatsaihtu Aizawl Development Authority chu "tunah AMC-ah tel tawh" ("now absorbed in AMC") (CAG); leh May ni 17, 2023-a sawrkar hnena thawn zonal leh ward plan regulation-te chu September 2023 thleng phalna pek a ni lo (CAG). Plan hian Aizawl Development Plan Area chu planning zone sawmah a huam; tui luanna lian sir lehlam leh lehlamah green buffer 15 m a rawt; 36° chung tlang pang "SL" zone leh "drainage line lian bula hmun" ("areas adjacent to major drainage lines") a chhinchhiah; "36 degree aia chim tlang pangah development chu nasa takin tihtlem a ṭha" ("development on slope more than 36 degree should be strongly discouraged") a ti; pianphung hlauhawmna hmunte "development loh zone" ("no development zone") anga ṭhen chu zonal plan-te kutah a dah; "Aizawl Urban Area 67% hi kutcha drain a ni a, 18% hi tui luanna system reng reng a nei lo" ("67% of Aizawl Urban Area is having kutcha drains and 18% are without any drainage system at all") tih a ziak; check dam pariat leh "outfall hmunah tihfaina facility" ("treatment facilities at the outfall points") a rawt; leh "monsoon a lo thlen hmain kum tin drain-te tihfai a ngai" ("drains need to be cleaned every year before the onset of monsoon") a ti. Design ruahpui a nei lo. Master plan-te chuan he Kaihhruaina Bu tuilian hlauhawm catchment, drainage reserve leh regional facility hmunte an lantir ang (Bung 11).

Instrument	Inzawmna
Roadmap to Stability: Actions to Reduce the Landslide Risk in Aizawl (Landslide Policy Committee for Aizawl City, February 2014); MIRSAC *Atlas of Micro-level Landslide Hazard Zonation of Aizawl City and Selected Towns*	He Kaihhruaina Bu-ah thu an pe. Roadmap chuan PHED chu ruahtui leh tui bal "tlang pang hawng aṭanga hlatah" ("away from exposed hillslopes") "nghet lo thei tlang pang tihhnawng lo tur" ("that will not saturate potentially unstable slopes") hmunah phurh turin, "Aizawl City chhunga septic tank, leach field leh soak pit zawng zawng paih bo" ("eliminate all septic tanks, leach fields and soak pits within Aizawl City") turin leh tui luanna office din turin a ngen a, Corporation chu "hmasawnna hna zawng zawng (Kawng, Tui luanna, lung laihna etc.) thunun thuneihna" ("controlling authority for all developmental activities (Roads, Drainage, quarries etc.)") a pe; a member-te zingah PHED, PWD, Land Revenue & Settlement Department, DM&R, MIRSAC, Geological Survey of India, Mizoram University, Corporation leh Directorate of Geology and Mineral Resources an tel. A tui luanna hmalakna te hi Clause 4.11 leh Bung 9 bulṭanna (hook) an ni. Atlas hi CAG-in a hmuh hlauhawm zone ṭhenna awmchhun a ni (CAG).
Mizoram Official Language Act, 1974 (Act No. 3 of 1975), May ni 6, 1996-a notification (No. H.12017/14/90-LJD, scan ṭha lo aṭanga chhiar) hmangin August ni 1, 1977 aṭanga hman	Chhunzawm. Mizo hi official language a ni; English pawh hman theih a nih thu chu thu lak chhawn angin chauh hriat a ni (section chhiar a ni lo). He Kaihhruaina Bu hnuaia chhinchhiahna (sign) leh thuk zawng chhinchhiahna (depth marker) te hi Mizo leh English ṭawngin an ni (front matter).
Gauhati High Court (Aizawl Bench): Bawngkawn–Durtlang (Leitan) kawng chungchanga suo motu PIL (July ni 23, 2024-a report) leh 2020-a petition-a single-bench order, November ni 23, 2023 (case number hmuh a ni lo); January ni 27, 2021-a riverine reserved forest rorelna leh Writ Appeal 8 of 2021; April 2024-a Supreme Court notice (a zavaia chanchin tlangzarh angin)	An phuarna-ah hman; thupek (direction) an ni a, he Kaihhruaina Bu dan an ni lo. High Court chuan "tun aṭang hian Bawngkawn – Durtlang (Leitan) kawng sir lehlam leh lehlamah sak hna thar reng reng phal a ni tawh lo vang" ("no new construction activity shall henceforth be allowed on either side of the Bawngkawn – Durtlang (Leitan) road") tiin thu a pe a, Corporation-in chhuat khatna chung lama phalna a pek te chu "chawl rih" ("in abeyance") a ti a, leimin venna retaining wall a chhuah a, 36° aia chim tlang panga development khapna master plan dan a lakchhawng (chanchin tlangzarh angin).
National Green Tribunal: OA 593/2017 leh OA 673/2018 (MPCB compliance report, February 2021); OA 606/2018 (January–June 2025 State report, tui bal table "August ni 31, 2025 dinhmun" ("as on 31st August, 2025"))	An phuarna-ah hman. State chuan ek tui 51.81 MLD, "Aizawl khawpui tan chauh" ("only for Aizawl city") 10 MLD tihfaina nen, February ni 6, 2021 aṭanga Chite treatment plant trial, leh River Rejuvenation Committee leh State Level Monitoring Committee a report; Tribunal hnenah "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area") a ti a, chu thusawi chu phai sirah a dik lo (Clause 1.1 Hrilhfiahna). Ruahtui drain-a ek tui chu Bung 8 (Clause 8.9)-ah sawi a ni.
CAG (Comptroller and Auditor General of India) Report No. 1 of 2025 (August ni 27, 2025-a tabled): chhiatna inbuatsaihna leh 74th Amendment performance audit-te	He Kaihhruaina Bu-ah thu an pe. Audit-te chuan "ram pum zinga 71 per cent aia tam chu Very High aṭanga Moderate Hazard Zone-ah a awm" ("more than 71 per cent of the total area is in Very High to Moderate Hazard Zone"), leimin hlauhawm hmun endik reng a awm loh, "khawpui ruahman loh lian chhohna enna Action Plan a awm lo" ("no Action Plan for checking unplanned urbanisation"), Seismic Zone V tana National Building Code "sample Lawngtlai leh Mamit district-ah pawm a la ni lo" ("yet to be adopted in the sampled Lawngtlai and Mamit districts"), Corporation hnena hna 18 zinga 15 hlan, mahse "Kawng leh Bridge, Tui pekna … leh Fire Services" ("Roads & Bridges, Water supply … and Fire Services") hlan loh, leh ram hman dan Land Revenue & Settlement Department kutah a la awm tih an hmu. Ruahtui drain, AMRUT tui luanna emaw Smart City drain audit hmuh a ni lo.
Leihnuai tui: State leihnuai tui Act a awm lo; Mizoram Ground Water (Control and Regulation) Bill, 2023 (title page chauh)	Chhunzawm. Leihnuai tui thunun State dan hmuh a ni lo; "Leihnuai tui hmasawnna thunun tura notify hmun: NIL" ("Areas Notified for Regulation of ground water development: NIL") (CGWB, State profile). Assessment unit tin "Him" ("Safe") a ni (lak chhuah zat 3.95%, GWRA 2024, thu lak chhawn angin), chuvangin recharge hi he Kaihhruaina Bu design thiltum a ni lo (Clause 4.11, recharge dan). He Kaihhruaina Bu-ah leihnuai tui record tan IWRD hming a lang; State observation-well network hmuh a ni lo.

Instrument	Inzawmna
Environment (Protection) Act, 1986; Water (Prevention and Control of Pollution) Act, 1974; Wetlands (Conservation and Management) Rules, 2017; Mizoram Pollution Control Board (MPCB)	Chhunzawm. State Wetland Authority notification hmuh a ni lo [TBC]. Siaha district-a Pala Wetland (Palak Dil) hi Ramsar site a ni (Bung 7). Dil leh tuikhurte chu Bung 7 leh 8-in a thunun.
Disaster Management Act, 2005; MSDMA, DM&R, District Disaster Management Authority-te leh Deputy Commissioner-te; State Disaster Management Plan 2020 (tarlan angin)	Chhunzawm. MSDMA dinna notification hmuh a ni lo [TBC]. Fûr hma leidip laih chhuah (desilting) ni ruatna State order hmuh a ni lo; Bung 10 hna calendar chuan he Kaihhruaina Bu ni-te a ruat a, March ni 31 aṭangin a ṭan.
IRC:SP:42-2014, IRC:SP:48 (Hill Road Manual), IS 14458 (Parts 1–3) leh IS 14496 (Part 2), leh kawng leh tlang kawng tui luanna chungchanga PWD leh national-highway agency-te hman dan	Kawng leh tlang kawng tui luanna-ah hman, Bung 6 aṭanga kaihhruai, a nen an inkalh loh chuan; IRC:SP:48 tui luanna clause-te he Kaihhruaina Bu tan chhiar a ni lo [TBC].
CPHEEO Manual on Storm Water Drainage Systems (2019)	Engineering reference (thu en tur). He Kaihhruaina Bu hian Clause 1.3.2 hnuaiah return period sang zawk a ruat.
NDMA Guidelines on Management of Urban Flooding (2010) leh MoHUA SOP (2017)	He Kaihhruaina Bu hian catchment innghahna design, detention leh retention, tui awmna humhalh leh climate siam rem IDF chungchanga NDMA thupek (directive) te a hlen chhuak.
NDMA Urban Flood Risk Management Programme (UFRMP) leh AMRUT 2.0	Heng programme hnuaia sum pek hnate chuan he Kaihhruaina Bu an zawm tur a ni. Bung 4–5 development thununna chuan chung hnaten capacity an siam chu a venhim.
IRC:SP:42-2014 leh IRC:SP:50-2013	Bung 6 nen an inkalh loh chinah kawng tui luanna-ah chauh hman.
MBBL 2016, Chapter 9	RWH leh Bung 10-a endikna kalphung tan entawn tur.

Hrilhfiahna. Mizoram-ah RWH hi tui pekna leh recharge hmalakna angin siam a ni. Chu thiltum atan chuan a ṭha hle. Mahse fûr hun tuilian thunun nan rinchhan theih a ni lo, June aṭanga August thleng fûr ruahpui, June 2018 laihawl ang chi, kar tam tak ruah a sur hnua a lo thlen hunah RWH sump-te chu a tam zawkah an khat tawh ṭhin emaw lei a hnawng tawh ṭhin avangin. Chuvangin he Kaihhruaina Bu hian khawl khawm tui zat leh tihtlem (attenuation) tui zat chu a ṭhen hrang a, recharge-in system aṭanga tui a paih bo tak tak chuan retention angin chhiar a phal.

Mizoram-ah tlang pang dan a awm a, tui luanna design erawh a awm lo. Landslide Policy Committee for Aizawl City chuan 2014-ah Public Health Engineering Department chu "tlang pang hawng aṭanga hlatah ruahtui leh tui bal man leh phurh tur facility design leh sak nan kum nga capital outlay plan pawm leh hlen chhuak, nghet lo thei tlang pang tihhnawng lo tur hmunah paih chhuak" ("Adopt and implement a five year capital outlay plan to design and construct facilities to capture and transport rain and waste water away from exposed hillslopes and ejected at locations that will not saturate potentially unstable slopes") turin, "Aizawl City chhunga septic tank, leach field leh soak pit zawng zawng paih bo" ("eliminate all septic tanks, leach fields and soak pits within Aizawl City") turin leh "tui luanna system design leh sak, en reng leh siam ṭhat emaw tihṭhat nan Public Health Engineering Department chhungah office din" ("Create an office within the Public Health Engineering Department to design and build, monitor and repair or improve drainage systems") turin a ngen a, Corporation chu "AMC ram chhunga hmasawnna hna zawng zawng (Kawng, Tui luanna, lung laihna etc.) thunun thuneihna a nei tur a ni" ("should have controlling authority for all developmental activities (Roads, Drainage, quarries etc.) within AMC area") a ti (Roadmap to Stability, 2014). Master plan chuan drain kawng nghet, "outfall hmunah tihfaina facility" ("treatment facilities at the outfall points") leh check dam pariat, Zuangtui, Sakawrtuichhun, Government Complex, Mission

Vengthlang, Tlangnuam, Saikhamakawn, Melthum leh Hlimen hnuaiah a rawt (Master Plan for Aizawl: Vision 2030). Aizawl Smart City Ltd ruahtui drain project hmuh a ni lo a, Aizawl tana ADB programme thuziak hmuhte chuan tui pekna leh sewerage an huam (tawi fel taka sawi angin). CAG chuan "leimin hlauhawm hmun endik reng leh zirna (research) neih a ni lo" ("regular inspection of landslide prone areas and research studies have not been conducted"), "khawpui ruahman loh lian chhohna enna Action Plan a awm lo" ("no Action Plan for checking unplanned urbanisation") leh "2015 aṭanga State Plan-a ngaihtuah" ("envisaged in the State Plan since 2015") automated leimin en rengna chu din a ni lo tih a hmu (CAG, Report No. 1 of 2025). Heng zinga pakhatin mah design ruahpui a sawi lo, development-control condition reng reng hian plot thar-te chu drain capacity hmang zo emaw tlang panga tui dah lut emaw a khap lo. Bung 4–5 phalna nena inzawm tir hian chu tlakchhamna chu a phuhruk.

State dan hian hmanrua ṭhenkhat a nei. Tlang pang regulation chuan site tui luanna pianphung a ruat a, swale pakhatin a luan khawm theih chin 400 m² a khap a, hnuai lama site siam chu a chung lam site tui luanna phur turin a ti (SD&SM reg. 27); building regulation chuan ruahtui khawl khawm leh "vantlang drain hnai ber thlenga a tawk drain" ("of adequate capacity to the nearest public drain") a phut (AMCBR regs. 33 leh 37); Municipalities Act chuan kawng drain-te Corporation kutah a dah a, "tui luanna emaw sewerage system leh outfall him leh tawk siam leh enkawl" ("provide and maintain a system of drainage or sewerage as well as a safe and sufficient outfall") turin a ti (s.288), tui bal chu "ruahtui nen hrang hranga" ("as distinct from rain-water") luan tir turin a phut thei a (s.298), municipal drain emaw ruahtui channel chunga structure reng reng a khap (s.300); 2024 Water Resources Act chuan WARDMA leh khaw leh veng thlenga committee-te a din a, an mawhphurhna zingah "tui hnar hriat tawhte bawlhhlawh laka veng" ("Prevent pollution of identified water sources") a tel; leh 2025 Village Councils Act chuan Village Council-te chu hmun him lo puang turin a phal. Court leh tribunal pawhin hma an la: High Court chuan July 2024-ah Bawngkawn–Durtlang kawng sir lehlam leh lehlamah sak thar a khap a, January 2021-ah 1965 riverine reserve notification a paih (chanchin tlangzarh angin), leh National Green Tribunal-in ek tui leh luipui bawlhhlawh a enkawlna (OA 593/2017, OA 673/2018 leh OA 606/2018) aṭangin Bung 8-in a hman report-te a chhuak. Dan-in a tlakchham chu design standard a ni. Heng dan zinga pakhatin mah drain emaw down-drain-in ruahpui eng ang nge a phur tur, tlang site-in tui eng zat nge a luan chhuah tir emaw a tlang panga a dah lut theih, terrace swale-in kum 10 ruahpuiah eng zat nge a phur tur, phai outfall chu luipuiin eng chen nge a khar, emaw development chu lui aṭanga eng chen nge a hlat tur a sawi lo; 400 m² dan hian area a ruat a, tui luang a ruat lo; pakhat mah Autonomous District Council ramah hman a ni lo. He Kaihhruaina Bu endikna-te hi chu hmun tana competent authority-in a pek building permit leh site development permit peng angin siam a ni a, no-objection certificate hran angin a ni lo. He Kaihhruaina Bu hi heng dan (instrument) te, Roadmap tui luanna hmalakna te leh court leh tribunal thupekte ṭanpuitu technical thuziak atan a pe chhuak a ni: anni-in an ruat loh design ruahpui, detention, outfall, infiltration, tlang site tui luanna leh corridor number-te a pe, sawrkar, Corporation leh authority dangte ngaihtuah tur rawtna angin. UD&PA, Corporation, LMC, PHED, PWD, IWRD, Village Council reng reng, District Council reng reng emaw pawl dang reng rengin pawm a ni lo.

1.9 Hna leh mawhphurhna

1.9.1 A hnuaia mawhphurhnate hi he Kaihhruaina Bu hnuaiah hman a ni. Agency reng reng dan anga thuneihna an thlak lo.

Table 1.4 — He Kaihhruaina Bu hnuaia hna leh mawhphurhna

Agency	He Kaihhruaina Bu hnuaia a hna
Urban Development & Poverty Alleviation Department (UD&PA)	Mizoram Municipalities Act, 2007 section 371 hnuaia Board of Councillors-in a siam AMCBR/SD&SM a notify a, khawpui ram master plan leh town development plan-te a vawng (Allocation of Business Rules, 2019, CAG-in a lakchhawn angin) a, khawpuite a notify. Corporation nen, AMCBR regs. 5(6), 26, 33 leh 37 leh SD&SM regs. 6 leh 27 chunga Clause 1.3.1(a) amendment a buatsaih ang; Mizoram (Village Councils) Act, 2025 section 13(6) model building bye-laws chu tui luanna annex nen a siam thei ang; master plan-ah (Bung 11) tuilian hlauhawm catchment, drainage reserve, phai 1% AEP hmun leh regional facility hmunte a lantir ang a, Clause 1.3.1(b) model bye-law a chhuah ang a, Tier B authority-te regional ṭanpuina a pe ang (Table 1.1).
Aizawl Municipal Corporation: a Board of Councillors, Local Council-te leh Ward Committee-te	OBPAS hmangin building permit leh AMCBR/SD&SM hnuaiah site development permit a pe a, a ram kawng drain-te a vawng (s.289) a, "tui luanna emaw sewerage system leh outfall him leh tawk siam leh enkawl" ("provide and maintain a system of drainage or sewerage as well as a safe and sufficient outfall") ngei ngei tur a ni (s.288); a Local Council-te chuan no-objection certificate an pe a, regulation-te chu "khauh taka zawm" ("are strictly observed") a nih an en (AMCBR reg. 15). OBPAS leh site development permit hmangin he Kaihhruaina Bu hi a hmang thei ang; chuti a nih chuan Bung 10 drainage report a phut ang a, site endiknaah Clause 4.11 tlang dan leh SD&SM tui luanna a endik ang a, amah drain leh hnaah he Kaihhruaina Bu a hmang ang a, Table 1.5 drain register a vawng ang a, asset hlan (Clause 10.14) a dawng ang a, a endik ang a, dan a zawm tir ang (Clause 10.12–10.15).
Lunglei Municipal Council (LMC)	State urban local body pahnihna (November 2021-a din; March ni 29, 2023-a inthlan hmasa ber, CAG); ama building regulation hmuh a ni lo [TBC]. Municipalities Act hnuaia ama regulation ngei hmangin he Kaihhruaina Bu hi a pawm thei ang; chuti a nih chuan Corporation-in a hman ang bawkin a hmang ang.
State Stormwater Technical Committee (Clause 1.3.2)	Standard sang zawk a pawm ang a, Belhchian, table leh compliance calculator a chhuah ang a, Tier A thlan dangah inremna a pe ang a, a hnena thlen variance-te a rel ang a, he Kaihhruaina Bu a endik ang (Clause 1.12).
Village Council-te	Mizoram (Village Councils) Act, 2025 hnuaiah, "State sawrkar-in a siam model building bye-laws chu pawm leh zawm tir" ("adopt and enforce the model building bye-laws as may be framed by the State Government") (hmuh a ni lo) a, District Disaster Management Authority phalna nen in sak atana hmun him lo an puang (s.13(6)); "Tihfaina leh tui luanna" ("Sanitation and drainages"), kawng leh culvert leh "khaw chhunga tui hnar humhalh" ("Conserve water resources within the village area") te hi an mawhphurhna zingah a tel (ss.14(6), 15(1)); in hmun an sem. Model bye-laws siam a nih hnuah chu hmangin he Kaihhruaina Bu hi an hmang thei ang a, hmun him lo puanchhuahna atan Clause 2.3.6(i) endikna (screening) an hmang thei ang; khaw drain-te leh tuikhur catchment-te chu ruahtui outfall laka an vawng fai ang.
Lai, Mara leh Chakma Autonomous District Council-te, an Executive Committee-te leh Village Council-te	Sixth Schedule hnuaiah an ram an enkawl; State municipal, village-council leh water-resources Act-te leh 2023 Rivers Bill-in an huam lo, an building emaw tui luanna regulation hmuh a ni lo [TBC]. District Council-in a pawm loh chuan he Kaihhruaina Bu hian an ramah thuneihna a nei lo. District Council chuan ama ram tan ama dan (instrument) ngei hmangin, a Executive Committee kaltlangin a pawm thei ang; a pawm chuan, chutah chuan chu hmun tana competent authority a ni ang. Pakhatin mah a pawm lo. Palak Dil, Ramsar site, hi Mara District Council ramah a awm.
Public Works Department (PWD) leh national-highway agency-te (NHIDCL pawh tel)	State kawng leh national highway-te, an kawng sir drain leh culvert nen, an sa a, an enkawl; kawng chu Corporation hnenah hlan a ni lo (CAG), PWD-in Aizawl pawn lama building him lo a zawng chhuak (CAG). An drain-ah Bung 6 leh Clause 6.3.6 tlang kawng dan an hmang ang a, kawng drain chu tlang pang venhim lohah engtik mah an luan chhuah tir lo vang; Hunthar-a NH-6 hi entirna reng a ni.
Public Health Engineering Department (PHED) leh State Investment Programme Management and Implementation Unit (SIPMIU)	PHED-in tui pekna, sewer, bio-digester leh khawtlang soak pit a kalpui; SIPMIU-in Chite-a 10 MLD ek tui tihfaina plant (sewage treatment plant) a sa a, "Aizawl City tan leh a hnuah state pum tan" ("for Aizawl City and subsequently for the whole state") ek tui plan a buatsaih (MPCB). Roadmap chuan PHED hnenah tui luanna office leh ruahtui leh tui bal "tlang pang hawng aṭanga hlatah" ("away from exposed hillslopes") phurh nan kum nga plan a ngen. Sewer sakna hmunah sewer leh ruahtui network a ṭhen hrang ang a, ruahtui outfall hmain in chhunga tui bal (sullage) a dang ang (Bung 8).

Agency	He Kaihhruaina Bu hnuaia a hna
Irrigation & Water Resources Department (IWRD); Mizoram State Water Resources Council (MISWARC), Water Resources Development and Management Authority (WARDMA), District Water Resources Committee-te leh Village leh Local Water Resources Committee-te	Mizoram Water Resources (Management and Regulation) Act, 2024 hnuaiah, Autonomous District Council-te pawn lamah: IWRD Chief Engineer hi WARDMA member secretary a ni a, IWRD chuan "leihnuai tui recharge tihpun nan ruahtui khawl khawm tihchak" ("promote rain water harvesting to augment ground water recharge") tur a ni (s.14(1)(b)(viii)), WARDMA chuan "ruahtui khawl khawm telin tui humhalh leh leihnuai tui recharge" ("water conservation and groundwater recharge, including rain water harvesting") thu a pe thei (s.16(2)(ix)), leh khaw leh veng committee-te chuan "tui hnar hriat tawhte bawlhhlawh laka veng" ("Prevent pollution of identified water sources") tur an ni; an dinna notification hmuh a ni lo [TBC]. Bung 5 tan luipui tui sang zawng leh tuilian chhinchhiahna (flood mark) a pe ang a, khaw luipui tan Clause 2.3.6(b) site zirna phalna a pe ang a, tlang ramah ruahtui khawl khawm chu khawlna leh hman nawn angin a chhiar ang (Clause 4.11) a, tuikhur catchment-te a humhalh ang.
Environment, Forests & Climate Change Department (EF&CC); Mizoram River Protection Authority (din a nih chuan)	EF&CC-in riverine reserve leh wetland a vawng a, spring-shed pilot (tuikhur tui luan khawmna hmun pilot) tan nodal a ni (chanchin tlangzarh angin). 2023 Rivers Ordinance leh Bill chuan River Conservation Zone-a phalna hmasa ngai River Protection Authority a din ang; enact a nihna, a dinna leh zone reng reng finfiah a ni lo. Riverine reserve-ah Bung 7 corridor a hmang ang; Authority, din a nih chuan, a hmang thei ang.
Mizoram Pollution Control Board (MPCB)	Ek tui leh luipui bawlhhlawh chungchangah National Green Tribunal hnenah report a thehluh (OA 593/2017, OA 673/2018). Bung 8 hnuaia ruahtui drain-a ek tui hmuh record a dawng ang.
MSDMA, Disaster Management & Rehabilitation Department (DM&R), Land Revenue & Settlement Department, Deputy Commissioner-te leh District Disaster Management Authority-te	DM&R hi "chhiatna venna, inbuatsaihna, tihziaawmna, chhanchhuahna, ṭanpuina leh siam ṭhat lehna mawhphurtu" ("is responsible for prevention, preparedness, mitigation, response, relief and rehabilitation") a ni a (CAG), tuilian leh leimin thih zat a report; District Disaster Management Authority-te chuan Village Council-te hmun him lo puanchhuahna phalna an pe; Land Revenue & Settlement Department chuan ram record a vawng a, ram hman dan a enkawl, Corporation ram chhungah pawh (CAG). Clause 2.3.6(i) endiknaa hman leimin leh tuilian inventory a pe ang a, Authority nen thil thleng hnu endikna a hruai ang (Clause 10.16).
Directorate of Geology and Mineral Resources, MIRSAC leh Landslide Policy Committee for Aizawl City	Directorate hian leimin a zirchiang a, 2022-23 leimin lian zinga ṭhena thum ṭhena hnih chu "tui luanna ṭha lo" ("improper drainage") avang a ni a ti (chanchin tlangzarh angin); MIRSAC chuan *Atlas of Micro-level Landslide Hazard Zonation of Aizawl City and Selected Towns* a buatsaih (CAG); Committee chuan Corporation Landslide Hazard Maps standard a ruat (SD&SM). Clause 2.3.6(i) leh Clause 4.11 tan hlauhawm map leh inventory a pe ang.
NEEPCO (Tuirial hydroelectric project) leh State power department (Serlui B)	Tuirial leh Serlui B dam an kalpui. Bung 5 leh Clause 2.3.6(i) endikna tan reservoir tui sang zawng, tui thlah dan leh tui thlah record ziak takin an pe ang.
Aizawl Smart City Ltd	November 2017-a din, March 2018-a incorporate (CAG); a ruahtui drain project hmuh a ni lo. Clause 1.11 ni-te aṭangin tui luanna hna reng reng he Kaihhruaina Bu angin a design ang a, Clause 10.14 hnuaiah a hlan ang.
Central Water Commission (CWC), sawrkar laipui pawl	State-ah hmun pasarihah tui sang zawng a en a, panga hman lo, forecasting site a nei lo (SANDRP-in a ziak chhawn angin). Bung 5 tan a record a pe ang a, subzone 2(c) tan Flood Estimation Report a awm emaw buatsaih mek a nih a nemnghet ang (Clause 2.3.6(b)).
Central Ground Water Board (CGWB), North Eastern Region, sawrkar laipui pawl	State leihnuai tui a teh (unit tin "Him" ("Safe")) a, Clause 4.11 innghahna district booklet-te a tlangzarh. IWRD nen leihnuai tui record a pe ang.
IMD (Meteorological Centre Aizawl), Directorate of Science and Technology (DST), Agriculture Department leh Mz-SWIC gauge kalpuitu [U]	Clause 2.3.6(a) data dilna hmasa ber, Bung 2 ruahtui tlak record an vawng. Kawng leh rel neitu-te chuan kawng tui luanna (Bung 6), culvert leh hna sei (Clause 1.5.7) chungah he Kaihhruaina Bu an hmang ang.

Hrilhfiahna. Mizoram-ah ruahtui hi, a hmasa berin, dan anga ram hran pathumin a ṭhen: municipal ram, Board of Councillors-in regulation a siamna, UD&PA-in a notify-na leh Corporation-in phalna a pekna; Village Council ram, building dan siam a nih lohna; leh Lai, Mara leh Chakma Autonomous District Council ram, State municipal,

village-council, water-resources emaw lui dan pakhatin mah a thlen lohna. Chu ṭhenna chu ram tui luan tirtu pawlte zingah a inthlak leh: kawng drain, a kuta awm, tan Corporation, State kawng drain, hlan ngai loh, tan PWD, NH-6 leh NH-306 tan national-highway agency-te, sewer leh Chite treatment plant tan PHED leh SIPMIU, tui hnar tan IWRD leh WARDMA, riverine reserve leh ram tan EF&CC leh Land Revenue & Settlement Department, Tuirial dam tan NEEPCO, leh Bawngkawn–Durtlang kawng, riverine reserve leh lui bawlhhlawh chungchanga hma la tawh court leh tribunal-te. Aizawl hian ṭhenna a pawimawh chhan a lantir. Chite lui hi khawpui chhak lam ṭhena thum ṭhena hnih ruahtui drain lian ber (trunk), a ek tui tihfaina plant awmchhun outfall, a catchment dang zawng tan sewer, leh Priority II luipui bawlhhlawh chin (CPCB, 2025) a ni nghal a, a chhawm kawng sir drain-te chu dan (s.289(1)) angin Corporation kutah a awm a, PWD-in an sir kawng a enkawl thung. **Mizoram khawpui reng reng drain-te an neitute zinga ṭhenna notification a awm lo (NEER chhiar dan).** State-in dan a chhuah hma loh chu [TBC], he Kaihhruaina Bu hian tui luanna peng-te chu Table 1.5-a angin a sem, Bung 6-in drain ngei tan a tih ang hian, leh khawpui tin hian **drain register**, drain chhung tin neitu, a thlen lui, leimin hlauhawm map-a a class leh a outfall tarlanna, vawn turin a rawt (he Kaihhruaina Bu-in a ruat). He semna hi he Kaihhruaina Bu clause-te hman nana hnathawh ṭhenna a ni; agency reng reng thuneihna a thlak lo, mimal ram emaw pass hnuaia neih ramah master plan-a hauhna emaw thuthlung hmangin hlen chhuah a ni a, lak (acquisition) hmangin a ni lo.

Table 1.5 — He Kaihhruaina Bu hnuaia tui luanna peng-te hnathawh semna

Peng	Mawhphurtu
Corporation rama vantlang drain leh vantlang kawng sir drain-te	Aizawl Municipal Corporation (Mizoram Municipalities Act, 2007, ss.80(d), 288, 289(1), 290–291), a Local Council-te nen
State kawng leh highway kawng sir drain-te	A tak takah PWD, kawng hlan a nih loh avangin (CAG), dan angin chu drain-te bawk chu Corporation kutah a awm nachungin (s.289(1)); inhuam (overlap) hi tarlan a ni a, chinfel a ni lo
National highway drain-te	National-highway agency-te
Pianphung lui leh riverine reserve-te	EF&CC leh Land Revenue & Settlement Department (NEER chhiar dan)
Sewer leh Chite ek tui tihfaina plant	PHED leh SIPMIU (s.289(3)-in sawrkar agency hnena hlan a phal)
Dam leh an tui thlahna lui chhungte	NEEPCO (Tuirial) leh State power department (Serlui B) (NEER chhiar dan)
Municipality pawn lama khaw drain-te	Village Council (Mizoram (Village Councils) Act, 2025, s.15(1)(q), "Tihfaina leh tui luanna" ("Sanitation and drainages"), pek theih mawhphurhna)
Lunglei khawpui drain-te	Municipalities Act hnuaiah Lunglei Municipal Council (regulation hmuh a ni lo [TBC])
Autonomous District Council rama drain-te	District Council leh a Village Council-te [TBC]

He Kaihhruaina Bu hian Department leh authority-te chu dan, order leh record-in an hming an sawi angin a sawi. Hna tin tana neitu pakhat hming tarlantu kaihhruaina bu hian amah chauhin institution a siam nghet lo, mahse tuin nge eng nge sign ang tih buaina a paih bo.

1.10 Variance leh waiver

1.10.1 **Variance.** Dilna thehluhtu chuan Clause 10.6 hnuaia certify report hmangin heng a lantir chuan, Authority chuan number-a phut aṭangin variance a pe thei:

- (a) site dinhmun, leihnuai tui sang, lei bawlhhlawh (contaminated soil), lungpui, emaw facility phut tan site a tê lutuk ang chi avangin dan zawm a tih theih loh; leh
- (b) rawtna thlan dang chuan Bung 5 luanna hnuailam hmunah hnathawh inang emaw ṭha zawk a pe, emaw a tlakchham chu catchment inang chhunga fee-in-lieu emaw site pawn lama hna hmangin phuhruk a ni.

1.10.2 **Waiver.** Clause 10.6 hnuaia certify hydraulic analysis chuan site chu tuifinriatah emaw, luanna hnuailamah tuilian hlauhawm ram nei lo tidal lui chhungah emaw a luang lut nghal tih, leh dah rih loh tui luang hian Bung 5 outfall khar dinhmun a tichhe zual lo tih a lantir chuan, Authority chuan Bung 4 detention phut (retention ni lovin) a waive thei. Mizoram hian tuifinriat kam leh tidal lui chhung a nei lo, chuvangin State-a site pakhat mah he waiver hi a tling lo. Phai emaw lui kam zawl sira tuilian luipuiah, Tlabung-a Khawthlangtuipui emaw Sairang leh Bairabi-a Tlawng ang chi, Tuirial reservoir emaw a backwater-ah, emaw Tuirial emaw Serlui B dam hnuaia tui thlahna lui chhungah luang lut site chu, a dawngtu tui a sang apiangin Bung 5 outfall khar dinhmunah a awm a, a tan detention waive a ni lo; lui chim, kor thuk (gorge) emaw tlang pang zawh chhuk a luang avang pawhin site tan waive a ni hek lo.

1.10.3 **Variance emaw waiver awm lo.** Heng tan hian variance emaw waiver pek loh tur a ni:

- (a) ruahtui drain-a ek tui inzawmna;
- (b) Bung 6 mi chenna chhuat hniam ber sang zawng;
- (c) Clause 7.4.7 Zone 1 hniam ber (kam chhip aṭanga 15 m, emaw lui laih thuk kam chu 10° aia a chim chuan kam pang chhip aṭanga) aia tui awmna setback tihtlem reng reng, emaw Bung 7 lei vur loh tur zone-a lei vur emaw sak reng reng; emaw
- (d) tuilian hlauhawm catchment-a retention phut, Clause 1.7 hnuaia fee-in-lieu hmang lo chu.

1.10.4 **Tih dan.**

- (a) Dilna chu drainage report hmasa nen **Form 1-2** (Variance / Waiver Dilna)-ah siam tur a ni.
- (b) Tier B authority chuan ha 1 emaw a aia lian site chunga variance reng reng chu State Stormwater Technical Committee hnenah a thlen tur a ni.
- (c) Thutlukna chuan a chhan leh condition reng reng a sawi tur a ni a, Clause 10.17 vantlang register-ah ziah lut tur a ni.
- (d) Variance hi phalna nen a kal. Phalna a tawp chuan a tawp ve.

> Hrilhfiahna. 2006 APWA 5600 chuan waiver section (5601.6) a tel a, Georgia chuan luanna hnuailam zirchianna-in peak control a ngai lo tih a lantir chuan waiver a phal. Clause 1.10.2 waiver hi a zim: tidal tuifinriat kamah chuan, dah rih loh tui luang chuan tide-in outfall a khar hmaa a luan zawh avangin a ṭanpui thei, mahse analysis chauhin chu chu a lantir thei. He Kaihhruaina Bu hian thutlukna tin tlangzarh a phut, tlangzarh hian case tin-a standard tihchhiat tlem tlem a dan avangin; Mizoram-ah luipui sira dan anga ri awmchhun awm tawh, 1965 riverine reserved forest, luipui 16 sir lehlam leh lehlama mile chanve, chu High Court-in January ni 27, 2021-ah a paih (chanchin tlangzarh angin), Aizawl tui luanna lian sira green buffer 15 m chu master plan rawtna chauh a ni (Master Plan for Aizawl: Vision 2030), tlang pang regulation "riverine reserve" ("riverine reserve") chu hrilhfiah a ni lo (SD&SM reg. 28), leh State chuan National Green Tribunal hnenah "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area") (MPCB, OA 593/2017) a ti a, Tlabung, Sairang leh Bairabi-ah an luipui aṭangin tuilian a thleng ṭhin (chanchin tlangzarh angin).

1.11 Inthlak danglamna thu (transition)

1.11.1 **Hman ṭan ni.** He Kaihhruaina Bu hi notification hnu **thla 6**-ah dilna thar tan hman ṭan a ni ang (hman ṭan ni).

1.11.2 **Kalpui mek dilna.** Hman ṭan ni hmaa kim taka thehluh dilna chu, hman ṭan ni aṭanga thla 12 chhunga thutlukna siam a nih chuan, a thehluh laia dan hman mek angin rel theih a ni. Chuti a nih loh chuan he Kaihhruaina Bu hman a ni.

1.11.3 **Tier B tan phase hrang hranga ṭanna.** Tier B authority-ah, Bung 4 leh 5 hi notification hnu **thla 24** aṭangin hman a ni, tuilian hlauhawm catchment-ah erawh hman ṭan ni aṭangin hman a ni.

1.11.4 **Public works.** Hman ṭan ni hmaa sanction DPR-te chu sanction ang zelin kal zel theih a ni. Hman ṭan ni hnua siam ṭhat emaw tender nawn DPR reng reng chuan dan a zawm tur a ni. Department-te chuan thla 12 chhungin dan zawm lo hna kalpui mekte chu State Stormwater Technical Committee hnenah an report tur a ni.

1.11.5 **Belhchian chhuah hmain.** He Kaihhruaina Bu-a sawi Belhchian pakhat a chhuah hma chu, dilna thehluhtu chuan clause-a kalphung tarlan chu, Authority nena inremna value nen, drainage report-a ziak luhin a hmang tur a ni.

> Hrilhfiahna. Thla 6 hun dah hi Clause 2.14.2-a NIH-DHAARA update hun dah nen a inmil. Singapore pawhin a 2025 detention addendum (16 Apr 2025-a chhuah, 1 Oct 2025 aṭanga hman) tan hun inang deuh a pe. Thla 12 leh 24 hun te hi Tier B authority-te-in hnathawktu an zirtir theih nan leh State-in design-aid table a chhuah theih nan he Kaihhruaina Bu-in a ruat a ni (Clause 1.7).

1.12 Endikna leh siam ṭhatna (amendment)

1.12.1 State Stormwater Technical Committee chuan he Kaihhruaina Bu hi **kum 10** zelah, leh Clause 2.14.1-a tarlan anga 1% AEP design thuk zawng aia nasa thil thleng reng reng hnuah a endik tur a ni.

1.12.2 Amendment-te chu Gazette-ah notify tur a ni a, danglamna chhinchhiahna (change log) nen tlangzarh tur a ni a, notification-in a sawi danglam loh chuan notification hnu thla 6-ah hman ṭan a ni ang.

1.12.3 Mi tu pawhin Committee hnenah amendment an rawt thei. Rawtna leh Committee thutlukna-te chu tlangzarh tur a ni.

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Belhchian leh Form

Belhchian / Form	A chhunga thu
1A	Tier A authority-te list, Aizawl Municipal Corporation leh Master Plan for Aizawl: Vision 2030 Aizawl Development Plan Area ri nen
1B	Tuilian hlauhawm catchment map-te
1C	Policy Supplement: thlan dang S-1 aṭanga S-5 thleng thu leh council thutlukna (resolution) entawn tur
1D	AMCBR/SD&SM amendment entawn tur leh ULB bye-law entawn tur
Form 1-1	A Huam leh Huam Loh Thutlukna
Form 1-2	Variance / Waiver Dilna

BUNG 2

Design Ruahtui Tlak leh Design Ruahpui

2.1 Tum leh a huam chin

2.1.1 He Bung hian he Kaihhruaina Bu-a hydrology chhutna zawng zawng tana ruahtui tlak thu (input) a ruat: drain (tui luanna) leh inlet (luan lutna) lian zawng ruatna (Bung 6), retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) leh detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) lian zawng ruatna (Bung 4), luanna hnuailam leh tailwater (outfall hnuailama tui sang zawng) zirchianna (Bung 5), leh tui awmna (waterbody) leh dil (tank) hnathawh (Bung 7).

2.1.2 He Bung hian heng hi a tarlang:

- (a) design ruahtui tlak zat leh chakna (intensity) lakna tur thu hnar phalna pekte;
- (b) duration (ruah sur rei zawng) hrang hrang inkarah, hmun khat (point) leh area inkarah, leh tunlai climate aṭanga hmalam climate-ah ruahtui tlak zat inthlak dan;
- (c) design ruahpui (hyetograph, hun hrang hranga ruahtui tlak zat) siam dan; leh
- (d) hmasawnna hma lam (pre-development) leh hmasawnna hnu lam (post-development) dinhmunah ruahpui hman ngei ngei turte.

2.1.3 He Bung hian Mizoram pum pui a huam. Aizawl Municipal Corporation, Lunglei Municipal Council, Village Council emaw Autonomous District Council emaw-in Bung 1 hnuaiah ruahtui tlak standard khauh zawk a pawm chuan, chu standard khauh zawk chu zawm tur a ni.

> **Hrilhfiahna.** Mizoram-a tui luanna hlawhchham tam zawk chu hydraulics avang ni lovin, ruahtui tlak thu (input) avangin a ni. Mizoram hian chu chu a lantir. State chhunga khawpui reng reng drain-te tan design ruahpui hmuh a ni lo: Aizawl Municipal Corporation regulation pahnihin design ruahpui te, return period (kum engzat zelah nge a lo thlen ṭhin) te, runoff coefficient te an ruat lo a, a tlang pang regulation chuan "hydrology leh hydraulic chhutna" ("hydrology and hydraulic calculations") chu licence nei civil engineer-te kutah a dah (SD&SM, Schedule I); master plan chuan Aizawl drain-te hi "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") a ti (Master Plan for Aizawl: Vision 2030). State dangte ṭanpuitu thu hnar tlangzarhte hian he State hi an huam lo: IMD *Extremes*-ah Mizoram station pakhat mah a awm lo, State pum hi CWC subzone 2(c)-ah a awm a, chu subzone tan chuan CWC-in Flood Estimation Report a tlangzarh lo, IMD Das et al. (2022)-ah pawh Mizoram panel a awm lo; chuvangin NIH-DHAARA hi hmun hrang hrang huam thu hnar (spatial source) awm chhun a ni (Clause 2.3.6). Zat darh mekte chu an inkalh: State kumtin ruahtui tlak zat pangngai hi thu hnar pathumah 2,056.8 mm, 2,500 mm leh 2,794 mm tiin a lang a, district booklet pakhatin Serchhip tan 1,486.5 mm leh 2,200 mm vel a pe kawp (CGWB); ni khat value hmuh chhun chu chanchinbu report an ni a, an zingah kum tarlan lohna report pakhatah Aizawl-a 148 mm a tel (chanchin tlangzarh angin). State pum tan thu hnar leh kalphung chiang tak pakhat ruat hi he Bung tum ber a ni.

2.2 Thumal awmzia

Thumal	He Kaihhruaina Bu-a a awmzia
Annual exceedance probability (AEP)	Kum khat chhungin ruahtui tlak zat pakhat a tluk emaw a pel emaw theih dan (probability). 1% AEP ruahpui chu "kum 100" ruahpui a ni. Hetah hian a pahnih hian hman a ni: kum T = 1/AEP.
IDF / DDF	Hmun pakhata ruahtui tlak chakna, a rei zawng leh a lo thlen ṭhin dan inzawmna (intensity–duration–frequency) leh ruahtui tlak zat, a rei zawng leh a lo thlen ṭhin dan inzawmna (depth–duration–frequency).
Hmun khata ruahtui tlak (point rainfall)	Hmun pakhata ruahtui tlak, ruah tehna (rain gauge)-in a teh ang chiah.
Design ruahpui (design storm)	AEP, duration leh temporal pattern (ruahtui tlak dan) tarlan nei hyetograph (hun hrang hranga ruahtui tlak zat).
Duration pawimawh ber (critical duration)	Design siam mek tan tui luang zat sang ber, tui sang zawng sang ber emaw khawl tur tui zat lian ber emaw siamtu ruahpui duration.
Areal reduction factor (ARF)	AEP leh duration inang tan catchment (ruahtui luan khawmna hmun) pum ruahtui tlak zat pangngai leh hmun khata ruahtui tlak inzawmna (ratio).
Fûr hun (monsoon season; he Kaihhruaina Bu-a hman dan)	April ni 1 aṭanga October ni 31 thleng. He Kaihhruaina Bu-ah "fûr" leh "fûr hun" ("the monsoon", "the monsoon season") tih hian he ruah hun hi a kawk a, April leh May thla fûr hma ruahpuite leh south-west monsoon a lo thlen (onset) aṭanga a kir leh (withdrawal) thleng a huam; he Kaihhruaina Bu fûr hun a ni a, IMD-a mi a ni lo, he Kaihhruaina Bu hian IMD awmzia angin April-ah monsoon a ṭan tih a sawi lo. Aizawl tan IMD-in monsoon lo thlen leh kir leh ni pangngai a tarlante chu he Kaihhruaina Bu tan hmuh a ni lo [TBC]; 2026-ah monsoon chu June ni 6 vel khan Mizoram-ah a lo thleng (chanchin tlangzarh angin). April ni 1-ah fûr hun a ṭan chhan chu State-a ruah thil thleng hlauhawm ber ni tarlan neite zawng zawng hi May thlaah, monsoon lo thlen hma emaw a vel emaw khan a thlen vek vang a ni: Aizawl-a Laipuitlang lungpui tlak, chanchinbu leh AGU Landslide Blog-in May ni 11, 2013 an tih a, paper pakhatin May ni 15, 2013 a tih (Laldinpuia et al., 2013; an inkalh); Cyclone Remal May ni 28, 2024-a, Melthum–Hlimen lung laihna (quarry) chim leh Aizawl-a leimin dangte nen; leh May ni 24, 2025 aṭanga June ni 3, 2025 thleng ruahpuite, leimin 598 leh mi panga thihna nen (DM&R zat) (paper bak chu chanchin tlangzarh angin vek); leh April ni 27–28, 2026-ah April ruahpuiin district panga aṭanga pakua thlengah school chawlh tir a nih vang a ni, Serchhip-ah 70.5 mm leh Hnahthial-ah 55 mm (chanchin tlangzarh angin). CGWB chuan "May aṭanga September tawp lam thleng ruahpui" ("heavy rainfall during May to late September") a hmu a (CGWB, Lunglei), National Adaptation Fund for Climate Change (NAFCC) tana State project report chuan "May aṭanga September thleng ruah tam" ("high rainfall during May to September") a hmu (Mizoram Agriculture Department, 2016); chungte chu anmahni thusawi a ni a, IMD ni ruat a ni lo. Kum khat ruahtui tlak zinga hlawm lian ber, 16.8%, chu August-in a keng (Lallawmzuali and Muniyan, 2024). State order reng rengin hnathawh ni a ruat lo a, master plan chuan "monsoon a lo thlen hmain kum tin drain-te tihfai a ngai" ("drains need to be cleaned every year before the onset of monsoon") tih chauh a sawi (Master Plan for Aizawl: Vision 2030). Fûr hun ṭan hnua hnathawh tawp ni (deadline) chuan April leh May ruahpuite a huam lo ang a, chuvangin fûr hma hnathawh tawp ni March ni 31 chu fûr hun ṭan hmaah ruat a ni (Bung 10). May thla thil thleng hlauhawm ni tarlan nei hmasa ber chu May ni 11-ah a thlen avangin (Laipuitlang, 2013), Bung 10-a fûr hun laia tihfaina chu April ni 30 hmaa zawh tur a ni, April ruahpuite hnuah leh May thla chhiatna ni tarlan nei zawng zawng hmaah: May ni 15 hmaa zawh tur tihfaina chu Laipuitlang hnuah a thleng thei a, May ni 31 hmaa zawh tur chu a pathum hnuah a thleng thei. State kumtin ruahtui tlak zat hi 2,056.8 mm (Lallawmzuali and Muniyan, 2024), 2,500 mm (NAFCC project report), 2,794 mm (CGWB, State profile), Lunglei tan 2,313.8 mm leh Serchhip tan booklet pakhatah 1,486.5 mm "(2009 dinhmun angin)" ("[As on 2009]") leh 2,200–2,216 mm a kawp (CGWB), Serchhip district tan 2,481.9 mm (MIRSAC) leh Aizawl tan "209 cm" (Master Plan for Aizawl: Vision 2030) tiin a lang; hun leh station an inang lo a, hetah pakhat mah thlan a ni lo, kumtin ruahtui tlak zat hian ruahtui drain design a thunun lo. Clause 2.11.4-a ruahpui hma lei hnawnna (antecedent moisture) dan leh Bung 10-a inpeih reng hun (standby period) chuan he fûr hun hi a kawk.

Thumal	He Kaihhruaina Bu-a a awmzia
Fûr hun pawn lama ruahpui	Fûr hun hnuah pawh ruah tam tak a sur ṭhin: NAFCC project report chuan "fûr hnu hun (October aṭanga December) cyclone-te hi fûr hma hun (April leh May) cyclone-te aiin an nasa zawk" ("the cyclones of the Post Monsoon season [October to December] are more intense than those of Pre-Monsoon season [April & May]") tih a hmu a (Mizoram Agriculture Department, 2016), Chawngte-ah October 2025-ah ni khatah 130 mm a sur, "region-a sang ber" ("the highest in the region") (chanchin tlangzarh angin). October ruahpuite chu fûr hun chhungah, a ni hnuhnung ber thlengin an tla a, November leh December ruahpuite chu a pawnah an tla. Series a awm veleh design statistics chuan thla zawng zawng kumtin sang ber (annual maxima) a hmang a, hnathawh tawp ni emaw kalpuina dan emaw reng rengin ruahpui hi June–September chhungah chauh a sur tiin a ngai loh tur a ni, chu vang chuan Bung 10-a hnathawh calendar chuan inpeih reng (standby) hun chu October ni 31 thleng a vawng a, fûr hun hnu tihfaina chu November ni 15 hmaa zawh tur a ni.
Climate factor (CF)	Design life chhunga climate entir nan tunlai design zat puntirna (multiplier).
Thu hnar phalna pek (approved source)	Clause 2.3-a ruahtui tlak thu hnar tarlan.

2.3 Design ruahtui tlak thu hnar phalna pekte

2.3.1 **Thu hnar ber (primary source).** Design ruahtui tlak zat leh chakna chu National Institute of Hydrology, Roorkee **NIH-DHAARA** platform (Design Hydrology and Advanced Rainfall Analysis, nihdhaara.in) aṭanga lak tur a ni. Site coordinates tan, Clause 2.4-in a phut duration leh AEP tin tan, a IDF / frequency hmanrua hman tur a ni. Mizoram-ah he Clause hi sub-area zawng zawngah, Clause 2.3.6-in a ruat floor (a hniam ber tur zat), ratio leh darkar 72 factor nen, hman a ni, State hmun reng reng station series te, CWC report te, IDF tlangzarh te-in an huam loh avangin: NIH-DHAARA hi State-a design ruahtui tlak thu hnar awm chhun a ni a, hetah hian endik a la ni lo.

2.3.2 **Station IDF.** Station bik IDF inzawmna chu heng zawng zawng hi a dik chauhin 2.3.1 aiah hman phal a ni:

- (a) kum 30 tal recording-gauge (darkar khat emaw a aia tawi zela chhinchhiah) data aṭanga siam a ni;
- (b) IMD, State Hydrology Authority emaw approving authority (phalna petu authority) emaw-in a tlangzarh emaw phalna a pe emaw tawh; leh
- (c) gauge chu site aṭanga km 10 chhungah a awm a, a inkarah ram pianphung emaw tuifinriat kam hnaihna (coastal exposure) danglamna lian a awm lo.

Station IDF hman a nih chuan, design value chu station value leh NIH-DHAARA value zinga **a sang zawk** a ni tur a ni.

2.3.3 **Khaikhinna (ngei ngei tur, thlan dang a ni lo).** Designer (design siamtu) chuan khaikhinna atan heng value-te hi a report tur a ni, mahse a hman a ngai lo:

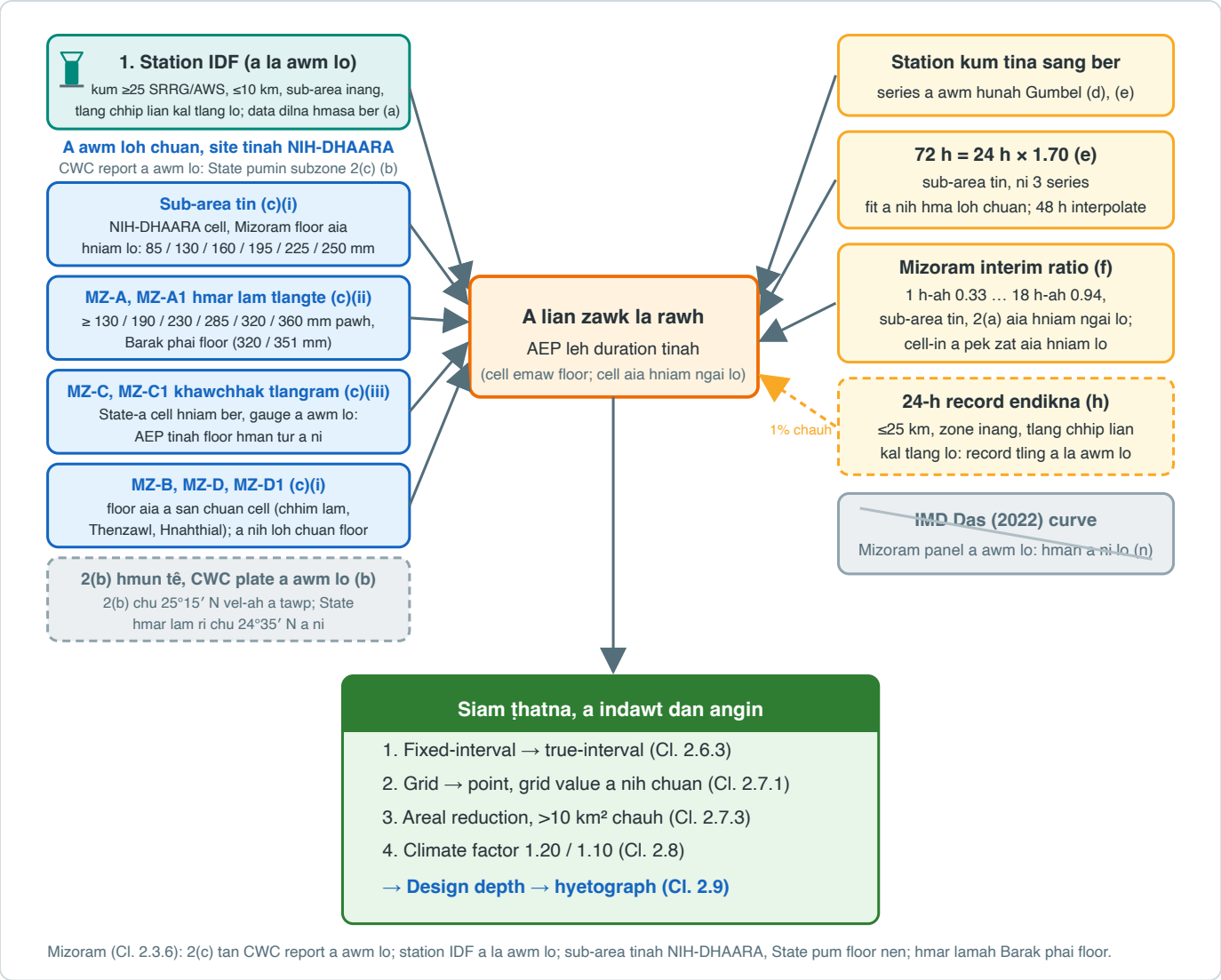
- (a) Das et al. (2022), *MAUSAM* 73(4)-a IMD isopluvial / IDF value-te, darkar 1–24 duration tan;
- (b) km² 25–5,000 catchment tan, subzone 2(c) (Barak and others) tana CWC Flood Estimation Report aṭanga darkar 24 hmun khata ruahtui tlak, chu subzone chuan Mizoram pum a huam a (Clause 2.3.6(b)), a tan CWC-in Flood Estimation Report a tlangzarh lo; subzone 2(b) (South Brahmaputra) report, Mizoram hmun reng reng awmna ni lo, chu a areal reduction curve-te atan leh unit hydrograph endikna atan chauh a aiah hman a ni a, chuvangin Clause 2.3.3(b) khaikhinna tan CWC hmun khata ruahtui tlak a awm lo, a huam ang zelin.

Design value chu AEP inang tan CWC subzone 2(c) (Barak and others) plate (a awm lo: CWC-in State pum huam subzone 2(c) tan Flood Estimation Report a tlangzarh lo a, a aiah Clause 2.3.6-in floor a ruat) value aia a hniam zawk chuan, CWC value chu a hniam ber atan hman tur a ni.

2.3.4 **Phal loh.** Heng zinga pakhat mah hi design ruahtui tlak thu hnar atan hman loh tur a ni:

- (a) India pum huap IDF formula tlangpui (entirnan Kothyari & Garde, 1992);

- (b) thu hnar tarlan lo ruahtui tlak value, vendor emaw web-calculator table pawh tiamin;
- (c) thil thleng pakhat zinga sang ber (single-event maxima); emaw
- (d) AEP tarlan lova project hmasa aṭanga design chakna lak chhawn.



Milem 2.1 — Design ruahtui tlak thu hnar indawt dan leh siam remna indawt dan. He Kaihhruaina Bu tana milem siam thar.

2.3.5 **Version enkawl.** Thehluh tur (submittal) tinah thu hnar, a version emaw a lak ni, coordinates zawh leh value lak chhuahte chhinchhiah tur a ni (Clause 2.13).

2.3.6 **Mizoram-a floor, ratio leh endikna.** Belhchian 2A a tlangzarh a, zone pakhat tan NIH-DHAARA emaw phalna pek station IDF emaw a finfiah hma chu, Clause 2.3.1 hi he Clause hnuaiah State sub-area zawng zawngah hman a ni a, design ruahtui tlak chu heti hian lak tur a ni:

- (a) **Station IDF.** Kum 25 tal IMD recording-gauge (SRRG, amah ngeiin a chhinchhiah ruah tehna) emaw automatic weather station record endik tawh aṭanga siam station IDF chu Belhchian 2B-ah tlangzarh a nih chuan, chu chuan thu a nei, station aṭanga km 10 chhungah leh Belhchian 2A sub-area inangah, tlang chhip lian kal tlangin ni ngai lovin, a huam duration leh AEP-te tan, (f) aiah, (c)(ii) leh (g) floor-te hnuaiah; chutichuan Clause 2.3.2 khaikhinna chu (c) aṭanga (e) thleng leh (h)-a darkar 24 leh a aia rei zawk zat-te nen siam a ni. Tlawng leh Tuirial phai inkara ding Aizawl tlang chhip lehlam pakhata gauge chuan a lehlam site a entir lo. Record chu a kumtin ruahtui tlak zat leh kumtin sang ber-te chu station tana IMD normals leh station extremes nen khaikhin a nih a, kum inmil lo zawng zawng hrilhfiah emaw paih emaw a nih chuan endik a ni. Ni khat data aṭanga one-third rule (Clause 2.6.4) emaw ratio nghet dang reng reng emaw hmanga IDF siam chu station IDF a ni lo. Mizoram-ah

Clause 2.3.2(a) hi kum 30 aiah kum 25 hmangin chhiar a ni, he series-a edition dang recording-gauge fit rei tak nei lote ang bawkin (he Kaihhruaina Bu-in a ruat). **Pakhat mah a awm lo.** Belhchian 2B-ah IDF pakhat mah tlangzarh a la ni lo; IMD *Extremes of Temperature and Rainfall for Indian Stations (up to 2012)*-ah Mizoram station a awm lo, a station index chu Aizawl, Aijal, Lunglei, Champhai leh Mizoram hmangin zawn a ni a, hmuh a ni lo (IMD); NIT Mizoram, Mizoram University emaw institution dang reng reng emaw aṭanga IDF paper hmuh a ni lo [TBC]; State ruahtui tlak chungchang peer-review frequency zirchianna awm chhun chuan thla tin leh kumtin zat chauh a fit a, ni khat sang ber emaw duration tawi emaw a fit lo (Lallawmzuali and Muniyan, 2024, *MAUSAM* 75(3)). He Kaihhruaina Bu data ngenna hmasate chu heng indawt hian an ni: (1) IMD **Meteorological Centre Aizawl (ORG)** leh **Lengpui (ORG)** ni khat series, an kumtin sang ber leh an ṭan kum nen (IMD city-weather ID Aizawl 42726 leh Aizawl-Lengpui 42727, tarlan angin); (2) Mizoram University, Kolasib, Champhai, Khawzawl, Serchhip, Hnahthial, Saiha leh Chawnhu-a IMD automatic weather station-te darkar khat kumtin sang ber; (3) Mz-SWIC network automatic rain gauge leh weather station-te record, Meteorological Centre Aizawl ni tin list-a site 30 vel, an operator hming (thu hnar-in a kimchang a tarlang lo [U]), an ṭan kum leh an chhinchhiah inkar hun (logging interval) nen; (4) Directorate of Science and Technology (DST) hnuaia State Meteorological Centre ni khat series, 1980s aṭanga 2021 thleng; (5) Serchhip, North Vanlaiphai, Lunglei, Haulawng leh Tlabung-a Agriculture Department rain gauge pangngaite; (6) Bairabi, Dapchhuah, Mat-1, Tlabung, Tuichawng, Tuipui D, Shitlangpui leh a site dangte-a CWC rain gauge-te; (7) May ni 27–28, 2024 leh May ni 24, 2025 aṭanga June ni 3, 2025 thleng Aizawl-a ruahtui tlak, leh (h)-a Aizawl-a 148 mm sur ni chu; leh (8) he Kaihhruaina Bu tana cell 15 zawh-a NIH-DHAARA darkar 2 aṭanga 18 thleng zat-te, darkar 1 leh 24 zat chauh zawh a ni a [TBC].

- (b) **Report, zone leh sub-area. State pum hi CWC subzone 2(c), "Barak leh a dangte" ("Barak and others")-ah a awm a, chu chu 2(b) report Annexure 1.1-in "Barak, Kalden leh Manipur luipuite" ("Barak, Kalden and Manipur rivers") nen a tarlang a (CWC, 2(b), Annexure 1.1), chu subzone tan chuan CWC-in Flood Estimation Report a tlangzarh lo**: 2(b) report-a kum 2000 thlenga report tlangzarh 21 list-ah 2(c) tan pakhat mah a awm lo a, CWC regional report page vawn hlui (archived)-ah pawh pakhat mah a tarlang lo (CWC; Wayback Machine, March ni 20, 2024); pakhat mah a awm lo emaw buatsaih mek a awm lo emaw tih CWC-in ziaka a finfiah chu la ngaih a ni [TBC]. Kaladan (Chhimtuipui, list-ah "Kalden") hming a lang a, Barak pawh a lang, chu luipuiah chuan Tlawng (Dhaleswari), Tuirial (Sonai), Tuivai, Serlui leh Langkaih an luang lut; Karnaphuli (Khawthlangtuipui), Bangladesh-a tuifinriat thleng chu, paih bo dan (elimination) hmangin "a dangte" ("others") hnuaiah a tla; Tiau chu Myanmar-ah Manipur luipui system-ah a luang lut (heng zawng zawng hi NEER chhiar dan, CWC subzone map-a finfiah tur [TBC]). **State hmun reng reng hi subzone 2(b)-ah a awm lo**: 2(b) report chuan a subzone chu "latitude 25° 15' aṭanga 28° North vel inkar" ("between … latitude 25° 15' to 28° North approximately") tiin a tarlang a (CWC, 2(b)), Mizoram hmar lam ri chu 24°35' N a ni a (Lallawmzuali and Muniyan, 2024), chhim lam panah 40' a hla zawk (NEER chhutna), chuvangin CWC plate pakhat mahin State hmun reng reng a huam lo. Report awm lo aiah he Kaihhruaina Bu hian heng a hmang (he Kaihhruaina Bu-in a ruat): km² 25–5,000 catchment-a Clause 2.7.3 areal reduction tan, CWC report tlangzarh hnai ber 2(b) report areal reduction curve-te; km² 25–1,500 khaw lam luipui tan, CWC, NEEPCO emaw State gauge-te a awm chuan an nena calibrate site zirchianna (SCS-CN emaw Clark emaw Snyder unit hydrograph), an zingah Sairang, Turial (Tuirial site CWC ziah dan), Bairabi, Tlabung, Tuichawng, Tuichang leh Sihthangpui-a CWC site leh gauge-te leh Tuirial reservoir (tui khuah) NEEPCO record-te, 2(b) unit hydrograph chu endikna atan chauh, a catchment 14-te zinga pakhat mahin Mizoram tui a luan chhuah loh avang leh a loss rate 0.35 cm/h hi Surma group shale tan a sang lutuk ang tih avangin (NEER chhiar dan) (Bung 3); leh Clause 2.3.3(b) khaikhinna tan CWC value a awm lo, Form 2-1-ah a awm lo tiin chhinchhiah a ni. Site ruahtui zone leh sub-area chu Belhchian 2A-a mi an ni (he Kaihhruaina Bu-in a ruat, NIH-DHAARA cell-te inthlak danglam dan leh State luipui system-te aṭangin): zone **MZ-Z1 Hmar lam tlang (Northern hills)**, Barak lam hawi, sub-area **MZ-A Hmar lam tlang (Kolasib–Kawnpui–Bilkhawthlir)** leh **MZ-A1 Hmar lam phai (Bairabi–Vairengte)** nen; zone **MZ-Z2 Laili tlang chhip (Central ridges)**, sub-area **MZ-B Laili tlang chhip (Aizawl–Sairang–Serchhip–Thenzawl–Hnahthial–Mamit)** nen; zone **MZ-Z3 Chhak lam tlang sang (Eastern uplands)**, Tiau leh Tuipui leh Tuivai hnar lam pan, sub-area **MZ-C Chhak lam tlang sang (Champhai–Khawzawl–Saitual–Ngopa–Zokhawthar)** leh **MZ-C1 Champhai phai** nen; leh zone **MZ-Z4 Chhim lam tlang (Southern hills)**, Karnaphuli leh Kaladan pan, sub-area **MZ-D Chhim lam tlang (Lunglei–Lawngtlai–Siaha–Chawngte–Tuipang)** leh **MZ-D1 Tlabung phai (Tlabung)** nen. An zavai hi subzone 2(c)-ah an awm. Anni hian (c)-a zat-te, (h) endikna huam chin leh (i) screening an ruat; (e) factor leh (f) ratio-te chu an zavaiah an inang. Sub-area hming 1-a tawp pathumte hi phai an ni: an zone ruahtui tlak an

la a, mahse infiltration (lei-a tui luh) (Clause 4.11, recharge dan), tailwater (Clause 5.8.5) leh ruahpui hma lei hnawnna (Clause 2.11.4)-ah an danglam. Luipui 1% AEP tuilian sang zawng hnuaia ram dang reng reng, Tlawng kama Sairang leh Kau leh Tuichawng kama Chawngte ang chi, chu a sub-area eng pawh ni se, dinhmun inang hnuaiah phai ram a ni (he Kaihhruaina Bu-in a ruat). Belhchian 2A zone pahnih emaw sub-area pahnih emaw inkar ri kal tlang catchment chuan duration tinah a pahnih zinga value sang zawk a la (he Kaihhruaina Bu-in a ruat). Belhchian 2A khawpui list-te hi kaihhruaina atan a ni a; ri-te chuan tlang chhip lian, luipui inṭhenna leh district ri-te a zui a, finfiah tur a ni [TBC].

- (c) **Darkar 24 zat, hman rih tur, sub-area zelin.** CWC plate leh station series pakhat mahin State a huam loh avangin, AEP tina darkar 24 zat chu heti hian ruat a ni (he Kaihhruaina Bu-in a ruat vek). Heng zat-te hi darkar 24 sliding (true-interval) zat an ni a, Clause 2.6.3 fixed-interval factor chu an chungah hman a ni lo. Zat tin chu (h) hnuaiah endik leh a ni.
    - (i) **Sub-area zawng zawng: NIH-DHAARA, State pum floor nen.** AEP tina darkar 24 zat chu **site cell NIH-DHAARA value leh Mizoram floor hman rih tur zinga a sang zawk** a ni:

AEP (return period)	50% (kum 2)	20% (kum 5)	10% (kum 10)	4% (kum 25)	2% (kum 50)	1% (kum 100)
Mizoram floor hman rih tur, darkar 24 zat	85 mm	130 mm	160 mm	195 mm	225 mm	250 mm

      Floor hi Aizawl chunga NIH-DHAARA cell a ni, kum 2, 10, 50 leh 100-ah 84.8, 156.9, 220.1 leh 246.8 mm (NIH-DHAARA, 14 Nov 2026-a zawh), kum 5 leh 25 value, 128.2 leh 193.2 mm, chu Gumbel reduced variate-ah interpolate a ni a, cell value pali chu a chungah dik takin an awm (NEER chhutna), mm 5 zela sang lam pana tihkim. Khawpui ber cell hi State laili tehna a ni: floor hian reanalysis grid, a cell-te km 12 vel zau, hmun khata a hniam chuan tlang chhip inanga khawpui ber aia hniam design zat a ruat lo turin a dang a, chhak lam tlang sang (c)(iii) pawh a chawi sang. NIH-DHAARA hian Mizoram-ah engtin nge a awm hriat a ni lo. He series-a edition hnaih phai khawpuiah chuan station fit aiin 1.3 aṭanga 1.5 vel a sang a, North-East edition dang pakhatah chuan a zat a dik vel a, mahse extremes nen khaikhin chuan a hniam; hetah hian endikna awm chhun chu chanchinbu value a ni a, chungte chu Aizawl cell zat inkarah an awm: a kum 2 leh kum 10 zat, 85 mm leh 157 mm, chu 2025-a 97.4 mm leh 2018-a Aizawl-a 148 mm sir lehlamah an awm (chanchin tlangzarh angin; NEER khaikhinna). MZ-B leh MZ-D-ah cell-te chuan floor an pel hmunah thu an nei, Thenzawl, Hnahthial, Siaha, Tlabung, Lunglei leh Lawngtlai-ah ang hian, an kum 50 darkar 24 zat chu 260, 244, 305, 295, 295 leh 271 mm a ni a, Aizawl, Mamit leh Serchhip-ah floor-in thu a nei, an cell-in 211–220 mm a pek avangin, Serchhip-a kum 2 bak chu, chutah cell-a 85.4 mm chu a sang deuh zawk (NIH-DHAARA; NEER khaikhinna). Cell value chu NIH-DHAARA-in a pek angin, coordinates zawh nen, Form 2-1-ah chhinchhiah a ni (Clause 2.3.5). (a) emaw (d) emaw hnuaia station fit chuan a huam AEP-ah he dan hi a thlak a; AEP reng rengah dan aia tlem a pek chuan, a danglamna leh a chhan Form 2-1-ah chhinchhiah a ni a, MZ-A leh MZ-A1-ah chuan 2% leh 1% AEP zat chu (c)(ii) floor-te aiin a hniam tir ngai lo.
    - (ii) **Hmar lam tlang leh phai (MZ-A, MZ-A1): Barak phai value aia hniam lo bawk.** Darkar 24 zat chu heng aia tlem lo bawk tur a ni:

AEP (return period)	50% (kum 2)	20% (kum 5)	10% (kum 10)	4% (kum 25)	2% (kum 50)	1% (kum 100)
MZ-A leh MZ-A1, darkar 24 zat, heng aia tlem lo	130 mm	190 mm	230 mm	285 mm	320 mm	360 mm

      Hei hi he series-a Barak-hnar edition hnaih, Barak phai dan hnaih floor kengtu, a thlang lam tlang table a ni: **2% AEP-ah 320 mm** (kum 50), 2(b) report Plate 9-in Barail tlang chhipa 2(b)/2(c) ri-ah a chhut value hniam ber (plate NEER chhiar dan, chu dan-in a chhiar angin), leh **1% AEP-ah 351 mm** (kum 100), Silchar (Kumbhigram) IMD record, June ni 2, 1974-a 350.6 mm (IMD, *Extremes*), sang lam pana tihkim; AEP dangte chu chu edition thlang lam tlang cell-a NIH-DHAARA growth curve pianphung hmangin 320 mm

aṭanga scale a ni a, mm 5 zela sang lam pana tihkim. Hmar lam tlangte hi Barak phai inang lamah an luang a, chuvangin ruahpui pakhat chu State ri lehlam leh lehlamah inang taka chhiar a ṭha (NEER chhiar dan). Chuta NIH-DHAARA cell-te, kum 50 darkar 24-ah Kolasib-ah 303 mm, Bairabi-ah 315 mm leh Vairengte-ah 338 mm, chu Barak phai IMD record-te nen a zat an inang vel, he Kaihhruaina Bu zirchianna chuan hmar lamah km 60 velah a dah: May ni 30, 1893-a 290.3 mm leh June ni 2, 1974-a 350.6 mm (IMD, *Extremes*). Table hian Kolasib leh Bairabi-ah AEP tinah thu a nei; Vairengte cell, kum 10, 50 leh 100-ah 241.5, 337.9 leh 378.7 mm, chuan a pel a, chutah thu a nei (NIH-DHAARA; NEER khaikhinna). (d) hnuaia station fit chuan siam a nih veleh table-a 50% aṭanga 4% AEP value-te a thlak a, 2% leh 1% AEP zat chu 320 mm leh 351 mm aiin a hniam tir ngai lo. A hnuai lama phai chu State pawnah a awm a, a lui chhungte chu edition hnaih chuan a thunun.

    - (iii) **Chhak lam tlang sang leh Champhai phai (MZ-C, MZ-C1): floor-in thu a nei.** NIH-DHAARA chhak lam cell-te hi State-ah an hniam ber a, kum 50 darkar 24-ah Saitual-ah 181 mm, Champhai-ah 174 mm leh Khawzawl-ah 157 mm, tlang chhip lian chhak lama rain shadow (ruah tlem lam) nen a inmil (NEER chhiar dan), mahse gauge pakhatin a finfiah lo a, finfiahna chuan lam hrang hrang a kawk: Khawzawl-ah ni thumah 248.3 mm a sur tih a ni (chanchin tlangzarh angin; hun tarlan a ni lo [U]), a cell kum 50 darkar 72 zat 263 mm nen khaikhin chuan; Champhai-ah January–July 2025-ah 1,084 mm (chanchin tlangzarh angin); leh May ni 24, 2025 aṭanga June ni 3, 2025 thleng ruahpuiah Champhai district-ah leimin a tam ber, 598 zingah 209 (DM&R zat, chanchin tlangzarh angin), leimin zat hian ruah ang bawkin tlang pang leh kawngte a entir tho na a. Chuvangin (c)(i) floor, AEP tinah chhak lam cell zawng zawng pel, chuan MZ-C leh MZ-C1-ah gauge fit a awm hma chu design zat a ruat (he Kaihhruaina Bu-in a ruat). Chutah chuan a him zawk lam (conservative) a ni ang; Champhai leh Khawzawl automatic weather station record-te chu (a) data ngenna hmasate zingah an tel.

- (d) **Darkar 24 zat tana station fit.** Authority nena inremna siam IMD emaw State station emaw, kum 30 emaw a aia tam ni khat record nei, (a)-a ang a endik, a kumtin ni khat ruahtui tlak sang ber series, thla zawng zawng tel, aṭanga Gumbel (EV1) chhutna chu Clause 2.6.3 fixed-interval factor-in puntir chuan, station sub-area tan (c)(i) dan a thlak a, MZ-A leh MZ-A1-ah chuan (c)(ii)-a 50% aṭanga 4% AEP value-te a thlak, (a) ri chhungah leh (c)(ii) floor-te nen. He Kaihhruaina Bu tan State station reng reng series Gumbel fit hmuh a ni lo a, State gauge-te record rei zawng hriat a ni lo [TBC]. (h) hnuaia record ni paih chu series aṭangin paih a ni a, a tel fit chu a tel lo fit bulah Form 2-1-ah report a ni (he Kaihhruaina Bu-in a ruat).

- (e) **Darkar 48 leh 72 zat.** (d) station kumtin ni 2 leh ni 3 ruahtui tlak sang ber series aṭanga Gumbel chhutna, Clause 2.6.3 fixed-interval factor-te nen, AEP inang tana darkar 24 zat aia tlem lo, (h) hnuaia endik angin. Chung series-te an lak hma chu, **darkar 72 zat chu sub-area tinah (c) darkar 24 design zat 1.70-a puntir a ni**, darkar 48 zat chu logarithmic axes-ah darkar 24 leh 72 zat inkarah interpolate a ni (he Kaihhruaina Bu-in a ruat). Factor hi he Kaihhruaina Bu tana NIH-DHAARA cell 15 zawh kum 50 darkar 72 leh darkar 24 ratio-te upper envelope (a sang ber ri), 0.05 zela sang lam pana tihkim a ni a, chung ratio-te chu Aizawl leh Saitual-a 1.45 aṭanga Serchhip-a 1.70 thleng an ni (NIH-DHAARA, 14 Nov 2026-a zawh; ratio NEER chhutna), edition hnaih phai leh thlang lam tlanga factor a ni bawk: platform pianphung a ni a, a value-te a ni lo. Darkar 24 design zat chu cell zat aiin a hniam ngai loh avangin, a chhut chhuah (product) chu cell darkar 72 zat ngei aiin a hniam ngai lo: kum 50-ah Aizawl-ah 319 mm nen khaikhin chuan 382 mm vel, Vairengte-ah 556 mm nen khaikhin chuan 574 mm vel (NEER chhutna). Mizoram leimin ruahpuite hi ni tam tak a rei avangin darkar 72 zat hi tunah a ngai: Serchhip district-ah June ni 1–13, 2018-ah 677 mm a sur a (SANDRP, chanchin tlangzarh angin), May ni 24, 2025 aṭanga June ni 3, 2025 thleng leimin 598 a thleng (DM&R zat, chanchin tlangzarh angin). Tlang pang tui luanna, culvert (kawng hnuaia tui kalna)-te leh tui chiar (seepage) dan chu darkar khat ruahpui thut (burst) tan ang bawkin ni 3 ruahpui tan design a ni (Bung 3), phai rama Clause 5.10 outfall (drain tui luan chhuahna) khar endikna pawhin darkar 72 zat a mamawh.

- (f) **Darkar 1 aṭanga 24 thleng duration.** (c) emaw (d) emaw darkar 24 zat, (h) endikna hmaa mi, chu AEP tinah Table 2B.1 **Mizoram ratio hman rih tur**, sub-area zawng zawngah inang, hmanga puntir: **darkar 1-ah 0.33, darkar 2-ah 0.51, darkar 3-ah 0.59, darkar 6-ah 0.74, darkar 9-ah 0.81, darkar 12-ah 0.85, darkar 15-ah 0.89 leh darkar 18-ah 0.94**; duration pakhat tana zat reng reng chu site-a chu duration tana NIH-DHAARA zat ngei aia tlem loh tur a

ni (he Kaihhruaina Bu-in a ruat vek). He set hi edition hnaih Barak-hnar edition ratio hman rih turte nen value tin an inang a, chungte chu duration tinah, State hmar chhak ri kal tlanga IMDAA platform inang cell sawm leh pakhat kum 50 duration-leh-darkar 24 ratio-te leh CWC subzone 2(a), North Brahmaputra report ratio-te upper envelope, 0.01 zela sang lam pana tihkim an ni: darkar 1-ah 0.260, darkar 2-ah 0.370, darkar 3-ah 0.457, darkar 6-ah 0.615, darkar 9-ah 0.720, darkar 12-ah 0.805, darkar 15-ah 0.875 leh darkar 18-ah 0.930, IMD recording gauge 12 frequency analysis aṭanga average, kum 50 zat tan chhut (CWC, NB/18/1991, §3.1.2, p. 24, leh Fig. 10, darkar 2 value petu); chuvangin set hi duration reng rengah 2(a) aiin a hniam ngai lo.

Darkar 1-ah set-a 0.33 hi Mizoram cell-te zinga sang ber nen a inang a, a dang zawng zawng a pel: cell 15-te kum 50 darkar 1 leh darkar 24 ratio-te chu 0.24 aṭanga 0.33 thleng an ni a, Aizawl-ah 0.28, chhak lam leh Mamit-ah 0.31–0.33 (Saitual 0.31, Champhai leh Mamit 0.32, Khawzawl 0.33) leh Lunglei, Tlabung leh Serchhip-ah 0.24–0.25 (NIH-DHAARA, 14 Nov 2026-a zawh; ratio NEER chhutna). Khawzawl ratio tihkim loh, 0.334, chu zat reng reng cell zat ngei aia a hniam loh tur dan-in a huam. He Kaihhruaina Bu zirchianna rawtna, darkar 1 zat chu cell zat leh darkar 24 zat 0.30-a puntir zinga a lian zawk aia tlem lo, chu a tlin a, a pel bawk. Darkar 2 aṭanga 18 thleng duration-te chu Mizoram tan zawh a ni lo, chuvangin chutah set value-te chu cell hnaihte leh 2(a) chungah an innghat; cell 15 tan anni zawh hi (a) data ngenna a ni [TBC], zawh an nih veleh cell zat ngei dan chu duration tinah hman a ni ang. 2(b) set (darkar 1-ah 0.48; CWC, 2(b), Table 4.1) hi hman a ni lo: State hmun reng reng 2(b)-ah a awm lo a, 0.48 hi Mizoram cell sang ber 1.45-a puntir a ni; he series-a edition, tlang zawl (plateau) chunga thlan inang tawkte chuan chutah chhan inang avangin an hnawl a, edition hnaih chuan Barak phai-ah chauh a hmang, chu chu Mizoram chhungah a tehkhin tur a awm lo, Bairabi leh Vairengte hi tlangin a hual lui kam zawl an ni. 2(a) set hi amah chauhin hman a ni lo, a darkar 1 ratio 0.26 hi chhak lam leh Mamit cell-te (0.31–0.33) aiin a hniam avangin. Hmar lam tlang, Tuivai leh Barak hnar lamte hian thlang lam tlang hnaih ratio inang an chhiar: (c)(ii)-a 320 mm floor-ah kum 50-ah darkar 1-ah 106 mm vel an pe, chutah ang bawkin. (c) design zat-ah set hian kum 50-ah darkar 1-ah Aizawl-ah 74 mm vel (cell 62.6 mm), Kolasib-ah 106 mm (cell 87.5 mm), Vairengte-ah 112 mm (cell 88.5 mm) leh Lunglei-ah 97 mm (cell 73.1 mm) a pe (NEER chhutna). Duration tarlan inkarah ratio chu logarithmic axes-ah interpolate a ni. Ratio-te hi (c) emaw (d) emaw darkar 24 zat, (h) endikna hmaa mi chungah hman a ni.

- (g) **Ruahpui tawi.** State sub-area reng reng tan millimetre-a floor nghet ruat a ni lo (he Kaihhruaina Bu-in a ruat), State-ah innghahna tur recording-gauge sang ber a awm loh avangin, (f) ratio-te hi Mizoram cell tin darkar 1 ratio-ah emaw a chungah emaw an awm tawh a, duration tinah 2(a) set chungah an awm bawk avangin. (a) hnuaia station fit-in nakinah (f) ratio-te a thlak chuan, AEP tin tana a darkar 1 zat chu Belhchian 2B a tlangzarh hma chu AEP inang tana a darkar 24 zat 0.33-a puntir aia tlem loh tur a ni (he Kaihhruaina Bu-in a ruat). (f) zat-te hi tunlai true-interval value an ni: Clause 2.6.3 fixed-interval factor chu NIH-DHAARA value-te chungah emaw ratio chhut chhuah chungah emaw hman a ni lo, sliding an ni tawh avangin, chumi hnuah Clause 2.8 climate factor hman a ni.

- (h) **Darkar 24 record endikna, zone-in a ri.** (c) emaw (d) emaw 1% AEP (kum 100) darkar 24 zat chu **site aṭanga km 25 chhung leh Belhchian 2A zone inanga** station reng renga darkar 24 ruahtui tlak record tling sang ber aia tlem loh tur a ni, chu record a sang zawk chuan; record chu a chhut angin hman a ni a, fixed-interval factor tel lovin, 1% AEP zat angin ngaih a ni; AEP dangte zat chu site tana (c) design zat-in a 1% AEP zat nena an inzawm dan angin chawisan a ni (he Kaihhruaina Bu-in a ruat vek). Record chu tlang chhip lian kal tlangin chhiar a ni ngai lo, Tlawng leh Tuirial phai inkara Aizawl tlang chhip emaw Belhchian 2A zone-te inṭhentu tlang chhip ang chi, chuvangin phai pakhata gauge chuan a chunga tlang chhip lehlamah zat a ruat ngai lo (he Kaihhruaina Bu-in a ruat). Record chu heng a nih chauhin a tling: IMD-in a chhut (*Extremes of Temperature and Rainfall for Indian Stations*-ah, State climatological summary-ah, thla tin emaw season tin climate summary-ah, IMD table hnu zawkah emaw gauge leh ni hming tarlan IMD press release-ah emaw); a gauge-a data kum zat chu IMD table pakhatin 20 tal a nih a finfiah; 1901 emaw a hnu emaw-a siam a ni, emaw a siamtu gauge chu tuna gauge dinna ngaiah a ding a, chhiar dan inang hmanga chhiar a ni tih IMD-in a finfiah; station tan chutiang lian zawng sur a

rinawm theihna thlaah a tla; a gauge awmna hriat a ni; leh gauge inang tana IMD table dangin a kalh lo. Test reng reng hlawhchham record chu a tlakchham IMD-in a finfiah hma chu paih a ni (he Kaihhruaina Bu-in a ruat). Tunah a rah chhuahte chu:

  - **Mizoram hmun reng renga record pakhat mah a tling lo.** IMD *Extremes* hian State-a station pakhat mah a chhut lo (IMD). Record chhut hnai ber, Barak phai-a Silchar-a, May ni 30, 1893-a 290.3 mm, 1901 hmaa siam, leh June ni 2, 1974-a Silchar (Kumbhigram)-a 350.6 mm (IMD, *Extremes*) chu a hnuai lama phai-ah, huam chin dangah an awm a, he Kaihhruaina Bu zirchianna angin State hmar lam khawpuite hmar lamah km 60 velah, chuvangin Mizoram khawpui hnai ber Vairengte aṭanga km 25 aia hla; Silchar (Kumbhigram) gauge aṭanga hlat zawng chu IMD station coordinates aṭanga chhut a ni lo, chungte chu hmuh a ni lo [TBC], engpawh ni se a rah chhuah a inang ang. Record pahnih hi (c)(ii) floor-te-ah an lang tawh. (a)-a IMD leh State series-te lak a nih hma chu endikna hian endik tur a nei lo, chu chu he Kaihhruaina Bu data ngenna hmasa ber a ni.
  - **Flag chauh (Form 2-1-ah chhinchhiah; pakhat mah a tling lo, a pakhat zelin a hmuna 1% AEP design zat hnuaiah a awm). Aizawl, ni khatah 148 mm**, chu ni-a "India-a sang ber" ("the highest in India"), kum tarlan lova "June 13" ni ziah report-ah, a khaw hmingte chu June 2018 tuilian nen a inmil a, chuvangin June ni 12, 2018 a ni mai thei (chanchin tlangzarh angin; ni chu NEER chhiar dan), Aizawl kum 10 zat 160 mm hnuaiah; **Serchhip 104.6 mm, Kolasib 98.3 mm leh Aizawl 97.4 mm** May tawp emaw June ṭan lam 2025 ni khatah (chanchin tlangzarh angin; ni ruat a ni lo [U]); **Chawngte, October 2025-ah ni khatah 130 mm**, "region-a sang ber" ("the highest in the region") (chanchin tlangzarh angin); ni tam tak zat **Serchhip district-ah June ni 1–13, 2018-ah 677 mm** (SANDRP, chanchin tlangzarh angin) leh **"Aizawl district ni thumah 253.7 mm"** ("Aizawl district 253.7 mm in three days"), Khawzawl 248.3 mm leh Siaha 241.5 mm nen, May tawp 2025-ah a ni mai thei (chanchin tlangzarh angin; hun tarlan a ni lo [U]); leh Cyclone Remal chungchang IMD press release-a **May ni 28, 2024 tan Mizoram University-ah 20 mm** (thu lak chhawn angin), a chhinchhiahna hun a chiang lo a, chu ni leimin-te hrilhfiah nan a tlem lutuk (NEER chhiar dan).

  Belhchian 2A a tlangzarh hma chu, designer chuan site aṭanga km 25 chhunga record leh flag zawng zawng chu Form 2-1-ah a zone leh a test tlin leh tlin lohte nen a tarlang tur a ni. Endikna hian darkar 24 zat a chawisang a, (e) kaltlangin darkar 48 leh 72 zat a chawisang bawk. Darkar 24-ah a tawp: darkar 1 aṭanga 18 thleng tana (f) zat-te a chawisang lo, record-te hi ni khat zat an nih a, an zinga pakhat mah darkar khat record a awm loh avangin.

- (i) **Hlauhawmna hmasa site.** Mizoram-ah vur tui luang catchment (snow-fed) a awm lo. Hlauhawmna hnuaia mite hriatchiantu leh site chu an kawngah a awm leh awm loh sawitu screening, drainage report-a chhinchhiah, tel lovin design reng reng a kim lo; a awm chuan, Bung 4, 6 leh 7-a site thlan, setback (tui kam aṭanga hmun kalhlen tur), tlang pang hnathawh leh floor sang zawng dan-te chuan thu an nei, drain reng reng hi leimin emaw bal luang (debris flow) emaw tan lian zawng ruat a nih loh avangin (he Kaihhruaina Bu-in a ruat). Hlauhawmnate chu: **map-a lang leimin hlauhawm zone**, Aizawl Municipal Corporation Landslide Hazard Maps (leimin hlauhawmna map)-ah, "2014 emaw a hnu lama Landslide Policy Committee for Aizawl City-in a pawm standard anga siam" ("created in 2014 or later to the standards adopted by the Landslide Policy Committee for Aizawl City") (SD&SM, thumal awmzia), 1:5,000-ah (GeoHazards International, chanchin tlangzarh angin), MIRSAC *Atlas of Micro-level Landslide Hazard Zonation of Aizawl City and Selected Towns*-ah (CAG thu hnar ang), a 2011 map chuan Laipuitlang hmun chu "Very High" a tih (Laldinpuia et al., 2013), leh MIRSAC Serchhip khawpui zonation-ah (Lallianthanga and Lalbiakmawia, 2013); **awn zawng 60° aia sang tlang pang**, site development permit pek loh (SD&SM reg. 14), leh master plan "SL" zone, "tlang pang 36° aia chho hmun, drainage line lian bula hmun" ("areas with slope higher than 36°, areas adjacent to major drainage lines") (Master Plan for Aizawl: Vision 2030); **lung laihna (quarry), hman mek emaw hman tawh loh emaw**, South Hlimen lung laihna, August ni 9, 1992-a a chimin "mi 100 deuhthaw nunna a la" ("claimed the lives of almost 100 people") (MIRSAC, 2013, hna hmasa a tarlan angin) leh Melthum leh Hlimen inkara lung laihna, "kum sawmthum" ("for three decades") chhung hman loh tawh tih, May ni 28, 2024-a Cyclone Remal-ah chim (chanchin tlangzarh angin); **Hunthar Veng lei kun hmun**, 2017-a a lei test (CAG), leh Hunthar-a NH-6 lei laihte; **Bawngkawn–Durtlang (Leitan) kawng**, a sir lehlam leh lehlamah July 2024-ah High Court-in in sak thar a khap (chanchin tlangzarh angin); **lei laih pang, lei vur leh retaining wall hnuaia bal kawng**; **phai ram** 1% AEP tuilian sang zawng hnuaia, Tlabung, Bairabi leh Vairengte, Sairang leh Champhai phai-ah; leh **Tuirial dam (tui khuahna) hnuaia tui chhuah lui chhungte**, dam-break zirchianna chuan "lui inkawpna

bulah" ("near the confluence") peak 3,035.34 m³/s a route (chanchin tlangzarh angin), leh Serlui B dam hnuai [TBC]. Screening hian heng map-te, MSDMA leh DM&R leimin record-te [TBC] leh NEEPCO leh State power department-in ziaka tui chhuah record-te [TBC] a hmang.

- (j) **Cloudburst (ruahpui thut tlak nasa).** IMD chuan hmun tê-ah darkar khatah 100 mm emaw a aia tam tlak chu cloudburst a ti (thu lak angin; he Kaihhruaina Bu tan IMD thu hnar bul hmuh a ni lo [TBC]). State-a gauge reng reng tan cloudburst chakna teh leh darkar khat value hmuh a ni lo. 1% AEP-a (f) darkar 1 zat chuan hmar lamah threshold a thleng, Kolasib-ah 119 mm vel leh Vairengte-ah 125 mm vel, mahse Aizawl tlang chhipah a thleng lo, 83 mm vel (NEER chhutna). Tlang pang nasa catchment-ah design ruahpui-in a entir loh ruahpui thut thiltih chu a minute hmasaah shale, tlang pang bal leh bawlhhlawh a hruai chhuk hi a ni; chutiang catchment-ah chuan inlet, debris rack (bal dangna) leh culvert-te inhawng reng theihna hian drain luan tir theihna aiin thu a nei zawk a, Bung 6 leh 9-in chumi tan an lian zawng an ruat.

- (k) **Darkar 1 aia tawi duration.** He Kaihhruaina Bu zirchiannaah State-a station reng reng tan darkar khat aia tawi frequency analysis hmuh a ni lo. Belhchian 2B-in pakhat a pek hma chu, darkar 1 aia tawi duration zat leh darkar 1 design zat inzawmna (ratio) chu recording-gauge analysis tlangzarh, a thu hnar tarlan aṭangin, Authority nen inremna siam a ni a, Form 2-1-ah chhinchhiah a ni [TBC]; darkar 1 aia tawi duration tana chakna pangngai chu AEP inang tana darkar 1 design chakna aia tlem loh tur a ni (he Kaihhruaina Bu-in a ruat). (a)-a IMD automatic weather station record-te hi chumi tan zirchian hmasak tur thu hnar an ni.

- (l) **Zat indawt dan.** AEP inang tan, zat reng reng chu duration tawi zawk zat aia tlem loh tur a ni.

- (m) **NIH-DHAARA.** NIH-DHAARA chu November ni 14, 2026-ah State hmun 15-ah zawh a ni (IMDAA dataset), Aizawl, Kolasib, Bairabi, Vairengte, Mamit, Serchhip, Thenzawl, Hnahthial, Lunglei, Tlabung, Lawngtlai, Siaha, Champhai, Khawzawl leh Saitual-ah, kum 2, 10, 50 leh 100-a darkar 1 leh 24 zat leh kum 50 darkar 72 zat tan; 15 zawng zawngin data an pe. **Sub-area tina design thu hnar a ni, (c) hnuaiah, (c)(i) leh (c)(ii) floor-te nen**; a darkar 72 leh darkar 24 pianphung chu (e)-ah hman a ni a, a darkar 1 ratio-te chu (f)-ah endikna atan. A kum 50 darkar 24 zat-te chu Khawzawl-a 157 mm aṭanga Vairengte-a 338 mm thleng an ni: Barak lam hawi hmar lamah 300–340 mm vel, chhim lamah 270–305 mm, laili tlang chhipah 210–260 mm leh chhak lamah 157–181 mm. State-a gauge pakhatin a endik lo (Clause 2.3 Hrilhfiahna). A hmalam zat (projected depths) chu Clause 2.8.4 hnuaiah hman a ni lo.

- (n) **IMD Das et al. (2022).** Paper-a panel 27 zinga pakhat mah Mizoram station tan a ni lo (IMD Das et al., 2022, *MAUSAM* 73(4), 887–898; page milem-ah panel 27 zawng zawng en a ni), khawpui hnai berte tana a panel-te chuan curve tlangpui a nawn a ni. Mizoram tan a chhunga thu reng reng tarlan a ni lo, Clause 2.3.3(a) khaikhinna chu Form 2-1-ah a awm lo tiin chhinchhiah a ni.

- (o) **Design value hmasa.** State khawpui reng reng drain-te tan design ruahtui tlak, return period, runoff coefficient emaw time of concentration dan emaw hmuh a ni lo: Aizawl Municipal Corporation Building Regulations, 2012 emaw Site Development and Slope Modification Regulations, 2017 emaw-ah a awm lo, chungte chuan "hydrology leh hydraulic chhutna" ("hydrology and hydraulic calculations") chu licence nei civil engineer-te kutah an dah (SD&SM, Schedule I); Master Plan for Aizawl: Vision 2030-ah a awm lo, a drainage bung chuan dinhmun a sawi chauh; Smart City thuziak hmuhah a awm lo; ADB North Eastern Region Capital Cities Development Investment Program Aizawl tranche thuziak hmuhah a awm lo, chungte chuan tui pek (water supply) leh sewerage chauh an huam (a tawi zawnga sawi angin). Kawng tui luanna chuan IRC:SP:42-2014 a zui a, tlang kawngah IRC:SP:48. Value dang reng reng hmangtu designer chuan Form 2-1-ah a tarlang ang; Table 2.1 return period-te leh he Clause zat-te hman tur a ni.

- (p) **Clause dangte.** Clause 2.3.2, 2.6.1, 2.7.1 leh 2.13, Belhchian 2A aṭanga 2C thleng leh Form 2-1-in NIH-DHAARA value an sawi hmunah, he Clause hnuaia value hi a kawk a ni.

> Hrilhfiahna. NIH-DHAARA hi sawrkar laipui institution aṭanga ram pum huap, mipui hman theih product a ni a, State hmun reng rengah zawh theih a ni. Chuvangin approving authority-in a endik theih default, nawn theih a ni. NIH-DHAARA ni khat aia tawi value-te hi darkar tin record aṭanga siam a ni a, ni khat zat aṭanga ṭhen chhuah

(disaggregate) a ni lo. Chuvangin drain-te, duration tawi chakna-a innghat, an lian zawng ruat nan public thu hnar remchang awm chhun a ni. Darkar 24 leh a aia rei-ah IMD ni khat record rei tak nen a value-te endik a ṭha tho (Belhchian 2A). Mizoram-ah platform hi endik a la ni lo a, State thu hnar awm chhun a ni. He Kaihhruaina Bu tan State hmun 15-ah zawh a ni a, an zavaiin data an pe. Station series te, CWC report te, IDF tlangzarh te-in State hmun reng reng an huam lo, chuvangin a nena endik tur chu ni khat chanchinbu report bak a awm lo, chungte chu Aizawl cell zat inkarah an awm: a kum 2 leh kum 10 darkar 24 zat, 85 mm leh 157 mm, chu 2025-a 97.4 mm leh 2018-a 148 mm sir lehlamah an awm (chanchin tlangzarh angin). He series-a edition hnaih phai khawpuiah platform chu station fit aiin 1.3 aṭanga 1.5 vel a sang a, North-East edition dang pakhatah chuan a zat a dik vel a, mahse extremes nen khaikhin chuan a hniam; Mizoram-ah eng lam nge a diklohna a pan hriat a ni lo. Mizoram hi series-a North-East edition pangana a ni a, thil pathumin a thu hnar hman rih tur a ṭhen hrang. A hmasa berah, **record pakhatin design a innghahpui lo**: IMD *Extremes*-ah Mizoram station a awm lo, State pum hi CWC subzone 2(c)-ah a awm a, chu tan CWC-in Flood Estimation Report a tlangzarh lo, IMD Das et al. (2022)-ah Mizoram panel a awm lo, chuvangin NIH-DHAARA hi spatial source awm chhun a ni a, Clause 2.3.6 chuan sub-area tinah design thu hnar atan a hmang, floor-te nen. Edition hnaihte chuan subzone 2(c) chu an hmanrua neiin an hmachhawn: tlang pang sang (escarpment) chunga IMD curve dik tak pakhat, Barak phai-a IMD station floor nen, leh phai pakhata station fit, a tlangah NIH-DHAARA leh floor nen; hetah hi chuan fit tur station a awm lo. Heng kalphung zawng zawng hi he Kaihhruaina Bu-in a ruat a ni a, an zavaiin CWC-in 2(c) tan report a tlangzarh lo tih an tarlang. A pahnihnaah, **floor-te hian cell-te chu a hnuai lam aṭangin an veng**. Clause 2.3.6(c)(i) State pum floor hi khawpui ber cell ngei a ni a, chuvangin grid hmun khat hniamin tlang chhip inangah Aizawl aia hniam design zat a dah thei lo; chhak lam tlang sangte chuan floor an la, an cell-te State-a hniam ber, finfiahtu gauge awm lo an nih avangin, chutah ni tam tak zat report leh 2025 leimin-te chuan lam dang an kawk laiin (Clause 2.3.6(c)(iii)); hmar lam tlang, Barak phai pana luangte chuan Barak phai dan hnaih floor-te an la, chuvangin ruahpui pakhat chu State ri lehlam leh lehlamah inang takin a chhiar (Clause 2.3.6(c)(ii)). A pathumnaah, **ratio-te hi pianphung puk a ni**. Mizoram-ah darkar 1 leh 24 duration chauh zawh a ni; Clause 2.3.6(f) Mizoram ratio hman rih turte hi edition hnaih set a ni a, ri kal tlanga platform inang cell sawm leh pakhat leh 2(a) ratio-te aṭanga siam, darkar 1-ah Mizoram cell tin chungah emaw a tlukah emaw an awm a, darkar 72 factor 1.70 erawh hi State cell ngei upper envelope a ni. Mizoram-ah chhiatna thunun ber chu darkar sang ber chauh a ni lo: record-a ruahpui hlauhawm berte chu shale tlang pang leh lei nghet lo chungah ni tam tak an sur a, 2022-23-a leimin lian zirchiante zinga ṭhena thum ṭhena hnih chu "tui luanna ṭha lo" ("improper drainage") avanga lo thleng tiin an sawi (Directorate of Geology and Mining, chanchin tlangzarh angin), chu vang chuan Clause 2.3.6(i)-in site thlan leh tlang pang screening a dah hmasa a, Clause 2.3.6(e)-in darkar 72 zat a phut. Floor hman rih turte, darkar 72 factor, ratio set, millimetre floor awm lohna, zone-in a ri record endikna, zone leh sub-area-te, hlauhawmna hmasa screening leh darkar 1 aia tawi duration-te hi he Kaihhruaina Bu-in a ruat a ni. Thil ṭhenkhat chinfel a la ni lo. NIH-DHAARA chu darkar 1 leh 24-ah chauh zawh a ni a, a darkar 2 aṭanga 18 thleng zat-te hi data ngenna a ni [TBC]. Mizoram gauge reng reng series lak a ni lo a, State gauge-te ṭan kum hriat a ni lo [TBC]. Aizawl-a 148 mm ni chu NEER chhiar dan a ni a, Aizawl-a Remal ruahtui tlak hriat a ni lo [TBC]. Barak phai gauge-te aṭanga hmar lam khawpuite hlat zawng chu IMD coordinates aṭanga chhut a ni lo [TBC]. State khawpui reng reng tan ruahtui drain DPR, a design ruahtui tlak analysis nen, he Kaihhruaina Bu tan hmuh a ni lo [TBC].

2.4 Design return period (tlangpui)

2.4.1 Design AEP-te chu element tin tan bung hrang hrangah ruat a ni. Design ṭan laia ruahtui tlak dik lak chhuah a nih theih nan hetah hian a tlangpuiin tarlan a ni.

Table 2.1 — Design return period (tlangpui)

Element	Design AEP (return period)	Endikna thil thleng	Bung
Drain tenau: Aizawl leh Lunglei laili leh mi tamna hmun	10% (kum 10)	1% (kum 100) leilung chunga luanna kawng (overland path)	6

Element	Design AEP (return period)	Endikna thil thleng	Bung
Drain tenau: Class I urban area dangte	20% (kum 5)	1% leilung chunga luanna kawng	6
Drain tenau: hmun dangte	50% (kum 2)	1% leilung chunga luanna kawng	6
Kawng lian (arterial) leh kawng kal tlangna	2–4% (kum 25–50)	AEP sang zawk dawt	6
Collector / local kawng	4% / 10% (kum 25 / 10)	2% / 4% (kum 50 / 25), 1% leilung chunga luanna kawng pawh	6
Tui luanna system lian (major, leilung chung)	1% (kum 100)	—	6
Retention tui zat	Percentile ni khat ruahtui tlak (Clause 2.10)	—	4
Detention: catchment pangngai	50%, 10%, 1% (kum 2, 10, 100)	1% emergency spillway	4
Detention: tuilian hlauhawm catchment (flood-sensitive)	Mixed-frequency dan, Clause 2.11	1%	4
In floor sang zawng	1% + 0.5 m freeboard (tui sang ber chunga zau dah)	—	6
Detention emergency spillway	1%, outlet tihtawp nen	0.2% (kum 500) hlauhawmna sang hmunah	4

> Hrilhfiahna. Heng value-te hi CPHEEO (2019) ram pum huap thurawn hniam ber, kum 5 (Class I khawpui) leh kum 2 (hmun dangte) aiin an sang zawk. CPHEEO chuan State-in value sang zawk a ruat phal a ni. Value-te hi Bung 4 leh 6-ah ruat a ni a, table hi remchan nan hetah tarlan nawn a ni.

2.5 Design duration

2.5.1 **Tui luan tirna element** (pipe, drain khuh lo, inlet, culvert) chu tui luan khawmna area time of concentration (Tc, catchment hla ber aṭanga tui lo thlen hun) tluk duration chakna hmangin design tur a ni (Bung 3). Duration tawi ber chu **minute 10** a ni.

2.5.2 **Khawlna element** (detention, retention, dil (tank), pump sump) chu set {1, 2, 3, 6, 12, 24, 48, 72 h}-a duration tinah endik tur a ni. Khawl tur tui zat emaw tui sang zawng emaw lian ber chuan thu a nei. Darkar 24, 48 leh 72 ruahpuite hi site tinah **ngei ngei tur** endikna an ni, duration pawimawh ber rah chhuah eng pawh ni se.

2.5.3 **Tidal (tuifinriat thlen theih loh, Mizoram-ah a awm lo) nghawng outfall.** Tidal nghawng outfall-a luang khawlna tan (Bung 5), darkar 48 leh 72 ruahpuite chu Clause 2.12 tailwater boundary nen kalpui bawk tur a ni.

> Hrilhfiahna. Mizoram chhiatna nasa berte hi tlang pangah ni tam tak ruah a sur hunah a lo thleng ṭhin. Serchhip district-ah June ni 1–13, 2018-ah 677 mm a sur a, pangngai aiin 345% a tam, June ni 5-ah leiminah mi sawm an thi (SANDRP; chanchin tlangzarh angin); May ni 24, 2025 aṭanga June ni 3, 2025 thleng ruahpuiin leimin 598 a thlen tir a, in 171 a tichhia a, hmun 257-ah kawng a dang (DM&R zat, chanchin tlangzarh angin); Cyclone Remal chuan May ni 27, 2024 aṭangin ruahpui a hruai a, May ni 28-ah a sang ber a, chu niah Melthum leh Hlimen inkara lung laihna hman tawh loh chu a chim (chanchin tlangzarh angin). Aizawl Municipal Corporation tlang pang regulation chuan a kalphung a sawi: "tlang panga leihnuai tui lut zat tihpun leh sewerage leh drainage tui tlang pangah enkawl ṭha lova paih hian tlang pang nghet lohna a tipung nasa thei" ("increasing the amount of groundwater penetrating into slopes, and disposing of sewerage and drainage onto slopes in a poorly controlled manner can greatly increase slope instability") (SD&SM, reg. 1). Tlang chhipa drain chu ruahpui thut hnu minute

> rei lo teah a khat ṭhin, mahse a tui luan chhuahna tlang pang te, a down-drain (tlang pang zawh chhuk drain)-te te, kawng chunga a tui chiar (seepage) khawmte te chu ruah sur chhung zawng zawngin a ruat a, phai bulah chuan ni inang chhungin luipuite a sang a, outfall-te a khar. Duration pawimawh ber chauh hmanga dan, site tê-ah hman chuan, darkar 1–2 ruahpui a thlang a, he hlawhchham dan hi a hmaih. Chuvangin duration rei endikna hi ngei ngei tur a ni.

2.6 Ni khat aia tawi ruahtui tlak

2.6.1 NIH-DHAARA emaw phalna pek station IDF emaw-in duration mamawh tan value a pek nghal chuan, chung value-te chu hman tur a ni.

2.6.2 Darkar 24 aia tawi duration tan ni khat (darkar 24) zat chauh a awm chuan, ni khat aia tawi zat chu **Belhchian 2B ratio set** hmangin chhut chhuah tur a ni. Heng hi Mizoram recording gauge-te nena calibrate duration-leh-darkar 24 ratio an ni. Clause 2.3.6(f)-in sub-area tin tana a ruat Mizoram ratio hman rih turte, duration tinah subzone 2(a) CWC Flood Estimation Report ratio-te chungah emaw a tlukah emaw awm, aiin a hniam loh tur a ni a, zat reng reng chu site-a chu duration tana NIH-DHAARA zat ngei aia hniam loh tur a ni. State pum hi subzone 2(c)-ah a awm a, chu tan CWC-in report a tlangzarh lo; subzone 2(b) CWC report ratio-te hman a ni lo a, IMD Das et al. (2022) hian Mizoram station tan panel a chhut lo.

2.6.3 **Fixed-interval siam remna.** Chhinchhiahna hun nghet (entirnan 08:30–08:30 IST ni khat data emaw dar-hun data) aṭanga zat-te chu sliding-window ("true interval") zat-ah thlak tur a ni:

- chhinchhiahna inkar hun nghet pakhat tan 1.13;
- inkar hun 2 tan 1.04;
- inkar hun 3–4 tan 1.02.

Thu hnar phalna pek chuan true-interval value a pek tawh chuan he siam remna hi hman a ni lo.

2.6.4 Empirical inzawmna P(t) = P(24)·(t/24)^(1/3) hi zone chungchang tan Belhchian 2B-in a finfiah loh chuan design atan hman loh tur a ni.

> **Hrilhfiahna.** One-third power rule hi India project report-ah a tam a, mahse he Kaihhruaina Bu zirchianna laiin a tan IMD thu hnar bul hmuh a ni lo. Hmun tinah curve pianphung nghet pakhat a hmang: P(1h)/P(24h) = 0.35, P(3h) = 0.50, P(6h) = 0.63 leh P(12h) = 0.79. Convective ruahpui thut tawi leh fûr ruah sur rei (monsoon soak) danglamna a entir thei lo a, tuifinriat kam convective ruahpuiah duration tawi zat a tihhniam duh. Belhchian 2B chuan NIH-DHAARA ratio P(t)/P(24h)-te chu heng value-te nen zone zelin table-ah a dah tur a ni. Chu khaikhinna chuan State hmun reng rengah dan hi hman theih a nih leh nih loh a lantir a, ni khat innghat analysis hlui zawkte a siam ṭha. Fixed-interval factor-te hi WMO (Hershfield) value pangngai an ni. IMD 2022 zirchianna chuan dar-hun aṭanga hun reng reng siam remna inang chi a hmang.

2.7 Hmun khat, grid leh area ruahtui tlak

2.7.1 Design zat-te hi hmun khat (point) value an ni. Thu hnar phalna pek chuan grid average value (entirnan 0.25° cell) a pek chuan, hman hmain Belhchian 2C grid-to-point factor-te hmangin hmun khat value-ah thlak tur a ni.

2.7.2 Catchment **≤ 10 km²** tan, ARF = 1.0.

2.7.3 Catchment **> 10 km²** tan, ARF chu heti hian hman tur a ni:

- subzone 2(c) (Barak and others)-a km² 25–5,000 tan, CWC-in a tlangzarh loh 2(c) report aiah subzone 2(b) (South Brahmaputra) report hmangin: CWC Flood Estimation Report huamtu ARF curve-te hman tur a ni;
- km² 10–25 tan: 10 km²-a ARF = 1.0 leh 25 km²-a CWC value inkarah linear takin interpolate tur a ni.

2.7.4 Development site pakhat khawlna design-ah ARF hman ngai loh tur a ni.

> **Hrilhfiahna.** Grid leh district average return level-te hi hmun khat value aiin an hniam fe. Entirnan, Aizawl chunga km 12 vel NIH-DHAARA cell chuan kum 50 darkar 24 zat tan 220 mm a pe a, chhak lam tlang sanga Khawzawl chunga a cell chuan 157 mm, hmar lama Vairengte chunga a cell chuan 338 mm (NIH-DHAARA, 14 Nov 2026-a zawh), pahnih leh pakhat aia tam inthlauhna, State-a gauge pakhatin a finfiah lo emaw a siam ṭha lo emaw. Cell value chu hmun khat value nen engzat nge a inthlauh emaw eng lam pan nge emaw lantirtu station series Mizoram-ah a awm lo; he series-a edition hnaih phai khawpuiah platform chu station fit aiin 1.3 aṭanga 1.5 vel a sang. Belhchian 2C factor-te tel lovin diklohna pahnih hi siam ṭhat theih a ni lo. Grid value-te chu siam ṭhat lova hmun khat value anga hman chuan site design a tihimlo ang.

2.8 Climate factor

2.8.1 State pum huap hmalam climate ruahtui tlak product pawm a nih hma chu, tunlai design zat-te chu heng climate factor hman rih turte hian puntir tur a ni:

Table 2.2 — Climate factor hman rih turte

Duration	Climate factor (CF)
≤ 6 h	1.20
> 6 h aṭanga 72 h thleng	1.10

2.8.2 CF hi kum 25 aia rei design life nei element zawng zawngah hman a ni. Hnathawh rei lo (design life ≤ kum 5) tan, CF = 1.0.

2.8.3 Climate factor hi retention zat (Clause 2.10) emaw water quality volume zat (Bung 8) emaw-ah hman a ni lo. Chung zat-te chu ni tin ruahtui tlak percentile emaw thil thleng fo statistics an ni a, AEP design value an ni lo.

2.8.4 NIH-DHAARA emaw Clause 2.14 hnuaia endikna-a pawm product emaw-in hmalam climate zat (projected) a pek chuan, chung zat-te chuan factor hman rih turte chu a thlak tur a ni.

> **Hrilhfiahna.** CPHEEO (2019) chuan ram pum huapin climate factor nghet hi "tih theih a ni lo" ("not feasible") a ti a, a aiah trend testing a rawt. Chu chuan designer-te chu hman theih number nei lovin a dah. Duration tawi factor 1.20 hi CPHEEO ngeiin a tarlan UK value nen a inmil. Mizoram-ah design puntirna factor pawm a ni lo. State Action Plan on Climate Change ngei pawh he Kaihhruaina Bu tan chhiar a ni lo [TBC]: Union ministry site-a a tan address pek chuan a aiah National Adaptation Fund for Climate Change tana sustainable agriculture chungchang State project report 2016-a mi a pe zawk. Chu report chuan, "State remote sensing center report" a tarlanna-ah, "district ṭhenkhatah ruahtui tlak 25% vel pun beisei a ni" ("some districts expected to experience nearly 25% increase in rainfall") leh "kumtin ruahpui nasa thil thleng zat a pung nasa ang tih beisei a ni (26% vel)" ("the number of yearly extreme rainfall events is expected to go up significantly [about 26%]") a ti a, Serchhip leh Kolasib hi ruahtui tlak pun avanga hlauhawm ber tura ngaih an ni (Ravindranath et al., 2010, thu hnar ang) (Mizoram Agriculture Department, 2016). Heng hi zat pumpui leh thil thleng zat hmalam ngaihtuahna an ni a, thu hnar pahnihna aṭanga lak, chakna factor an ni lo, value atan hman an ni lo. 1986–2005 tan report inang chuan

"July thlaah pun nasa tak, ni khat sang ber nen" ("a remarkable increase during the month of July, with one-day maximum peaks") a hmu a, value-te a chhut lo. CSTEP North-East district zirchianna chuan Mizoram a huam a, mahse a zat-te lak chhuah a ni lo [TBC]. State-a ruahpui nasa trend statistic hmuh a ni lo. He series-a edition dangte ang bawkin, darkar 6 thleng duration tan factor 1.20 leh duration rei zawk tan 1.10 hi Clause 2.3.6(h) record endikna hnuah hman a ni. NIH-DHAARA hmalam zat-te hman a ni lo (Clause 2.3.6(m)). Chuvangin Table 2.2 factor-te hi value hman rih tur an ni a, Mizoram chhutna an ni lo.

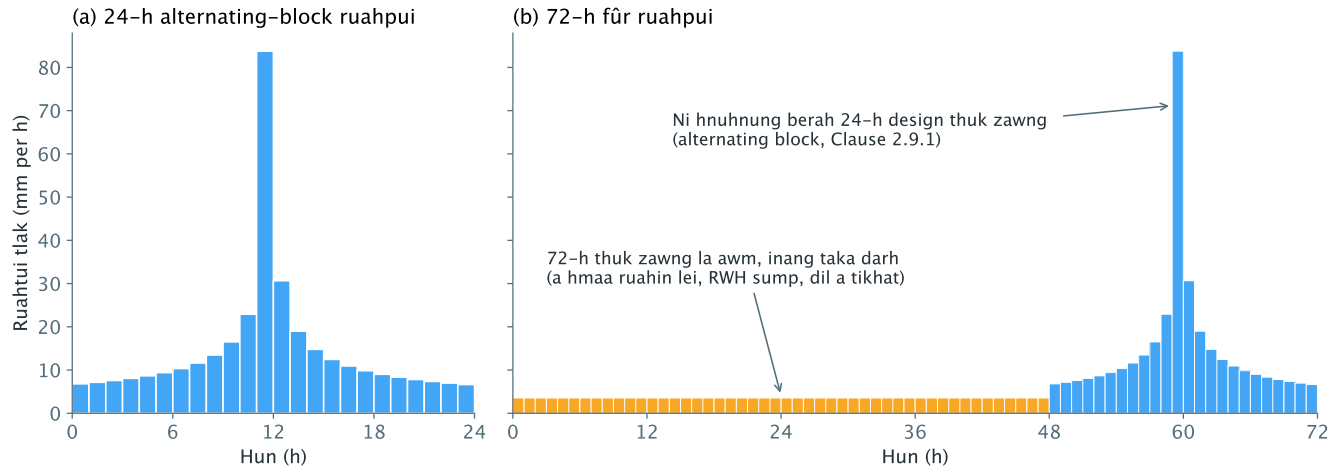
2.9 Temporal pattern (design hyetograph)

2.9.1 **Darkar 24 thleng ruahpui.** Nested **alternating-block** kalphung hman tur a ni:

- ruahpui chu IDF inzawmna inang (climate factor hnua mi) aṭangin siam tur a ni, Tc/3 aia rei lo leh minute 15 aia rei lo hun step-ah;
- block sang ber chu ruahpui duration **50%**-ah dah tur a ni.

2.9.2 **Darkar 48 leh 72 ruahpui (fûr pattern).** Heti hian siam tur a ni:

- (a) Ruahpui zat pumpui chu duration pum (48 emaw 72 h) tana design zat a tluk.
- (b) **Darkar 24 hnuhnung ber** chuan AEP inang tana darkar 24 design zat a keng a, 2.9.1 alternating-block kalphung hmangin sem a ni.
- (c) A bang (zat pumpui, darkar 24 zat paih) chu a hma lama darkar 24 emaw 48 emaw chhungah inang takin sem a ni.



Milem 2.2 — (a) Darkar 24 alternating-block design ruahpui; (b) darkar 72 fûr design ruahpui, ni hnuhnung berah darkar 24 design zat nen. Entirna zat chauh. He Kaihhruaina Bu tana milem siam thar. Alternating-block kalphung hi Chow, Maidment & Mays, Applied Hydrology (1988), §14.4 a zui.

2.9.3 **Temporal pattern dangte.** Mizoram ruahpui aṭanga siam Huff-type emaw mass-curve pattern emaw chu Belhchian 2D-ah tlangzarh an nih hnu chauhin 2.9.1 leh 2.9.2 aiah hman phal a ni. SCS Type I, IA, II leh III distribution-te hman loh tur a ni.

2.9.4 **Catchment lian.** km² 25–5,000 catchment tan, CWC Flood Estimation Report time-distribution curve-te hman phal a ni a, 2.9.1 hmanga sensitivity run report tur a ni.

> **Hrilhfiahna.** Alternating-block ruahpui hian duration tawi zawk design chakna zawng zawng hyetograph pakhatah a dah lut. Chuvangin a him zawk lam (conservative) a ni a, duration hrang hrangah a inmil. Darkar 72 pattern hian ni nasa ber chu a hnuhnung berah a dah. Hei hian Mizoram ruahpuite indawt dan a entir: May emaw June-a ni tam tak ruah sur chhunga sur nasa berte an lo thlen hunah, 2024 leh 2025-a Aizawl nghawng May tawp ruahpuite ang hian, tlang pangte a hnawng tawh a, tuikhur leh tui chiar (seepage) hmunte a luang tawh a, phai luipuite a sang mek. SCS distribution-te chu US convective leh Gulf ruahpui data aṭanga lak an nih a, Mizoram record-ah innghahna an neih loh avangin hman loh a ni.

2.10 Retention ruahtui tlak zat

2.10.1 **Retention design zat** chu record rei takah ruah sur ni (≥ 2.5 mm) **90%**-ah pel loh darkar 24 ruahtui tlak zat a ni a, Belhchian 2E zone value aṭanga chhiar a ni.

2.10.2 Site chuan he zat aṭanga ruahtui luang (runoff) chu site-ah a khawl ngei ngei tur a ni (Bung 4). Retention hian retention dah chunga routing hmanga hmuh detention khawl tur tui zat tihtlemna tluk detention credit a hmu (Clause 4.4.6). Credit hi tui khawl zat pakhat-leh-pakhata paih chhuah a ni lo.

> **Hrilhfiahna.** Hei hian Kansas City Metro APWA 5600 (2025.01) Required Retention Volume ngaihdan leh Georgia 1.0-inch runoff reduction standard a zui. A pahnih hian percentile ruahpui an innghahpui. Percentile zat hi ni tin ruahtui tlak statistic a ni a, AEP value a ni lo, chuvangin frequency curve aṭanga chhut lovin ni tin record aṭangin chhut a ni.

2.11 Hmasawnna hma leh hnu khaikhinna tana design ruahpui

2.11.1 **Scenario pahnih tan ruahpui inang.** Hmasawnna hma leh hnu run-te chuan design ruahpui inang an hmang tur a ni:

- AEP, duration, temporal pattern leh climate factor inang;
- ruahpui hma lei hnawnna dinhmun (antecedent moisture condition) inang (Clause 2.11.4).

Run pahnih hi leilung chung parameter leh Tc-ah chauh an danglam.

2.11.2 **Catchment pangngai.** 50%, 10% leh 1% AEP ruahpui tin leh Clause 2.5.2-a duration tin tan:

> $Q_{post}(T) \le 0.9 \times Q_{pre}(T)$

2.11.3 **Tuilian hlauhawm catchment (flood-sensitive)** (Bung 4-a tarlan angin: Aizawl Chite lui leh Ser lui catchment-te, Hlimen–Melthum lung laihna belt, Hunthar Veng leh NH-6 corridor leh Aizawl-a Durtlang leh Bawngkawn–Durtlang kawng catchment-te, Sairang, Bairabi leh Vairengte, Tlabung, Lunglei, Serchhip leh Champhai khawpui leh Champhai phai, Siaha leh Lawngtlai catchment-te, leh Tuirial dam hnuaia tui chhuah lui chhung catchment, leh authority-in a notify (Gazette-a tarlan) catchment reng reng). **Mixed-frequency dan** hman a ni:

> $Q_{post}(1\%\ AEP, km\ 100) \le Q_{pre}(10\%\ AEP, km\ 10)$, leh $Q_{post}(50\%\ AEP, km\ 2) \le Q_{pre}(50\%\ AEP, km\ 2)$,

Hmasawnna hnu tui luang zat sang ber chu Clause 2.5.2-a duration tin tan endik a ni. Cap-te chu **hmasawnna hma duration pawimawh ber**-ah lak a ni. Kum 10 cap chu duration zawng zawnga hmasawnna hma kum 10 tui luang zat sang ber lian ber a ni a, kum 2 cap chu duration zawng zawnga hmasawnna hma kum 2 tui luang zat sang ber lian ber a ni. Cap tin hi hmasawnna hnu duration tinah hman a ni.

2.11.4 **Ruahpui hma lei hnawnna.** Belhchian 2A sub-area reng renga (MZ-A, MZ-A1, MZ-B, MZ-C, MZ-C1, MZ-D emaw MZ-D1) site-ah May ni 1 aṭanga October ni 31 thleng design ruahpui tin tan, a duration eng pawh ni se, **AMC III** (ruahpui hma lei hnawnna dinhmun, hnawng) hman tur a ni. Luipui emaw lui emaw 1% AEP tuilian sang zawng hnuaia phai ramah, sub-area MZ-A1, MZ-C1 emaw MZ-D1-ah emaw hmun dangah emaw, Tlawng kama Sairang leh Kau kama Chawngte ang chi, leh dil kamah April ni 1 aṭanga October ni 31 thleng design ruahpui tin tan AMC III hman tur a ni. Tuirial reservoir emaw Serlui B reservoir emaw a backwater emaw, emaw dam pahnih zinga pakhat hnuaia dam-in tui a chhuahna lui chhung pana luang catchment-ah kum chhung hun reng rengah design ruahpui tin tan AMC III hman tur a ni. Site emaw hun emaw dangah chuan, ni 5 ruahtui tlak zat 53 mm aia tam hnung zui emaw a keng emaw design ruahpui tan AMC III hman tur a ni. Ruahpui dang zawng zawng tan AMC II (dinhmun pangngai) hman tur a ni. AMC I hi design atan hman a ni lo.

2.11.5 **Hmasawnna hma dinhmun.** Hmasawnna hma hi Bung 3-ah hrilhfiah a ni: greenfield, map-a lang hydrologic soil group tan dinhmun ṭha taka ram ruak. Tuna tui luh theih lohna hmun (impervious) chu hmasawnna hma atan chhiar a ni lo.

> Hrilhfiahna. Site tin hmasawnna hnu tui luang zat sang ber chu a hmasawnna hma tui luang zat sang ber ngei nena tihinmil hian catchment a humhalh lo. Denver zirchianna chuan site tinah 100% tihinmil pawhin luanna hnuailamah hmanlai tui luang zat sang ber 106% a la siam tih a hmu a, chu chuan 90% dan a thlen tir. Mixed-frequency dan hi a khauh zawk. Kum 100 hmasawnna hnu luan chhuah tir zat chu site hmasawnna hmain kum 10 ruahpuiah a siam zat-ah a khaikhawm (cap). Malaysia (DID 2008: ARI zawng zawng ≤ hmasawnna hma kum 2) hi chutiang cap tana tropical entirna a ni. Ruahpui rei tan AMC III hian fûr nasa berte hi kar tam tak ruah sur hnuah an lo thleng tih a entir. Mizoram-ah fûr hun, lei leh tui dawngtute hian catchment hnawn zawng an ruat ṭhin. Tlang chhipte hi Surma group shale, siltstone leh sandstone an ni a, "tui luh theihna leh infiltration hniam lutuk" ("very low permeability and infiltration") nei, "ruahtui luang chhuahna zone" ("run off zone") (CGWB, Lunglei), "a la naupang a, a bawrh" ("young and in a loose state") lei hnuaiah (Master Plan for Aizawl: Vision 2030). Ruahpui pawimawhte chu ni tam tak an rei: kum pangngaiah ni thumah 240–250 mm zat report a ni (Aizawl district 253.7 mm, Khawzawl 248.3 mm leh Siaha 241.5 mm, chanchin tlangzarh angin), Serchhip district-ah June ni 1–13, 2018-ah 677 mm a sur (SANDRP, chanchin tlangzarh angin); thil thleng hlauhawm ber ni tarlan nei zawng zawng hi May thlaah an tla. Phai leh lui kam zawlah chuan hmun ṭhenkhatah tui chu "lei chung aṭanga 2.0 m hnuai chhungah" ("within 2.0 m below ground level") a ding a (CGWB, Lunglei), Tuirial leh Serlui B reservoir-te chuan kum tluanin tui an khawl a, an lui chhungah an chhuah. Chuvangin he Kaihhruaina Bu hian sub-area tinah May ni 1 aṭanga October ni 31 thleng design ruahpui tin tan AMC III a hmang, he series-a Barak phai leh thlang lam tlang dan hnaih hun; 1% AEP tuilian sang zawng hnuaia phai ram leh dil kamah April ni 1 aṭanga October ni 31 thleng; outfall chu Tuirial emaw Serlui B reservoir emaw, a backwater emaw dam pahnih zinga pakhat hnuaia tui chhuah lui chhung emaw a nih hmunah kum chhung hun reng rengah; a nih loh chuan ni 5 zat 53 mm aia tam hnuah, AMC III tana NRCS growing-season threshold; a nih loh chuan AMC II (Clause 2.11.4). AMC I hman a ni lo, fûr hun chhungin State hmun reng reng a hman chhan tur tawk khawpin a ro loh avangin. Heng hi he Kaihhruaina Bu-in a ruat thlan hman rih tur an ni; State-ah zirchianna reng rengin AMC class-te chu ruahtui luang hmuh nen a la finfiah lo.
>
> **Mixed-frequency dan lian zawng entirna.** A hnuaia value-te hi design value an ni lo. Lunglei khawpuia tlang pang colony-a site 2 ha, tlang lui (lui) pana luang, darkar 24 zat 200 mm (kum 10) leh 350 mm (kum 100), SCS-CN ruahtui luang Ia = 0.2S nen, leh hmasawnna hma CN 70 leh hmasawnna hnu CN 92 tiin a ngai:

Table 2.3 — Mixed-frequency dan lian zawng entirna (design value a ni lo)

Thil	Ruahtui luang zat (depth)	Ruahtui luang tui zat (2 ha)
Hmasawnna hma, kum 10, darkar 24	111 mm	2,210 m³
Hmasawnna hnu, kum 100, darkar 24	325 mm	6,500 m³

Hmasawnna hnu kum 100 ruahpui hian hmasawnna hma kum 10 ruahpui ruahtui luang tui zat let thum vel a siam. Hmasawnna hma kum 10 level-a peak-rate cap chuan danglamna tam zawk chu khawl a, zawi zawia chhuah ngei ngei tur a ni tihna a ni a, chuvangin site m² khatah m³ 0.2 vel khawlna a ngai thei. Chu vang chuan dan hi tuilian hlauhawm catchment-ah chauh hman a ni (Clause 2.11.3); hmun dangah Clause 2.11.2 0.9 × Q_pre dan hman a ni.

2.12 Tailwater nena inrual thlen

2.12.1 Tidal emaw luipui backwater emaw nghawng hnuaia outfall-te tan, he Bung design ruahtui tlak chu Bung 5 tailwater dinhmun-te nen heti hian kawp tur a ni. A nasa zawk chuan thu a nei.

- (a) Design ruahtui tlak (AEP a ngaih ang) mean high water springs (MHWS) tailwater leh sea-level allowance nen.
- (b) 10% AEP (kum 10) darkar 48 ruahpui, 1% AEP still-water level (tide leh surge) leh sea-level allowance nen.

Mizoram-ah tuifinriat kam a awm lo, chuvangin State-ah outfall reng reng tidal a ni lo a, case (a) leh (b) a lo awm lo. State outfall tam zawk chu lui (lui) chhuk takah an tla chhuak mai a, chungte tan chuan luipui tailwater a awm lo: design case chu energy dissipation (tui chakna tihnemna) nei free outfall leh tui dawngtu lui chu lui inkawpna dawt thleng endik a ni (Clause 5.8.5(a)). Tailwater chu phai leh lui kam zawl bulah chauh luipui a ni, Tlawng kama Sairang, Bairabi leh Vairengte-ah, Champhai phai-ah, Kau leh Tuichawng kama Chawngte-ah leh Khawthlangtuipui kama Tlabung-ah, Tuirial leh Serlui-ah chauh reservoir a ni. Luipui emaw reservoir emaw backwater hnuaia outfall tan, site ruahpui chu Clause 5.8.4 hnuaiah tui dawngtu level nen kawp a ni, chu chuan lehlamah design thil thleng chu lehlamah kum 10 thil thleng nen case (b) ang bawkin a kawp a, luipui leh reservoir level-te chu Clause 5.8.2-a mi an ni; flap gate-in a khar outfall tan, Clause 5.10 outfall khar endikna pawh hman a ni. CWC hian State-ah flood-forecasting site a nei lo a, site reng reng tan warning emaw danger level emaw a chhut lo. Level-monitoring site pasarih a nei a, panga chu hman lo an ni: Tlawng ("Dhaleswari") kama Sairang, hydrograph hman mek nei leh level sang ber nei lo; Tuirial kama Turial, June ni 17, 1995-a level sang ber 149.0 m nei, chhut chhun; leh Bailley Bridge Tuipui, Kaladan ("Kolodyne") kama Sihthangpui, Tlawng kama Keitum, Tuichang leh Tuichawng, pakhat mah nei lo (CWC data, SANDRP-in a ziah chhawn angin, 2018); kum inang list dang chuan site pariat a tarlang a, Pangkhuah a belh (chanchin tlangzarh angin). NEEPCO Tuirial dam hian full reservoir level 90.5 m, minimum drawdown level 68.0 m leh full load-a normal tailwater level 30.7 m a nei (CERC, Petition 125/MP/2021); Turial gauge 149.0 m chu heng level-te nen engtin nge an inzawm tarlan a ni lo a, hetah ngaihtuah chhuah a ni lo [TBC]. Tuirial dam dam-break zirchianna chuan "lui inkawpna bulah" ("near the confluence") peak 3,035.34 m³/s a route (chanchin tlangzarh angin). Serlui B dam full leh maximum water level-te hmuh a ni lo [TBC]. Karnaphuli, Kaladan leh Tiau chu State aṭangin Bangladesh leh Myanmar-ah an kal chhuak a, State-a designer-te tan a hnuai lama level reng reng a awm lo. Phai luipuite hi tlang pang tihhnawngtu ni tam ruahpui inang nen an sang a, chuvangin phai bulah chuan luipui a sang tawh laiin hmun ruahpui a sur thei: Tlabung-ah Khawthlangtuipui chuan June 2017-ah report pakhat angin sub-division-ah in 350 vel, emaw district officer-te angin 9 a kim zawngin leh 60 aia tam a then zawngin, a tuilian a, July 2019-ah in 400 vel, khawpuiah 150, a tuilian (chanchin tlangzarh angin; an inkalh). He Kaihhruaina Bu zirchiannaah hmuh thuziak reng rengin State khawpui reng reng outfall-te tan design tui dawngtu level a ruat lo [TBC], Bung 5-in dan hman rih tur a ruat. Level tin chu gauge leh datum hming tarlan chungah tarlan a ni, Bung 5-in a phut angin; thu hnar hmuh reng rengin hetah CWC level tarlan datum a sawi lo, tuifinriat level pangngai chunga metre a ni ang [TBC].

> **Hrilhfiahna.** Mizoram-ah tuifinriat kam a awm lo, chuvangin outfall reng reng tidal a ni lo a, storm surge a awm lo; inrual thlen load chu phai emaw lui kam zawl emaw bula luipui level emaw Tuirial reservoir level emaw a ni. Chutah inrual thlen hi record-ah a awm: June 2018-ah, Serchhip district-ah ni 13-ah 677 mm thlentu ruahpui laiin, Tlawng kama Sairang-ah chhungkuate an dang a, Tiperabagh, Serhuan leh Tlabung-ah in-te tuiin a lian (chanchin

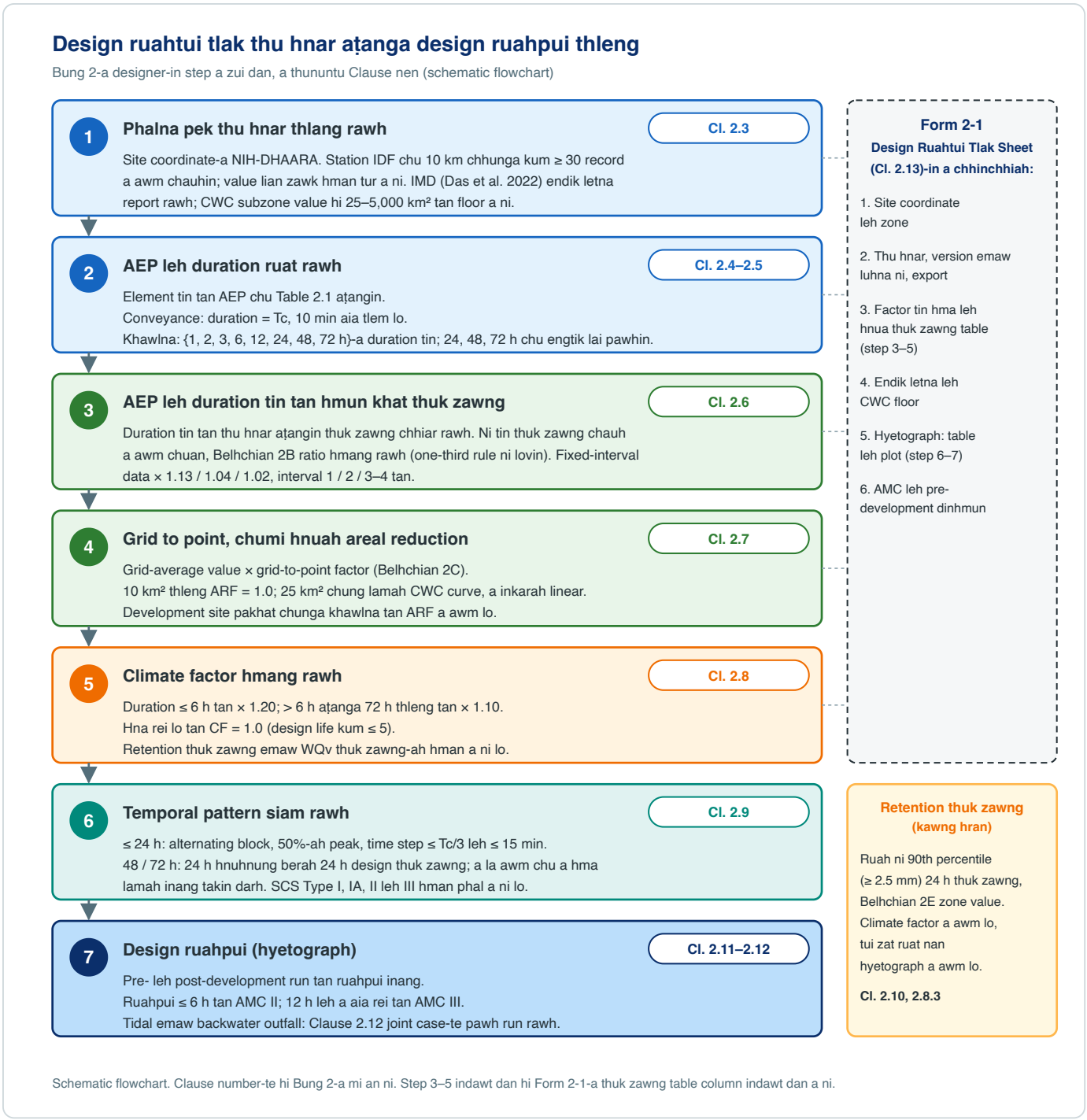
> tlangzarh angin); Tlabung-ah Khawthlangtuipui chuan July 2019-ah in 400 vel, khawpuiah 150, a tuilian a, August 2023-ah chhungkua 40 sawn chhuah an ni (chanchin tlangzarh angin). Tlang chhipah chuan inrual level a awm lo, lui-te chu an tla chhuak mai avangin; chutah inrual load chu ruahpui inangin a hruai chhuk bal a ni. State-a luipui level reng reng hian datum tarlan a nei lo: CWC site tana level sang ber chhut chhun chu Tuirial kama Turial-a 149.0 m a ni a (June ni 17, 1995; CWC data, SANDRP-in a ziah chhawn angin), reservoir full level 90.5 m (CERC) nena a inzawmna tarlan a ni lo [TBC], chu vang chuan Bung 5-in level tin chu a thu hnar leh datum hming tarlang turin a phut. Ruahtui tlak leh surge hian boruak chhan inang an neih avangin (Mizoram-ah, tuifinriat kam awm lo, surge aia ding chu phai leh lui kam zawl drain-te tui dawngtu phai luipuite leh Tuirial reservoir level a ni a, khawpuiah ruahpui nasa ber hruaitu ni tam ruahpui inangin a chawisang: June 2018-ah, Serchhip district-ah June ni 1–13-ah 677 mm a sur laiin, Tlawng kama Sairang-ah chhungkuate an dang a, Tlabung-ah in-te tuiin a lian a, July 2019-ah Tlabung-ah in 400 vel tuiin a lian (chanchin tlangzarh angin vek)), inzawm lo angin ngaih theih an ni lo. Case (b) hi statistical joint analysis hman a nih hma chu joint-probability aia ding awlsam a ni.

2.13 Thehluh tur

Hydrology thehluh tur tin chuan **Design Ruahtui Tlak Sheet** (Form 2-1) a tel tur a ni, heng tarlanna:

1. site coordinates leh zone;
2. thu hnar (Clause 2.3), version emaw lak ni, leh value lak chhuah screenshot emaw export emaw;
3. AEP leh duration hman tin tana zat table, fixed-interval factor, grid-to-point factor, ARF leh climate factor hma leh hnu;
4. Clause 2.3.3 khaikhinna value-te leh floor endikna;
5. design ruahpui tin tana hyetograph hmante, table leh plot-in; leh
6. AMC leh hmasawnna hma hrilhfiahna hman.

Milem 2.3-in he Bung step-te chu sheet-in a chhinchhiah indawt dan angin a lantir.



Milem 2.3 — Design ruahtui tlak thu hnar ạtanga design ruahpui thleng: designer-in step a zui dan (thu hnar, AEP leh duration, hmun khat zat, grid-to-point leh areal reduction, climate factor, temporal pattern, design ruahpui), step tin thununtu Clause, Form 2-1-in a chhinchhiah, leh retention zat tana kawng hrang. Schematic. He Kaihhruaina Bu tana milem siam thar.

2.14 Endikna leh siam thar

2.14.1 Approving authority chuan he Bung hi **kum 10 zelin** a endik tur a ni. State-a phalna pek gauge pahnih emaw a aia tam emaw-ah ruahtui tlak chhinchhiah chuan 1% AEP darkar 24 emaw darkar 72 design zat a pel thil thleng reng reng hnu kum 2 chhungah pawh a endik bawk tur a ni.

2.14.2 NIH-DHAARA siam ṭhatna-te chu tlangzarh hnu thla 6-ah thehluh thar tan hman ṭan a ni ang, authority-in dang a notify loh chuan.

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Belhchian

Belhchian	A chhunga thu
2A	NIH-DHAARA leh IMD station leh IMD grid endikna, benchmark hmunah; zone map
2B	Zone zela ni khat aia tawi ratio P(t)/P(24h): NIH-DHAARA (darkar tin innghat) leh one-third rule
2C	Grid-to-point factor-te
2D	Mizoram temporal pattern (Huff curve)
2E	Zone zela retention percentile zat
Form 2-1	Design Ruahtui Tlak Sheet

BUNG 3

Hydrology Kalphungte

3.1 Tum leh huam chin

3.1.1 He Bung hian Bung 2-a design ruahtui tlak chu ruahtui luang (runoff) tui luang zat sang ber (peak flow), tui zat (volume) leh hydrograph (hun hrang hranga tui luang zat) a chantir dan a tarlang a, a hmanna chu:

- (a) drain (tui luanna), inlet (luan lutna) leh culvert (kawng hnuaia tui kalna) size ruatna (Bung 6);
- (b) retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) leh detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) size ruatna, leh pre-development (hmasawnna hma lam) leh post-development (hmasawnna hnu lam) khaikhinna (Bung 4);
- (c) luanna hnuailam (downstream) leh tailwater (outfall hnuailama tui sang zawng) zirchianna (Bung 5); leh
- (d) tui awmna (waterbody), dil (tank) leh regional facility zirchianna (Bung 7).

3.1.2 He Bung hian heng hi a tarlang chiang:

- (a) eng tum leh catchment (ruahtui luan khawmna hmun) lenzawng tan nge eng kalphung hman phal a nih (Clause 3.4);
- (b) pre- leh post-development lei chung (land surface) hrilhfiah dan (Clause 3.3);
- (c) kalphung tin parameter-te: runoff coefficient, time of concentration (catchment hla ber aṭanga tui lo thlen hun), lei (soil), curve number, unit hydrograph leh routing (Clause 3.5–3.12);
- (d) continuous simulation (kum tam tak ruahtui hmanga model) leh model calibration a ngaih hun (Clause 3.13 leh 3.15);
- (e) pre- leh post-development khaikhinna step tin (Clause 3.14); leh
- (f) software lo pawmna leh thuziak buatsaih (documentation) (Clause 3.16 leh 3.17).

3.1.3 Ruahtui tlak input-te (ruahtui tlak zat, a rei zawng (duration), areal reduction, climate factor, ruahtui tlak dan (temporal pattern) leh ruahpui hma lei hnawnna) hi Bung 2-in a thunun a, he Bung-ah thlak danglam loh tur a ni.

> **Hrilhfiahna.** CPHEEO (2019) Manual on Storm Water Drainage Systems hian Rational Method kalphung kimchang a pe a, hydrograph hna atan SWMM a sawi a, mahse drain size ruatna kaihhruaina a ni. Regulator-in "pre-development" (pre-development) eng tin nge a hrilhfiah ang a ṭha tih leh hmasawnna hna chu chumi nena tehkhin nan eng kalphung nge hman ngei ngei tur tih a sawi lo (CPHEEO Part A §4.4, §8.5.1). APWA Section 5600 hian a pahnih hi a ti: Rational Method hman theihna chin a bituk a, baseline hydrograph kalphungte a sawi a, dinhmun awm mek leh dinhmun rawt tan ram hman dan (land-use) ngaihtuahna a ruat (KC Metro APWA 5600, 2011, §5602.2–5602.3; Version 2025.01, §5603.4). He Bung hian chu entawn chu a zui.

3.2 Thumal awmzia

Thumal	He Kaihhruaina Bu-a a awmzia
Pre-development dinhmun	Clause 3.3.2-a hrilhfiah lei chung khaikhinna (reference), post-development ruahtui luang tehkhinna. Dinhmun awm mek (existing condition) a ni lo.
Post-development dinhmun	Hna rawt zawh hnua lei chung dinhmun, Clause 3.3.3-a hrilhfiah ang.
Khaikhinna hmun (point of comparison, POC)	Site aṭanga ruahtui luang a chhuahna hmun, pre- leh post-development tui luang khaikhinna (Clause 3.14).
Time of concentration (Tc)	Catchment-a hydraulic lama hla ber aṭanga ngaihtuah hmun (point of interest) thleng ruahtui luang a luan hun.
Lag (tL)	Rainfall excess (ruahtui luang chang ruahtui tlak) centroid aṭanga ruahtui luang hydrograph peak thleng hun.
Hydrologic soil group (HSG)	Lei a hnawn laia tui a luh tir theih zat hniam ber (minimum infiltration rate) azira NRCS-in lei a ṭhen hranna (A, B, C, D) (USDA NRCS, NEH Part 630, Ch. 7).
Curve number (CN)	NRCS parameter, lei group, lei khuhna (land cover) leh ruahpui hma lei hnawnna chu ruahtui luang theihna index pakhatah a belhkhawm (USDA NRCS, NEH Part 630, Ch. 9–10).
Antecedent moisture condition (AMC)	Ruahpui ṭan laia lei hnawn zawng: AMC I (ro), II (pangngai), III (hnawng).
Directly connected impervious area (DCIA)	Tui luh theih lohna hmun (impervious), tui luh theihna hmun (pervious) chunga luang hmasa lova drain, pipe emaw channel-a luang lut.
Disconnected impervious area	Tui luh theih lohna hmun, a ruahtui luang chu tui luanna system a thlen hmaa tui luh theihna hmun chungah sheet flow angin a luang a, Clause 3.9.3 a tlin.
Peak rate factor (PRF)	Unit hydrograph peak equation-a constant (US customary unit-ah 484; Clause 3.11.2-a SI form-ah 0.208).
Continuous simulation	Ruahtui tlak record rei tak (kum tam tak) chunga model run, lei hnawnna, khawlna leh dil tui sang zawng chu ruahpui pakhat aṭanga a dawt thleng chhunzawm zel.
Dil cascade (tank cascade)	Dil (tank) inzawm zel, dil pakhat tui luan liam (surplus) chuan a dawt a luan lut.

3.3 Pre-development leh post-development lei chung

3.3.1 **Site inang, ruahpui inang.** Pre- leh post-development run-te hian POC tin-a luang lut hmun inang an huam tur a ni a, design ruahpui inang an hmang tur a ni (Clause 2.11.1). He Clause-a lei chung parameter-te, chu avanga Tc lo chhuak, leh ruahtui thununna (stormwater control)-te chauhah an danglam tur a ni.

3.3.2 **Pre-development dinhmun.** Pre-development lei chung chu **greenfield: map-a tarlan hydrologic soil group tan hmun awl (open land) dinhmun ṭha** a ni tur a ni, heti hian:

- (a) Site chhunga ram zawng zawng, tuna in sak tawhna, chhuah (paved), lei hrual (compacted) emaw thlai chinna ram pawh tiamin, hmun awl (hlobet khuh > 75%) dinhmun ṭha angin ngaih a ni. **Tui luh theih lohna hmun awm mek chhiar tel loh tur a ni.**
- (b) Curve number chu Clause 3.7-a HSG tan TR-55-a "hmun awl, dinhmun ṭha" (open space, good condition) value a ni: AMC II-ah **CN 39 (A), 61 (B), 74 (C), 80 (D)** (Table 3.5).
- (c) HSG chu Clause 3.7-a HSG pianphung a ni, leihnuai tui sang tan group pahnih dan (dual-group rule) pawh tiamin (Clause 3.10.1). Tui luanna hna avanga HSG tihṭhat phal a ni lo.

- (d) Tc chu pre-development lei chungah, channel nei lo overland flow leh shallow concentrated flow leh channel pianphung chauh hmangin chhut a ni (Clause 3.6). Pipe, drain lined leh kerb (kawng kam dai) awm mekte ngaihtuah loh a ni.
- (e) Tui awmna awm mek, full tank level (FTL) thleng dil tui zau zawng (waterspread), channel pianphung leh tui lakna emaw tui luan liamna (supply or surplus) channel-te chu an awm angin vawn a ni a, hmun awl angin ni lovin, tui chung emaw channel angin model a ni.

3.3.3 **Post-development dinhmun.** Post-development lei chung chuan hna rawt chu a famkim taka sak zawh (full build-out) dinhmun a entir tur a ni:

- (a) Tui luh theih lohna hmun chu site plan aṭangin teh tur a ni a, in chung (roof), chhuah hmun, kawng leh hmun khuh dangte hrang hrangin, a inzawm nghal (directly connected) emaw inzawm lo (disconnected) emaw tiin ṭhen hran tur a ni (Clause 3.9). TR-55-a plot lenzawng azira chenna row-te chu site ngei tan hman loh tur a ni.
- (b) Sak lai hnathawh avanga tihbuai tui luh theihna hmun (lei siam, lei vur emaw a chunga kal tam) chu HSG pianphung aiin infiltration theihna-ah HSG pakhat hniam zawk pek tur a ni (A aṭanga B, B aṭanga C, C aṭanga D), sak zawh hnua infiltration test (Clause 3.7.3)-in a dang a lantir loh chuan. Sak lai hnathawh avanga lei tihbuai chu engtikah mah HSG A-ah dah loh tur a ni.
- (c) Ruahtui khawl khawm (RWH) sump-te chu darkar 12 emaw a aia rei ruahpui ṭan laiin a khat angin ngaih tur a ni a, chung ruahpui tan chuan anmahnia luang lut in chung chu a inzawm nghal angin ngaih tur a ni (Bung 4).
- (d) Retention leh detention facility-te chu khawlna (storage) angin chiang takin entir tur a ni (Clause 3.12), CN tihhniam hmangin ni lovin.

3.3.4 **Siam ṭhatna (redevelopment).** Clause 3.3.2-a pre-development dinhmun hi siam ṭhatna-ah pawh hman a ni. Site chhuah vek tawh chu greenfield nen tehkhin a ni a, a dinhmun awm mek nen ni lovin. Clause 4.5.6-a hmun khawh siam ṭhatna (constrained-redevelopment) kawng tan chuan, dinhmun awm mek pawh model tur a ni, tui luh theih lohna hmun awm mekte survey ang zelin, 50% hniam ber chu endik theih nan.

3.3.5 **Site pawn lam hmunte.**

- (a) Tui luan tirna design (conveyance design) (Bung 6) tan chuan site luanna chunglam (upstream) hmunte chu phalna pek master plan emaw development plan anga a tawpna ram hman dan (ultimate land use)-in ngaih tur a ni. Plan a awm loh chuan luanna chunglama hmasawnna hna awm lohna ram chu tal 35% tui luh theih lohna hmun nei angin ngaih tur a ni.
- (b) Pre- leh post-development khaikhinna tan chuan site pawn lam aṭanga luang lut (off-site run-on) chu run pahnihah inang takin, a dinhmun awm mek angin model tur a ni (Clause 3.14.2).

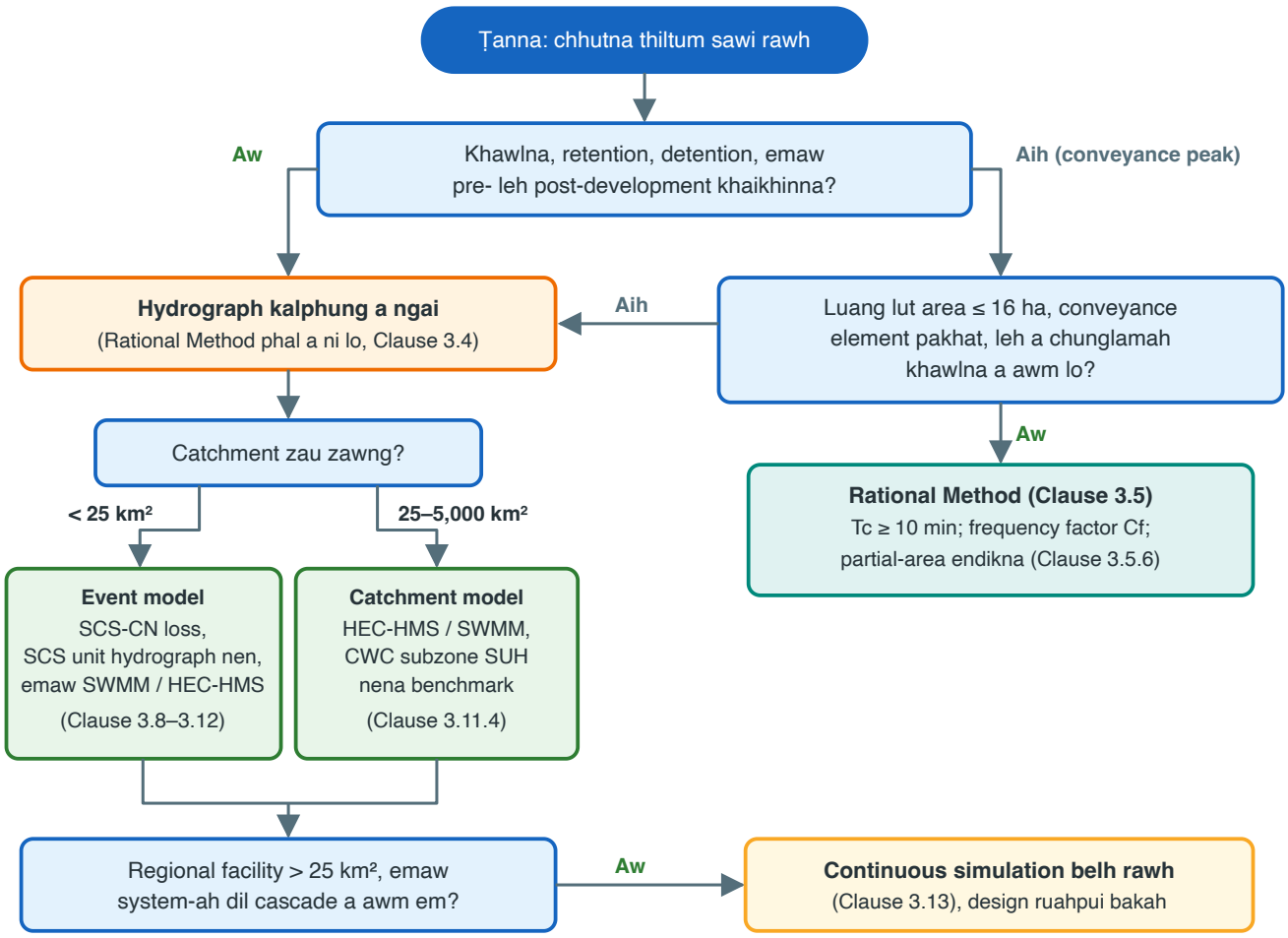
> Hrilhfiahna. Greenfield khaikhinna hian siam ṭhatna tin chu baseline chhe tawh nena tehkhin a nih a dang. UK non-statutory standards leh KC APWA hian kawng hrang hrangin kawng inang an zawh: APWA hian HSG C tan thlai chinna ram awm mek chu "ran chawm hmun, hlobet ram emaw ram awl dinhmun ṭha (C = 0.30, CN = 74)" (good condition pasture, grassland or range [C = 0.30, CN = 74]) aia sang lovin a ruat a, lei tihbuai chu HSG A emaw B-a dah a khap (KC Metro APWA 5600, 2011, §5602.3A leh E). (b)-a TR-55 "hmun awl, dinhmun ṭha" (open space, good condition) value hmante hi TR-55 "ran chawm hmun, hlobet ram emaw ram awl, ṭha" (pasture, grassland or range, good) value-te nen an inang chiah (USDA SCS TR-55, 1986, Table 2-2a leh 2-2c), chuvangin he Kaihhruaina Bu-a pre-development CN hi HSG C lei-ah APWA cap nen a inang. 3.3.3(b)-a lei tihbuai tan class pakhat tihhniam hi APWA dan aia awlsam leh khauh lo zawk atan he Kaihhruaina Bu-in a ruat a ni, Surma group-a shale, siltstone leh sandstone leh Barail sandstone chunga tlang lei pan lo leh colluvium, leh Champhai phai, Tlabung, Bairabi leh Tlawng kama phai alluvium leh lui kam zawl tan a remchang, chutah chuan HSG A aṭanga C zuang chu a nasa lutuk ang. 3.3.5(a)-a ruahmanna nei lo luanna chunglam ram tan tui luh theih lohna 35% hniam ber hi APWA value a ni (2011, §5602.3E.2). Tui luan tirna tan master plan ram hman dan hman hi CPHEEO zuina a ni, CPHEEO chuan C hian "master plan anga catchment hmasawnna tawp ber" (ultimate development of the catchment as per the master plan) a entir tur a ni a ti (CPHEEO 2019, Part A §4.4.1.5).

3.4 Kalphung thlan

3.4.1 Kalphung chu Table 3.1 aṭangin tum leh catchment lenzawng azirin thlan tur a ni. Milem 3.1-in chu dan bawk chu flowchart angin a lantir.

Table 3.1 — Hydrology kalphung hman phalte

Tum	Catchment / dinhmun	Kalphung hman phal	Clause
Tui luan tirna (conveyance) element pakhat tan peak flow (inlet, pipe chhung, drain chhung, culvert)	≤ 16 ha luang lut, luanna chunglamah khawlna awm lo, backwater awm lo	Rational Method	3.5
Tui luan tirna tan peak flow	> 16 ha, emaw luanna chunglamah khawlna, dil emaw pond reng reng a awm	Hydrograph kalphung (SCS-CN leh SCS unit hydrograph, SWMM emaw HEC-HMS)	3.8–3.12
Retention, detention, khawlna reng reng; pre- leh post-development khaikhinna	Lenzawng engpawh	Hydrograph kalphung; **Rational Method hman phal a ni lo**	3.8–3.12, 3.14
Backwater, tidal emaw dil tailwater nei pipe emaw drain network	Lenzawng engpawh	Hydrograph kalphung, dynamic-wave hydraulic routing nen	3.12.4; Bung 5
Catchment pum tui luang	CWC subzone 2(c) (Barak and others)-ah 25–5,000 km², CWC-in a tlangzarh loh 2(c) report aiah subzone 2(b) (South Brahmaputra) report hmangin	HEC-HMS emaw SWMM, CWC synthetic unit hydrograph (SUH) nen tehkhin (benchmark)	3.11.4
Regional facility	> 25 km² luang lut	Design ruahpui hydrograph kalphung **leh** continuous simulation	3.13
Dil (tank) cascade	Lenzawng engpawh	Design ruahpui hydrograph kalphung **leh** continuous simulation	3.13
Tier B: Bung 1 hnuaia site tê	Design aid ramri chhungah	Bung 4 hnuaia design aid tihchhuah, he Bung kalphungte hmanga siam ngei	3.4.4
Site tê, authority engpawh	≤ 1 ha, Clause 4.14.3 ramri chhungah	Bung 4-a fixed-coefficient route (release coefficient nghet, rainfall-mass storage)	3.4.4; 4.14.3



Tidal emaw backwater outfall: dynamic-wave hydraulic model hmangin route rawh (Bung 5).

Milem 3.1 — Hydrology kalphung thlan dan. He Kaihhruaina Bu tana milem siam thar, KC Metro APWA, Section 5600 Storm Drainage Systems and Facilities, 2011 (§5602.2) leh Version 2025.01 (§5603.4, Policy Supplement, 2025) aṭanga siam danglam.

3.4.2 **Rational Method ramri.** Rational Method hi **16 ha emaw a aia tlem** catchment tan chauh leh **tui luan tirna element pakhat** tan peak flow chhut nan chauh hman tur a ni. Retention, detention emaw khawlna dang reng reng size ruat nan emaw, hydrograph emaw ruahtui luang tui zat siam chhuah nan emaw **engtikah mah** hman loh tur a ni.

3.4.3 **Hydrograph kalphungte.** 16 ha chunglam leh khawlna chhutna tin tan hydrograph kalphung hman tur a ni: SCS (NRCS) unit hydrograph nen SCS-CN losses, EPA SWMM, emaw HEC-HMS. 25–5,000 km² tan chuan CWC synthetic unit hydrograph pawh benchmark atan chhut tel tur a ni (Clause 3.11.4).

3.4.4 **Kawng awlsam (simplified route).** Tier B hmunah (Bung 1), Bung 4 hnuaia design aid tihchhuah-a ramri tarlan chhunga site-te chuan site bik hydrograph model aiah chu design aid chu an hmang thei. Hmun engpawhah, 1 ha emaw a aia tlem site-te chuan Clause 4.14.3-a fixed-coefficient route an hmang thei; hei hi 3.4.2-a dan, ruahtui tlak hmanga peak kalphungte khawlna tan hman loh tur a ni tih aṭanga hranpa awm chhun a ni. Rational Method hi 3.4.2 hnuaiah tui luan tirna tan hman theih a ni reng.

3.4.5 **Catchment 5,000 km² chunglam.** Hengte hi he Kaihhruaina Bu huam chin pawnah an awm a, Irrigation & Water Resources Department (IWRD)-in phalna a pek basin zirchianna an ngai.

> **Hrilhfiahna.** 16 ha ramri leh element pakhat dan hi APWA 5600 Version 2025.01 zuina a ni, chu chuan Rational Method chu 200 ac aṭanga 40 ac-ah a tihtlem a, "pipe segment pakhat" (a single pipe segment) tan chauhah a khap. MARC Policy Supplement chuan "ruahtui luang tihtlem hmanrua size ruat nan emaw retention volume leh detention volume hriat nan emaw hman theih a ni lo" (cannot be used to size runoff reduction practices or determine retention volumes and detention volumes) a ti belh (MARC, APWA Stormwater Standards Supplement, 2025). CPHEEO (2019, Part A §4.4.1.3) chuan Rational Method chu 8–10 km² thlengin a phal a, chu chu catchment pum leh Tc chhung zawng zawngah ruahtui tlak chakna inang a ngaih a, tui zat a pek loh kalphung tan a lian lutuk. Rational Method hi khawlna design aṭangin paih a ni, a chhan chu hydrograph ni lovin peak a pe a, khawlna hi tui zat leh hun azirin a ni si.

3.5 Rational Method

3.5.1 **Equation.** Peak flow chu heti hian chhut tur a ni:

> $$Q = C \cdot Cf \cdot i \cdot A / 360$$

heta Q hi peak flow (m³/s) a ni; C hi runoff coefficient (Table 3.2) a ni; Cf hi frequency factor (Table 3.3) a ni, $C \cdot Cf \le 1.0$ nen; i hi Tc nena inang duration tana ruahtui tlak chakna (mm/h) a ni, Bung 2 aṭanga lak (Clause 2.8-a climate factor nen); leh A hi luang lut hmun zau zawng (ha) a ni.

> **Hrilhfiahna.** Hei hi CPHEEO equation Qp = 10 C I A, Qp hi m³/h-a (CPHEEO 2019, Part A §4.4.1.1–4.4.1.3), m³/s-a thlak a ni.

3.5.2 **Runoff coefficient-te.** C chu Table 3.2 aṭanga lak tur a ni. Range chhungah, site data-in value hniam zawk hman chhan ṭha a pek loh chuan, designer chuan range chanve chung lam a hmang tur a ni.

Table 3.2 — Runoff coefficient C (AEP 10% emaw a aia zing zawk tan)

Lei chung emaw ram hman dan	C	Hnar
Sumdawnna (commercial)	0.70–0.95	CPHEEO 2019, Table 4.2
Industry	0.60–0.90	CPHEEO 2019, Table 4.2
Institution	0.70–0.95	CPHEEO 2019, Table 4.2
Chenna, in khat tak	0.60–0.75	CPHEEO 2019, Table 4.2
Chenna, in khat lo	0.40–0.60	CPHEEO 2019, Table 4.2
Intihhlimna hmun	0.10–0.25	CPHEEO 2019, Table 4.2
Asphalt	0.70–0.95	CPHEEO 2019, Table 4.2
Concrete	0.80–0.95	CPHEEO 2019, Table 4.2
Brick chhuah	0.70–0.85	CPHEEO 2019, Table 4.2
In chung: tile	0.80–0.90	CPHEEO 2019, Table 4.2
In chung: thir (metal)	0.70–0.90	CPHEEO 2019, Table 4.2

Lei chung emaw ram hman dan	C	Hnar
In chung: concrete	0.70–0.90	CPHEEO 2019, Table 4.2
Hlobet hmun (lawn), lei sand tam, phei (≤ 2%)	0.05–0.10	ASCE/WPCF 1969
Hlobet hmun, lei sand tam, pangngai (2–7%)	0.10–0.15	ASCE/WPCF 1969
Hlobet hmun, lei sand tam, chhoh (> 7%)	0.15–0.20	ASCE/WPCF 1969
Hlobet hmun, lei rit (clay), phei (≤ 2%)	0.13–0.17	ASCE/WPCF 1969
Hlobet hmun, lei rit, pangngai (2–7%)	0.18–0.22	ASCE/WPCF 1969
Hlobet hmun, lei rit, chhoh (> 7%)	0.25–0.35	ASCE/WPCF 1969
Hmasawnna hna awm lohna ram (dinhmun engpawh tan a sang ber)	0.30	KC APWA 5600 (2011), §5602.3E

3.5.3 **Frequency factor.** Design AEP 10% aia a lo thlen tlem zawk tan chuan C chu Table 3.3-a Cf-in puntir tur a ni. C · Cf chu 1.0 aia tam loh tur a ni.

Table 3.3 — Frequency factor Cf

Design AEP (return period, kum engzat zelah nge a lo thlen ṭhin)	Cf
10% (kum 10) leh a aia zing zawk	1.00
4% (kum 25)	1.10
2% (kum 50)	1.20
1% (kum 100)	1.25

3.5.4 **C inbelhkhawm (composite C).** Catchment-ah lei chung chi hrang tam a awm chuan, C chu hmun zau zawng azira value (area-weighted) C = Σ(Cj · Aj) / ΣAj a ni tur a ni, lei chung tin hmun zau zawng teh aṭanga chhut. Cf chu composite C-ah hman a ni.

3.5.5 **Time of concentration leh network-te.**

- (a) Tc chu Clause 3.6 angin chhut tur a ni a, **minute 10** aia tlem loh tur a ni.
- (b) 16 ha ramri chhunga network chhung tin tan, peak chu chu chhung luanna chunglama Σ(C · A) belhkhawm leh chu chhung thleng Tc rei ber hmangin chhut tur a ni. Luanna chunglam chhung aṭanga peak-te belhkhawm loh tur a ni.

3.5.6 **Hmun ṭhenkhat endikna (partial-area check).** Catchment-a hmun inkhawm, tui luh theih lohna tam tak nei chuan catchment pum aiin Tc tawi zawk tak a neih chuan, peak chu chu hmun chauh tan pawh, a hmun zau zawng, C leh Tc ngei hmangin chhut tur a ni. Peak lian zawk chuan a thunun ang.

> **Hrilhfiahna.** Table 3.2-a hmasawnna hna awmna lei chung coefficient-te hi CPHEEO Table 4.2 a ni a, CPHEEO-in ASCE/WPCF (1969) aṭanga a siam rem a ni. CPHEEO chuan return period zawng zawng tan C chu a nghet reng. Table 3.3 erawh chuan APWA antecedent-precipitation factor-te a hmang (KC Metro APWA 5600, 2011, §5602.2A: 4%, 2% leh 1% ruahpui tan K = 1.1, 1.2 leh 1.25, C·K ≤ 1.0 nen). Heng factor-te hi hetah a pawimawh, Mizoram-a ruahpui lo thleng tlem (rare storm)-te hi lei hnawng chungah an tlak ṭhin avangin (Clause 2.11.4). Minute 10 Tc hniam ber hi Clause 2.5.1-a design duration hniam ber nen a inmil. APWA 2011 chuan inlet hun chu minute 5 leh 15 inkarah a bituk (§5602.7A). Hmun ṭhenkhat endikna hi CPHEEO-in "hmun ṭhenkhat nghawng" (partial area effect) a chin dan zuina a ni (CPHEEO 2019, Part A §4.4.1.7). He Kaihhruaina Bu hian 3.5.2-a range tin chanve chung lam a phut, India khawpui plot-te hi ASCE range innghahna US ram hman dan aiin a tlangpuiin khuh khah zawk an nih avangin.

3.6 Time of concentration

3.6.1 **A tlangpui.** Tc chu pre- leh post-development dinhmun tan hrang hranga chhut tur a ni, ngaihtuah hmun (point of interest) thleng luan hun rei ber petu tui luan kawng zawhin, segment tin-a luan hun belhkhawm angin. Dinhmun pahnih zinga pakhatah mah Tc chu **minute 10** aia tlem loh tur a ni.

3.6.2 **NRCS velocity (segment) kalphung.** NRCS segment kalphung hi catchment zawng zawng tan default a ni. Tc = Tt(sheet) + Tt(shallow) + Tt(channel), heta:

- (a) **Sheet flow:**

  > Tt = 0.091 (n · L)^0.8 / (P2^0.5 · S^0.4)

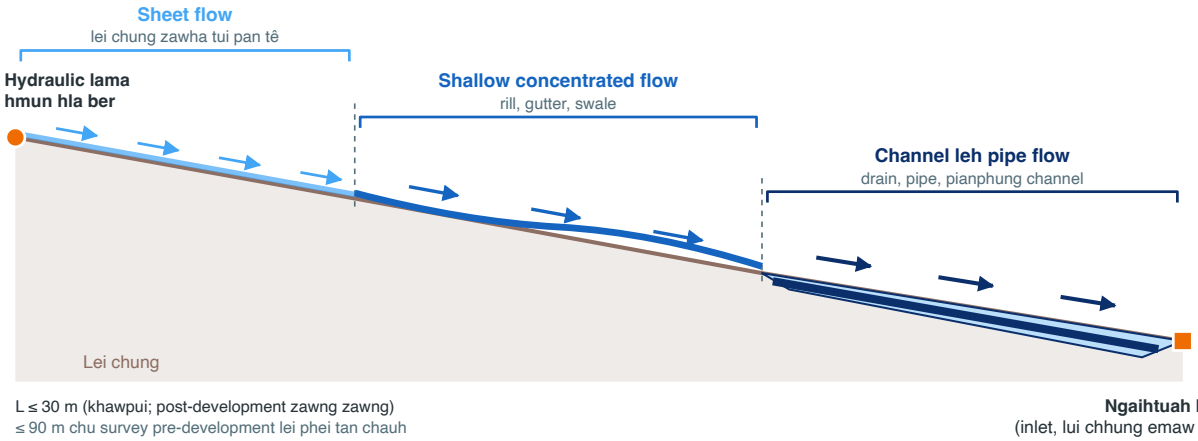
  heta Tt hi darkar-in a ni; n hi Table 3.4 aṭanga sheet-flow roughness a ni; L hi sheet-flow dung (m) a ni; P2 hi Clause 2.3 aṭanga tunlai 50% AEP (kum 2) darkar 24 ruahtui tlak (mm) a ni, climate factor tel lovin; leh S hi lei tlan zawng (land slope, m/m) a ni.

- (b) **Sheet-flow dung.** Khawpui hmunah leh post-development dinhmun zawng zawng tan, sheet-flow dung chu **30 m** aia rei loh tur a ni. Pre-development greenfield lei chung tan chuan, survey-in channel nei lo lei phei a lantir hmunah chauh 90 m thleng hman theih a ni; a nih loh chuan 30 m hman a ni.

- (c) **Shallow concentrated flow:** Tt = L / (3,600 V), V = 4.918 S^0.5 (chhuah loh) emaw V = 6.196 S^0.5 (chhuah) nen, V hi m/s-in, L hi m-in leh S hi m/m-in.

- (d) **Channel leh pipe flow:** Tt = L / (3,600 V), V chu kam khat (bank-full) emaw pipe khat (pipe-full) flow-a Manning's equation aṭanga lak.

Time of concentration: tui luan kawng rei ber zawh flow segment-te (schematic, scale ang a ni lo)



Sheet flow — Clause 3.6.2(a), (b)	Shallow concentrated — Clause 3.6.2(c)	Channel leh pipe — Clause 3.6.2(d)
Tt = 0.091 (n · L)^0.8 / (P2^0.5 · S^0.4) [h] n chu Table 3.4 aṭangin; pre-development n = 0.15 P2: kum 2 24 h ruahtui tlak, climate factor tel lo	**Tt = L / (3,600 V)** V = 4.918 S^0.5 (paved lo) V = 6.196 S^0.5 (paved)	**Tt = L / (3,600 V)** V chu bank-full emaw pipe-full flow-a Manning's equation aṭangin

Tc = Tt(sheet) + Tt(shallow) + Tt(channel) ≥ 10 min (Clause 3.6.1)

Pre- leh post-development tan hrang takin chhut; lag tL = 0.6 Tc (Clause 3.6.5)

Milem 3.2 — NRCS segment kalphung hmanga time of concentration: tui luan kawng rei ber zawh sheet flow, shallow concentrated flow leh channel emaw pipe flow, Clause 3.6-a luan hun equation leh ramri-te nen. Schematic, scale ang a ni lo. He Kaihhruaina Bu tana milem siam thar, USDA SCS TR-55 (1986), Ch. 3, leh USDA NRCS, NEH Part 630, Ch. 15 (2010) aṭanga siam danglam.

Table 3.4 — Sheet flow tan Manning's n (USDA SCS TR-55, 1986, Table 3-1)

Lei chung	n
Lei chung nal (concrete, asphalt, gravel, lei saruak)	0.011
Ram awl (fallow, thlai bal awm lo)	0.05
Thlai chinna, thlai bal khuh ≤ 20%	0.06
Thlai chinna, thlai bal khuh > 20%	0.17
Hlobet: hlobet tawi prairie	0.15
Hlobet: hlobet chhah	0.24
Range (pianphung)	0.13
Ramngaw: ramhnuai (underbrush) zing lo	0.40
Ramngaw: ramhnuai zing	0.80

3.6.3 **Pre-development roughness.** Clause 3.3.2-a pre-development greenfield lei chung tan sheet-flow n chu **0.15** a ni tur a ni, designer-in chu hmun thlai leh ramhmul pianphung aṭanga Table 3.4 value dang hman chhan a sawi fiah loh chuan.

3.6.4 **Kirpich formula.** Kirpich formula hi endik letna (cross-check) atan emaw, channel ber chiang tak nei pre-development thingtlang catchment tan emaw chauh hman theih a ni:

> tc = 0.0195 L^0.77 S^−0.385

heta tc hi minute-in a ni, L hi tui luan kawng ber dung (m) a ni leh S hi a tlan zawng chawhrual (m/m) a ni. Khawpui emaw post-development catchment tan hman loh tur a ni.

3.6.5 **Lag.** Unit hydrograph kalphung-in lag a ngaih chuan, tL = 0.6 Tc.

3.6.6 **Endikna.** Post-development Tc chu a pangngaiin pre-development Tc aiin a tawi zawk tur a ni. A rei zawk chuan, designer chuan a chhan thehluh tur (submittal)-ah a sawi fiah tur a ni.

> **Hrilhfiahna.** Segment kalphung leh a equation-te hi TR-55 (USDA SCS, 1986, Ch. 3) leh NEH Part 630, Ch. 15 (USDA NRCS, 2010) aṭanga lak a ni. SI constant-te hi US equation-te thlak chiahna a ni: L hi m-a leh P2 hi mm-a a nih chuan 0.007 chu 0.091 a ni a, 16.1345 leh 20.3282 ft/s chu 4.918 leh 6.196 m/s a ni. TR-55 (1986) chuan sheet flow chu 300 ft (≈ 90 m) thleng a phal. NEH 630 Ch. 15 chuan sheet flow hi a tlangpuiin shallow concentrated flow a nih hmain 100 ft (≈ 30 m) vel aia rei a luang lo tih a sawi (Merkel, 2001 a tarlan), US agency tam takin tunah chutah chuan a ramri an siam. He Kaihhruaina Bu hian chu innghahnaah 3.6.2(b)-a khawpui ramri 30 m a ruat: India khawpui plot-ah tui chu metre tlem te chhungin drain, kerb emaw compound wall (in hung bang) weep hole a thleng ṭhin. Sheet-flow equation-ah P2 tihdanglam loh hman a ni, P2 hi luan hun inzawmna parameter a nih avangin, design load ni lovin. Greenfield tan n = 0.15 default hi TR-55 hlobet tawi value a ni; he Kaihhruaina Bu hian Q_pre chu dik lo taka tihniam tur pre-development Tc rei tak pumpelh nan a hmang. Kirpich

formula hi Chow, Maidment leh Mays (1988, Table 15.1.2)-in an pek SI form a ni a, Tennessee-a thlai chinna catchment tê aṭanga lak a ni (Kirpich, 1940), chuvangin khawpui lei chung tan a inmil lo. Lag ratio 0.6 hi NRCS value a ni a, APWA pawhin a hmang (2011, §5602.7C).

3.7 Lei leh hydrologic soil group-te

3.7.1 **Map siam.** HSG chu National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) emaw State soil survey (agency finfiah tur [TBC]) map-a lei series aṭanga pek tur a ni, Belhchian 3A-a lei series aṭanga HSG zawnna (lookup) hmangin. Map hnar leh a scale chu tarlan tur a ni.

3.7.2 **Pek dan.** Lei series pakhat tan Belhchian 3A a la awm loh chuan, HSG chu saturated hydraulic conductivity teh leh tui luh theih lohna lei pheng (impermeable layer) emaw leihnuai tui sang zawng (water table) thleng thuk zawng hmangin NEH Part 630, Ch. 7-a tehna angin pek tur a ni. Belhchian 3A tlangzarh a nih hma chu, he Kaihhruaina Bu hian Mizoram tan heng group rih (interim group)-te hi a ruat: Surma group-a shale, siltstone leh mudstone tlang chhip (Bokabil shale leh Bhuban-a shale unit-te), an tlang lei pan lo nen, design tan HSG D, lei ngei group eng pawh nei se; sandstone tlang chhip (Bhuban sandstone leh Barail sandstone), site test-ah HSG C, lung a chhe loh (unweathered) hmunah HSG D, scarp emaw lei laih pang (cut slope) chungah test pit emaw infiltration hmanrua awm lovin; tlang pang colluvium, ruahtui luang tan HSG C, mahse infiltration chhiar tel lohna lei nghet lo (Clause 4.11, tlang dan (hill rule)); leimin bal (slide debris), design tan HSG D, infiltration chhiar tel lovin; Champhai phai (sub-area MZ-C1), Bairabi leh Vairengte (sub-area MZ-A1), Tlabung (sub-area MZ-D1) leh Tlawng kama phai alluvium leh lui kam zawl (river terrace), site test-ah a lei chi azirin HSG B emaw C, Clause 3.10 hnuaia leihnuai tui sang zawng endik nen, lei chung aṭanga 2 m hnuai chhunga a awm theih avangin; leh Aizawl leh khawpui dangte tlang panga khawpui lei vur leh lei laih bal (cut-spoil), a pangngaiin HSG D. Tier A hmuna site tin leh Clause 4.14.1-a kalphung awlsam ramri aia lian site dang tinah, facility rawt thuk zawngah, field infiltration test a ngai; site tê zawk-ah chuan, lei test loh chu a tan group tarlan zinga tui luh theihna hniam zawk pek tur a ni. Infiltration hmanrua sak theih leh theih loh chu Clause 4.11-a infiltration dan pahnih (tlang dan leh recharge dan)-in a thunun, a HSG-in ni lovin. Clause 3.10.1 hi heng group zawng zawngah hman a ni.

3.7.3 **Site-a finfiahna.** Infiltration hmanga retention innghat site tin tan (Bung 4), map-a HSG chu infiltration facility tin awmna leh a thuk zawngah site infiltration test hmangin finfiah tur a ni. Test-in map-a HSG aiin infiltration theihna hniam zawk a lantir chuan, retention design leh post-development CN tan test result chuan a thunun ang. Sang zawk a lantir chuan, authority phalna lovin pre-development HSG thlak loh tur a ni.

3.7.4 **Lei tihbuai leh lei vur.** Clause 3.3.3(b) hman a ni.

> **Hrilhfiahna.** NBSS&LUP lei map-te hi a tlangpuiin 1:250,000 aṭanga 1:50,000 scale an ni a, lei chu series leh taxonomy azirin an ṭhen hrang, HSG azirin ni lovin. Chuvangin lookup table a ngai (Belhchian 3A). Site pakhatin group pahnih a huam theihna hmunah site test a pawimawh ber: tlang chhipah, shale, siltstone leh sandstone hla lo tak chhunga an inthlak chhawk zelna, Serchhip khawpui Middle Bhuban litho-unit-te ang (MIRSAC); tlang pangah, colluvium, lei vur emaw lei laih bal shale chunga a awmna, chuta pit laih-a rate sang chu tui lut thei lo tlang panga tui lut a nih theih avangin (Clause 4.11); leh phai emaw lui kam zawl kamah, lung leh lung tê terrace lei chu a chung lam tlang pang aṭanga colluvium-ah a inthlak a, luipui lam panin leihnuai tui a san zelna (CGWB, Lunglei district). He Kaihhruaina Bu zirchianna laiin NBSS&LUP-a Mizoram lei series map, HSG map emaw table, SCS-CN calibration leh State chhunga site engpawh infiltration rate teh hmuh a ni lo [TBC]. Group rihte hi region thu hnarte-in an sawi geology zuina a ni. "Geology lamah chuan, State hi Tertiary hun lai sedimentary lung, anticline leh syncline inzawm zela tihkawi nghet tawh chungah a innghat" (Geologically, the State is underlain by sedimentary rocks of Tertiary age, which have been tightly folded in a series of anticlines and synclines) (CGWB, *Ground Water Scenario of Mizoram*); Lunglei district-ah lung chu "Miocene hun lai Surma formation-a shale, siltstone leh sandstone" (shale, siltstone, and sandstone of Surma formation of Miocene age) a ni a, Bokabil shale tlang chhip hniamte chu "tui luh theihna leh infiltration hniam an ni. Ruahtui luang chhuahna zone angin a awm" (characterized by low permeability and infiltration. It acts as run off zone), Bhuban group-a tlang chhip

pangngai "district pum deuhthaw luahtu" (which occupy almost the entire district) chuan "tui luh theihna leh infiltration hniam lutuk an nei a, ruahtui luang chhuahna zone angin a awm" (very low permeability and infiltration and acts as run off zone); lei chu tlang lei, "tlang pang chhoh tak zawha colluvial lei" (colluvial soil, formed along the steep side slopes), phai lei, "colluvial leh alluvial bungrua inchawhpawlh" (a mixture of colluvial and alluvial materials), leh terrace lei, "lung leh lung tê ṭawm la bang" (remnants of deposits of cobbles and pebbles) an ni; leh "Ruahtui tam ber chu lei chunga ruahtui luang angin a luang chhuak" (Most of the rain water flows out as surface run-off) (CGWB, Ground Water Information Booklet, Lunglei district). Serchhip district-ah "Oligocene aṭanga Miocene hun lai Surma leh Barail formation-a shale, siltstone leh sandstone" (shale, siltstone, and sandstone of Surma and Barail formations of Oligocene to Miocene age) a awm (CGWB, Serchhip district booklet). Serchhip khawpuiah, Middle Bhuban Formation chungah, "Shale leh siltstone awmna lithological unit-te hi sandstone unit khauh leh nghet aiin leimin a tlak theih zawk" (Lithological units comprising shale and siltstone are more susceptible to landslide than the hard and compact sandstone unit), shale kawikawi chu weight sang ber pekin (Lallianthanga leh Lalbiakmawia, 2013, MIRSAC); leh State ram chu "N-S lam pana anticlinal strike tlang chhip, tlang pang chhoh tak nei leh a inkara synclinal phai zim … tlang chhip ṭhen darh, ruam thuk tak nei … hmun tam takah faulting-in fault scarp chhoh tak a siam" (N-S trending mostly anticlinal strike ridges with steep slopes and narrow intervening synclinal valleys … dissected ridges with deep gorges … Faulting in many areas has produced steep fault scarps) a ni (MIRSAC, 2013). Aizawl-ah "Khawpui leh a chhehvela lei hi a la naupang a, a bawrh" (The soil in and around the city is young and in a loose state) (Master Plan for Aizawl: Vision 2030). Shale tlang chhipah HSG C anga test theih lei a awm thei a, mahse tlang pang chhoh takah tui tlem chauh lut thei lung chungah a pan lo a, chuvangin D angin design a ni; colluvium chuan tui a dawng nghal a, chuvang chuan infiltration tan hman a ni lo. Champhai phai emaw Tlabung, Bairabi leh Vairengte lui kam zawl lei tan primary thu hnar chhiar a ni lo [TBC]; anmahni tan group-te hi CGWB-in Lunglei district-a phai leh terrace lei a sawi dan aṭanga ruat a ni a, test hmanga finfiah tur a ni. Region-a losses tehna awm chhun chu CWC subzone 2(b) report-a design loss rate, 0.35 cm/h (3.5 mm/h) a ni, State pawn lama bridge-a gauge thingtlang catchment-a tuilian 100 modal value, chung zinga pakhat mah Mizoram aṭanga luang lo (Belhchian 3E). Surma shale tan a sang lutuk ang, CGWB-in "tui luh theihna leh infiltration hniam lutuk" (very low permeability and infiltration) nei tia a sawi (NEER chhiar dan). Clause 3.11.4 hnuaia 2(b) SUH endikna run-ah chauh hman tur a ni, HSG pek nan emaw, khawpui SCS-CN emaw SWMM model-ah emaw, infiltration hmanrua size ruat nan emaw ni lovin. Clause 3.7.2-a group rihte, shale tlang chhip, leimin bal leh khawpui lei vur group D anga design, colluvium chungchang leh site tê-a lei test loh dan te hi Mizoram tan lei series lookup a awm hma chu he Kaihhruaina Bu-in a ruat a ni. Kalphung dan-te hi lei ang bawkin a pawimawh, Mizoram khawpui deuhthaw zawng zawng hi tlang chhip emaw tlang pangah an din avangin. Aizawl tlang pang chu 30°–45° a ni (chhiar kopi-ah "300 to 450"; Master Plan for Aizawl: Vision 2030), Serchhip khawpui 89.2% chu 30° aia chhoh a ni a, 38.7% chu 45° aia chhoh (MIRSAC tlang pang share aṭanga NEER chhutna: 0–15° 10.51%, 15–25° 0.11%, 25–30° 0.25%, 30–35° 5.13%, 35–40° 14.61%, 40–45° 30.72%, 45–60° 26.59%, 60° chunglam 12.12%). Chutiang tlang pangah Kirpich leh Kerby formula-te chuan time of concentration minute 1–5 an pe (NEER chhutna), leh tlang kawng chhuaha tui chu minute tlem te chhungin lui a thleng. He Kaihhruaina Bu hian heng dan-te hi a ruat. (a) Tc chu Clause 3.6.2-a velocity-a innghat segment kalphung hmangin, segment tin zelin hmuh tur a ni a, Clause 3.6.1-a minute 10 hniam ber, Bung 2-a design duration tawi ber nena inmil, aia tlem loh tur a ni; he Kaihhruaina Bu zirchianna chuan tlang chhip khawpui tan minute 5 hniam ber a rawt a, core-a minute 10 hniam berin a phal lo, chuvangin tlang kawng tam berah hniam ber chuan a thunun; Kirpich formula, thlai chinna catchment tê tlang pang pangngai aṭanga lak, chu tui luan kawng tlang pang chawhrual 10% aia a chhoh hmunah endik letna atan pawh hman loh tur a ni. (b) Lung saruak, lei laih pang emaw tlang kawng chhuah chunga sheet-flow segment chuan Table 3.4-a lei chung nal n a hmang tur a ni a, 30 m aia rei loh tur a ni. (c) Tlang tui luanna system tin tan design case pahnih run a ni: ruahpui thut tawi, Clause 2.5.2-a duration darkar 6 thleng, Clause 2.3.6(f)-a darkar 1 ruahtui tlak zat nen; leh ruahpui rei, Clause 2.3.6(e)-a darkar 72 ruahpui, Site Development and Slope Modification Regulations, 2017 regulation 27-a terrace (tlang panga hmun zawl siam) swale, interceptor drain (cut chung lama ruahtui dangtu drain) leh down-drain (tlang pang zawh chhuk drain) tan, culvert leh cross-drainage tan, leh tlang pang leh tuikhur aṭanga tui chiar (seepage) dan tan; element tin tan tui luang emaw tui zat lian zawk chuan a thunun, Mizoram leimin ruahpui chu ni tam tak a rei ṭhin avangin, June ni 1–13, 2018 chhunga Serchhip district-a 677 mm sur (SANDRP, chanchin tlangzarh angin) leh May ni 24, 2025 aṭanga June ni 3, 2025 thleng leimin 598 tichhuaktu ruahpui (DM&R figure, chanchin tlangzarh angin) ang hi. (d) A critical slope aia chhoh drain emaw luiah tui luang chu supercritical a ni: Froude number

report a ni a, tlang pang a phei hmun emaw tui luang chuan pool, structure emaw lui chhung phei zawk a tawh hmunah hydraulic jump awmna tarlan a ni a, kawng kawiah tui chhuak leh superelevation chu freeboard (tui sang ber chunga zau dah) nen endik a ni; drain chhohte chu lined, step siam emaw baffle siam a ni a, tlang panga outfall (drain tui luan chhuahna) tin-ah energy dissipator (tui chakna tihnemna) a awm (Bung 6 leh 9). (e) Tlang pang aṭanga phai emaw lui kam zawl-a luang thlengtu catchment, Bairabi, Vairengte, Sairang leh Tlabung lui kam zawl emaw Champhai phai thlengtu luite ang, chu tlang pang inthlakna-ah ṭhen tur a ni a, tlang sub-area chu amah chauhin model tur a ni, lui chhung hnuai lam phei zawk chuan tlang chhanna rang chu chawhrualin a tihbo loh nan. (f) Phai ram leh Sairang, Bairabi, Vairengte, Tlabung leh Chawngte lui kam zawl leh Champhai phaiah, Clause 3.4 hnuaia Rational Method chuan sub-catchment tê-ah element pakhat chauh size a ruat; luipui thleng system tin chu SWMM hmangin design a ni, luipui tui sang zawng chu tailwater angin (Clause 5.8.5) leh outfall tui hnuaia a awm hmunah dynamic-wave routing nen (Clause 3.12.4). (g) Tlawng, Tuirial, Serlui, Tuichang, Tuichawng, Khawthlangtuipui leh an lui pengte chunga 25–1,500 km² thingtlang catchment-te hian CWC unit hydrograph mahni bik an nei lo a, State luipui pakhat mah catchment area hmuh a ni lo [TBC]: site zirchianna (SCS-CN, emaw Clark emaw Snyder unit hydrograph, HEC-HMS-ah) hmangin model an ni a, Clause 3.15 hnuaiah CWC site-te (Sairang, Turial, Bairabi, Tlabung, Tuichawng, Tuichang leh Sihthangpui), Tuirial reservoir tan NEEPCO record emaw State gauge-te nen, a awmna apiangah, calibrate a ni; CWC subzone 2(b) unit hydrograph, a peak hi area chauh azira awm leh a catchment pakhat mah Mizoram aṭanga luang lo, chu Clause 3.11.4-a endikna (Belhchian 3E) atan chauh chhut a ni, leh Clause 3.11.4(d) chu a ziah angin hman a ni. Catchment 1 km² aia lian nei cross-drainage structure leh outfall tin chuan site bik hydrology zirchianna a ngai. (h) Tuirial emaw Serlui B reservoir, emaw a tui khuahna (dam) pahnih zinga pakhat hnuaia lui chhung luang thleng catchment-te chu storage routing leh operator-in tui a luan chhuah tir dan (release scenario) hmangin model a ni, peak-flow kalphung chauh hmangin ni lovin (Clause 3.12; Clause 5.8.5(e)). (i) He Bung kalphung pakhat mahin leimin emaw debris flow a sawi lawk thei lo; luite leh tlang pangah design tui luang chu bal (sediment leh debris) tan tihpun (bulk) a ni a, inlet leh culvert-te chu tihtawp (blockage) tan design a ni (Clause 6.3.6; Bung 9), leh drain size ruat theih lohna hmunah hmun thlan, setback (tui kam aṭanga hmun kalhlen tur) leh tlang pang hna chuan a thunun (Clause 2.3.6(i)).

3.8 SCS curve number (SCS-CN) loss kalphung

3.8.1 **Ruahtui luang equation.** Ruahtui luang thuk zawng chu heti hian chhut tur a ni:

> $Q = (P - Ia)^2 / (P - Ia + S)$, $P > Ia$ tan; a nih loh chuan $Q = 0$ $S = 25{,}400 / CN - 254$

heta Q hi ruahtui luang thuk zawng (mm) a ni, P hi ruahtui tlak zat belhkhawm (mm) a ni, S hi potential maximum retention (mm) a ni leh Ia hi initial abstraction (mm) a ni. Hydrograph model-ah, equation hi time step tin-a ruahtui tlak belhkhawm chungah hman a ni a, rainfall excess pun zel hmuh nan.

3.8.2 **Curve number-te.** AMC II-a CN chu Clause 3.7-a HSG tan Table 3.5 aṭanga lak tur a ni.

Table 3.5 — Ruahtui luang curve number-te, AMC II, Ia = 0.2S (USDA SCS TR-55, 1986, Table 2-2a leh 2-2c)

Khuhna chi (cover type)	HSG A	HSG B	HSG C	HSG D
Pre-development khaikhinna (Clause 3.3.2): hmun awl (open space), dinhmun ṭha (hlobet > 75%)	39	61	74	80
Hmun awl, dinhmun pangngai (hlobet 50–75%)	49	69	79	84
Hmun awl, dinhmun chhe (hlobet < 50%)	68	79	86	89

Khuhna chi (cover type)	HSG A	HSG B	HSG C	HSG D
Tui luh theih lohna: in chung, motor dahna chhuah, in kawng (driveway), kerb leh drain nei kawng chhuah	98	98	98	98
Kawng chhuah, ditch khuh lo nei (right-of-way tiamin)	83	89	92	93
Gravel kawng (right-of-way tiamin)	76	85	89	91
Lei kawng (right-of-way tiamin)	72	82	87	89
Hmun lei siam thar (tui luh theihna, thlai awm lo)	77	86	91	94
Ram awl (fallow), lei saruak	77	86	91	94
Hlobet ram (meadow; hlobet chhunzawm, ran chawm loh)	30	58	71	78
Ramhnuai (brush), dinhmun ṭha	30	48	65	73
Ramngaw, dinhmun ṭha	30	55	70	77
Ramngaw, dinhmun pangngai	36	60	73	79
Ramngaw, dinhmun chhe	45	66	77	83
Tui chung, dil tui zau zawng, wet detention basin	Ruahtui luang = ruahtui tlak (losses awm lo)			

3.8.3 **Table 3.5 hman dan.**

- (a) Post-development CN chu lei chung teh (Clause 3.9) aṭanga siam tur a ni. TR-55 khawpui district leh chenna plot lenzawng row-te chu site tan hman loh tur a ni.
- (b) Post-development dinhmuna tui luh theihna hmunte chuan landscape plan-in a thlen tur dinhmuna "hmun awl" (open space) an hmang tur a ni. Landscape plan thehluh a nih loh chuan, dinhmun pangngai (fair condition) hman a ni.
- (c) TR-55 thlai chinna row-te chu site pawn lam dinhmun awm mek tan hman theih a ni a, mahse Clause 3.3.2-a pre-development khaikhinna tan engtikah mah hman loh tur a ni.

3.8.4 **Ruahpui hma lei hnawnna.** AMC chuan Clause 2.11.4 a zui tur a ni: Belhchian 2A sub-area (MZ-A, MZ-A1, MZ-B, MZ-C, MZ-C1, MZ-D emaw MZ-D1) engpawh chhunga site-ah May ni 1 aṭanga October ni 31 thleng design ruahpui tin tan, a duration eng pawh ni se, AMC III; luipui emaw lui 1% AEP tuilian sang zawng hnuaia phai ram, sub-area MZ-A1, MZ-C1 emaw MZ-D1-ah emaw hmun dangah emaw, Tlawng kama Sairang leh Kau kama Chawngte ang, leh dil kamah, April ni 1 aṭanga October ni 31 thleng design ruahpui tin tan AMC III; Tuirial reservoir emaw Serlui B reservoir emaw a backwater emaw, tui khuahna pahnih zinga pakhatin tui a luan chhuah tirna lui chhung hnuai lam emaw luang thleng catchment-ah, kum chhung hun engtik lai pawhin design ruahpui tin tan AMC III; site emaw hun dang engpawhah, ni 5 ruahtui tlak belhkhawm 53 mm aia tam hnung zui emaw a tel emaw design ruahpui tan AMC III; leh ruahpui dang zawng zawng tan AMC II. AMC I hman a ni lo. AMC I leh III tan CN chu AMC II aṭangin heti hian hmuh tur a ni:

> CN(I) = 4.2 CN(II) / (10 − 0.058 CN(II)) CN(III) = 23 CN(II) / (10 + 0.13 CN(II))

Conversion hi **tui luh theihna hmun chauhah** hman tur a ni. Tui luh theih lohna hmunte chu AMC zawng zawngah CN 98-ah an awm reng. Composite CN chu tihdanglam nghal loh tur a ni.

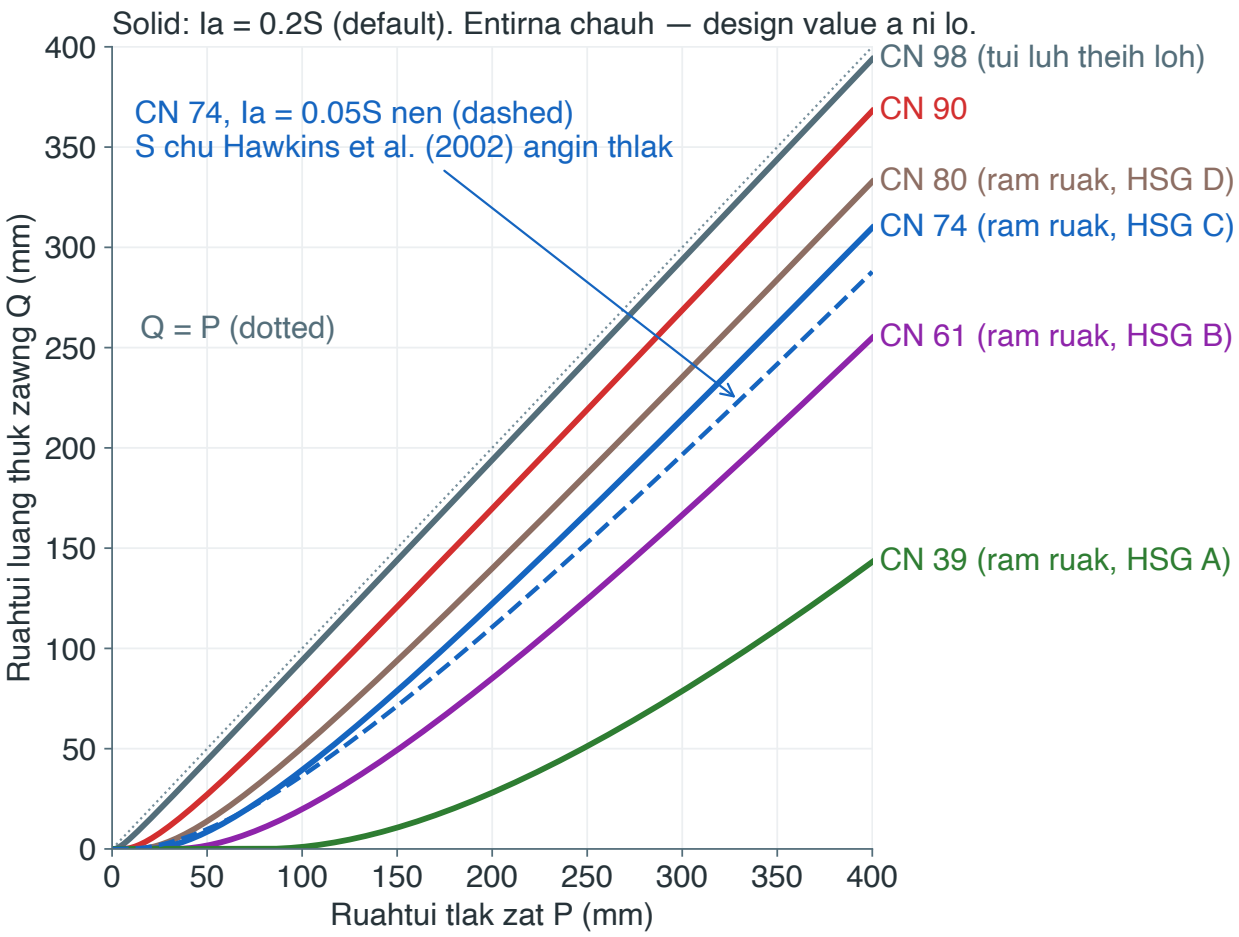
Entirna chauh — design value a ni lo. AMC III-a pre-development khaikhinna CN-te chu: HSG A 59.5; HSG B 78.2; HSG C 86.7; HSG D 90.2.

3.8.5 **Initial abstraction.**

- (a) **Default:** Ia = 0.2S, Table 3.5-a CN-te nen.
- (b) **Sensitivity run (tih ngei ngei tur):** khawlna design tin chu Ia = 0.05S nen pawh run tur a ni. He run tan hian S chu S0.05 = 1.33 · S0.20^1.15 (S hi inch-in) angin thlak tur a ni, SI-ah chuan:

  > S0.05 = 25.4 × 1.33 × (S0.20 / 25.4)^1.15 (mm)

- (c) Design chu default run-ah innghat tur a ni. Sensitivity result-te chu Form 3-2-ah report tur a ni. Sensitivity run-in khawl tur tui zat (required retention volume) emaw water quality volume a tihpun chuan, chu volume tan value lian zawk chuan a thunun ang.



Milem 3.3 — Ia = 0.2S-a curve number thlan ṭhenkhat tan ruahtui tlak zat nena SCS-CN ruahtui luang thuk zawng, CN 74 tan Ia = 0.05S sensitivity case nen. He Kaihhruaina Bu tana milem siam thar, USDA NRCS, NEH Part 630, Ch. 10 (2004) leh USDA SCS TR-55 (1986) runoff equation leh Hawkins et al. (2002) S-conversion aṭanga chhut. Entirna chauh — design value a ni lo.

Hrilhfiahna. Table 3.5 hian NRCS TR-55 (1986) value pangngai a tarlang. US catchment aṭanga lak an ni a, Mizoram-ah calibrate an ni lo. AMC conversion equation-te hi Chow, Maidment leh Mays (1988, §5.5)-in an pek angin NEH-4 inzawmna pangngai an ni. Tui luh theihna hmun chauh thlak hi APWA zuina a ni, chu chuan

"composite antecedent moisture condition thlak nghal hi a dik lo" (direct conversion of composite antecedent moisture conditions is not appropriate) a ti (KC Metro APWA 5600, 2011, §5602.2C). Composite CN thlak chuan tui luh theih lohna hmun CN chu dik lo takin a tihniam ang.

Ia = 0.2S hi NRCS ratio hmasa ber a ni. US ruahtui tlak–ruahtui luang data zirchianna chuan 0.05S hi a chawhrualin a inmil zawk tih a hmu a (Hawkins et al., 2002; Woodward et al., 2003), 3.8.5(b)-a conversion a pe. NRCS-in 0.2S chu formal takin a thlak lo, chuvangin he Kaihhruaina Bu hian default atan a vawng. Milem 3.3-in sensitivity run a ṭul chhan a lantir: CN 74 tan, 0.05S case chuan ruahpui tê tan ruahtui luang **tam zawk** a pe (ruah 25 mm aṭanga 2.0 mm vel, 0.5 mm nen khaikhin) mahse ruahpui lian tan **tlem zawk** (350 mm aṭanga 242 mm vel, 262 mm nen khaikhin). *Entirna chauh — design value a ni lo.* Chuvangin ratio hi retention leh water quality volume tan a pawimawh ber a, default 0.2S hi peak leh detention design tan thlan fimkhur (conservative) a ni. 3.8.5(c)-a retention emaw water-quality volume lian zawk chuan a thunun tih dan hian entawn tur nghet a nei lo; he Kaihhruaina Bu hian a ruat a ni, 0.05S case chuan chung volume-te ruattu ruahpui tê aṭanga ruahtui luang tam zawk a pek avangin.

3.9 Tui luh theih lohna hmun inzawmna

3.9.1 **Ṭhen hranna.** Post-development dinhmuna tui luh theih lohna hmun tin chu inzawm nghal (DCIA) emaw inzawm lo (disconnected) emaw tiin ṭhen hran tur a ni a, drainage plan-ah lantir tur a ni.

3.9.2 **Entir dan duh zawk.** Hydrograph model-ah, DCIA leh tui luh theihna hmunte chu sub-area hrang hrangin (emaw SWMM subcatchment-a tui luh theih lohna leh tui luh theihna ṭhen hrang angin) model tur a ni, pakhat zelin mahni loss parameter nen. Hmun inzawm lo aṭanga ruahtui luang chu a dawngtu tui luh theihna hmunah route tur a ni.

3.9.3 **Inzawm lohna tehna.** Tui luh theih lohna hmun chu heng zawng zawng hi a dik chauhin inzawm lo angin ṭhen theih a ni:

- (a) a ruahtui luang chu pipe, channel emaw kerb tel lovin tui luh theihna hmunah sheet flow angin a luang chhuak;
- (b) tui luh theihna hmun luan kawng chu a chunga luang lut tui luh theih lohna hmun luan kawng tal a rei;
- (c) tui luh theihna hmun chu hrual (compacted) a ni lo, HSG D a ni lo, leh phalna pek plan-in chhuah (paving) laka a humhalh; leh
- (d) darkar 12 emaw a aia rei ruahpui tan, RWH sump emaw tank-ah a luang lut lo (Clause 3.3.3(c)).

3.9.4 **Composite CN.** 3.9.2 aiah composite CN pakhat hman a nih chuan, heti hian chhut tur a ni:

- inzawm nghal tui luh theih lohna hmun tan: CNc = CNp + (Pimp / 100)(98 − CNp);
- tui luh theih lohna hmun pum 30% aia tlem a nih a, a ṭhenkhat inzawm lo a nih chuan: CNc = CNp + (Pimp / 100)(98 − CNp)(1 − 0.5 R),

heta CNp hi tui luh theihna hmun CN a ni, Pimp hi tui luh theih lohna hmun percentage a ni leh R hi tui luh theih lohna hmun pum leh inzawm lo inkar ratio a ni. Composite CN hi retention emaw water quality volume tan hman loh tur a ni.

Hrilhfiahna. Composite equation-te hi TR-55 (USDA SCS, 1986, Ch. 2, Figure 2-3 leh 2-4) aṭanga lak a ni. He Kaihhruaina Bu hian 3.9.2-a entir hran a duh zawk, composite CN chuan tui luh theih lohna chhanna chu hmun pumah a darh a, ruahpui tê aṭanga ruahtui luang a tihtlem avangin. HSG B hmun awl (CNp 61)-a 50% inzawm nghal tui luh theih lohna site tan, ruah 25 mm hian a ṭhen pahnih hrang hranga model a nih chuan ruahtui luang 9.9 mm vel a pe a, mahse composite CN 79.5 nen chuan 1.8 mm vel chauh. 200 mm-ah kalphung pahnih an inang (139.5 mm leh 138.4 mm). *Entirna chauh — design value a ni lo.* Retention leh water-quality volume ruattu ruahpui

zingte tan dik lohna a lian ber. 3.9.3-a inzawm lohna tehna-te hi he Kaihhruaina Bu-in a ruat a ni, US runoff-reduction manual-te hmanna pangngai aṭangin. Tehna (d) hi fûr hun ruahpui ṭan laiin RWH sump-te an khat tih Clause 3.3.3(c) dan zuina a ni.

3.10 Leihnuai tui, leihnuai tui sang leh dil backwater

3.10.1 **Leihnuai tui sang (HSG pahnih).** Hun bik-a leihnuai tui sang ber (seasonal high water table) chu lei chung aṭanga 0.6 m chhunga a awm chuan, lei chu pre- leh post-development run pahnihah, a lei chi eng pawh ni se, HSG D pek tur a ni, Bung 10 hnuaia enkawl hna hmanga chatuana tui tihhul a nih loh chuan. He dan hi darkar 12 emaw a aia rei ruahpui, AMC III-a run (Clause 2.11.4) tan engtik lai pawhin hman a ni.

3.10.2 **Leihnuai tui sang zawng data.** Hun bik-a leihnuai tui sang ber chu fûr hun (April–October) chhunga record sang ber lak tur a ni, site piezometer emaw trial pit aṭangin, emaw Central Ground Water Board (CGWB) emaw IWRD observation well hnai ber aṭangin, lei sang zawng azira siam rem.

3.10.3 **Infiltration-a innghat losses.** SCS-CN aiah Green–Ampt, Horton emaw soil-moisture-accounting losses hman a nih chuan, ruahpui engpawh-a infiltration belhkhawm chu hun bik-a leihnuai tui sang ber chung lama lei khawlna awm aia tam loh tur a ni.

3.10.4 **Dil leh tui awmna backwater.** Site emaw sub-catchment chu tank, dil, tuilum (marsh) emaw tui awmna dang-ah a luang thleng chuan:

- (a) a dawngtu tui awmna tui sang zawng chu Bung 5 leh Bung 7 angin model luanna hnuailam ramri (downstream boundary) atan hman tur a ni;
- (b) design event-a dawngtu tui awmna tui sang zawng hnuaia ram (FTL hnuaia dil kam (foreshore) pawh tiamin) chu tui chung emaw khawlna angin, losses tel lovin model tur a ni; leh
- (c) tui awmna tui sang zawngin outfall a chim (submerged) chuan, routing chuan Clause 3.12.4-a dynamic-wave kalphung a hmang tur a ni.

Hrilhfiahna. Group pahnih dan hi NEH Part 630, Ch. 7 (USDA NRCS, 2009) zuina a ni, chu chuan lei chung aṭanga 60 cm (24 in) chhunga leihnuai tui nei lei hnawngte chu tui tihhul loh dinhmunah group D-ah a dah a, tui tihhul theih hmunah group pahnih (A/D, B/D, C/D) nen. He Kaihhruaina Bu hian Mizoram-a a ngaihna hmunah tui tihhul loh group a hmang, chu chu tlang chhipah ni lovin hmun hniam tlemteah a ni. Tlang chhipah lung chuan tui tlem chauh a dawng: Lunglei district-a Bokabil leh Bhuban tlang chhipte chuan "tui luh theihna leh infiltration hniam" (low permeability and infiltration) an nei a, "ruahtui luang chhuahna zone" (run off zone) angin an awm a, "Ruahtui tam ber chu lei chunga ruahtui luang angin a luang chhuak" (Most of the rain water flows out as surface run-off), "Leihnuai tui hi in tur atan chauh hman a ni" (Ground water is used for drinking purpose only), leh leihnuai tui hmasawnna stage chu 1.37% a ni (CGWB, Ground Water Information Booklet, Lunglei district). Chutah chuan leihnuai tui chu lung ṭhenna, lung chhe leh colluvium-ah a awm a, tuikhur angin a chhuak: tuikhurte chu "lung ṭhenna, lineament leh lung chhe bal ang zone chak lo" (weak zones such as fractures, lineaments and weathered residuum) aṭangin a chhuak a, "Tuikhur tam tak hi kum tluanin a tui a awm" (A large number of springs are perennial), "January aṭanga March chhungin ni khatah liter 3,000 aṭanga 20,000" (3,000 to 20,000 liters per day during the period of January to March) a luang chhuak (CGWB, Lunglei). Tlang pang chhunga tui khawl (perched) emaw tuikhur hnuaia tui chiah chu design-in a hman theih leihnuai tui sang zawng (water table) a ni lo a, Clause 4.11-a tlang dan-in a venhim hlauhawmna a ni. Phai leh lui kam zawlah chuan a dang: Lunglei district-ah phai dil tê-te chuan "lei chung aṭanga 2.0 m hnuai chhungah" (within 2.0 m below ground level) tui an pai (CGWB, Lunglei), chuvangin Sairang, Bairabi, Vairengte, Tlabung leh Chawngte leh Champhai phaiah fûr hunah hun bik-a leihnuai tui sang ber chu lei chung aṭanga 0.6 m chhungah a awm thei a, site test emaw trial pit-in a lantir apiangah Clause 3.10.1 hman a ni. State observation-well network hmuh a ni lo; Mizoram-a observation well-te hi CGWB, North Eastern Region ta an ni a, "Leihnuai tui lak a awm loh avangin tui sang zawng kal dan (trend) pawh hriat theih a ni

lo" (Water level trend is also not available due to lack of ground water abstraction) (CGWB, Lunglei). Khawpui engpawh-a site bik fûr hun leihnuai tui thuk zawng leh hun bik-a leihnuai tui sang ber map hmuh a ni lo [TBC]; Belhchian 3A-in a pe tur a ni. Clause 3.10.4 hian State-a tui dawngtu chi thum a entir. Khawpui drain tam berte chu backwater nei lo lui chhoh takah an luang: Aizawl drain-te chu khawchhak lamah Chite lui kaltlangin Tuirial-ah an luang a, chu chuan khawpui "chhak lam ṭhena thum ṭhena hnih aia tam" (more than two-third of eastern portion) a dawng, leh khawthlang lamah Ser lui leh a lui tê-te kaltlangin Tlawng-ah (Master Plan for Aizawl: Vision 2030), leh master plan chuan Chite, Chanmari, Theihai, Bethlehem, Tuikhurhlu, Mirawng leh Bangla lui chu "fûr hun chhungin tui luan chak tak nen an luang buai" (turbulent with high velocities of currents during the monsoon season) tiin a sawi. Phai khawpuite chu an drain aia sang zawka tui chhuak luipuiah an luang: Khawthlangtuipui kama Tlabung, June 2017-ah sub-division chhunga in 350 vel tui a chim (emaw disaster-management officer-te chhiar dan angin in 9 pumin leh in 60 aia tam ṭhenkhatin; thu hnarte a inang lo) leh July 2019-ah in 400 vel, khawpui chhungah in 150 (chanchin tlangzarh angin) tia report a ni, leh Tlawng kama Sairang leh Bairabi. Leh hmar lam catchment-te chu Tuirial reservoir-ah an luang, NEEPCO-in full reservoir level 90.5 m leh minimum drawdown level 68.0 m inkarah a kalpui a, full load-ah normal tailwater level 30.7 m nen (CERC order in Petition 125/MP/2021), emaw Serlui B reservoir-ah, a tui sang zawng hmuh a ni lo [TBC]. CWC hian State-ah tui sang zawng enna site pasarih a nei a, panga chu hman lo (inactive) tia report a ni, forecasting site a awm lo a, an zinga pakhat mah warning emaw danger level a nei lo; HFL (gauge-a tuilian sang ber) tarlan awm chhun chu Tuirial-a Turial-ah 149.0 m, June ni 17, 1995 (CWC, SANDRP-in a ziah chhawn angin, 2018), datum tarlan a ni lo [TBC]. Chu tui sang zawng leh a chunga reservoir tui sang zawng inzawmna chu thu hnarte-ah tarlan a ni lo a, hetah pawh chhut chhuah a ni lo [TBC]. Tuilian luipui emaw reservoir-a luang thleng site chuan luipui emaw tui khuahna (dam)-in a vawn tui chung a thleng a, Clause 3.12 Hrilhfiahna-a dawngtu tui ṭan tui sang zawng ruat leh Clause 5.8.5-a tailwater hnuaia ram tan Clause 3.10.4(b) hman a ni.

3.11 Unit hydrograph leh ruahtui luang thlak danglamna (transformation)

3.11.1 **Thlak danglamna (transform) phalte.**

- (a) SCS (NRCS) dimensionless unit hydrograph, kawi (curvilinear) emaw triangular, 25 km² aia tlem catchment leh model lian zawk sub-area engpawh tan;
- (b) SWMM non-linear reservoir, kinematic overland flow nen;
- (c) HEC-HMS-a Clark emaw ModClark unit hydrograph, Clause 3.15 hnuaiah parameter calibrate a nih chuan; leh
- (d) CWC synthetic unit hydrograph, 25–5,000 km² tan (Clause 3.11.4).

3.11.2 **SCS unit hydrograph.** Unit hydrograph peak leh peak thlen hun chu heti hi a ni tur a ni:

> qp = PRF′ · A · Q / tp, PRF′ = 0.208 nen (peak rate factor pangngai 484 SI form) tp = Δt / 2 + tL, tL = 0.6 Tc

heta qp hi peak flow (m³/s) a ni; A hi hmun zau zawng (km²) a ni; Q hi ruahtui luang thuk zawng (mm) a ni, unit hydrograph tan 1 mm; tp hi peak thlen hun (h) a ni; leh Δt hi chhutna inkar hun (computation interval, h) a ni.

3.11.3 **Chhutna inkar hun leh sub-area-te.**

- (a) Δt chu sub-area tê ber Tc 0.133 aia tam loh tur a ni a, Clause 2.9.1-a hyetograph (hun hrang hranga ruahtui tlak zat) time step aia tam pawh loh tur a ni.
- (b) Sub-area-te chu HSG, lei khuhna leh tlang pangah inang tawk tur a ni. Tui luh theihna leh inzawm nghal tui luh theih lohna hmunte chu Clause 3.9.2 angin sub-area hrang an ni tur a ni.

3.11.4 **CWC synthetic unit hydrograph.** CWC subzone 2(c) (Barak and others)-a 25–5,000 km² catchment-te tan, chu chuan Mizoram pum a huam a (Clause 2.3.6(b)) CWC-in a tan Flood Estimation Report a tlangzarh lo; subzone 2(b) (South Brahmaputra) report, Mizoram ṭhenkhat mah a awm lohna, chu a aiah a areal reduction curve-te tan leh unit hydrograph endikna atan chauh hman a ni, chuvangin Clause 2.3.3(b)-a endik letna tan CWC point rainfall a awm lo:

- (a) SUH parameter, design ruahpui duration, loss rate, base flow, areal reduction leh time distribution chu CWC Flood Estimation Report hman tur aṭanga lak tur a ni, survey emaw DEM aṭanga catchment physiographic parameter teh hmangin;
- (b) darkar 24 design ruahtui tlak chuan Clause 2.3.3(b) leh Clause 2.7.3 a zui tur a ni a, Clause 2.8-a climate factor hman tur a ni;
- (c) SUH result chu dinhmun pianphung awm mek tan HEC-HMS emaw SWMM result bulah report tur a ni; leh
- (d) hydrograph model-in CWC SUH aiin 1% AEP peak hniam zawk a pek chuan, designer chuan Clause 3.15 hnuaia calibration hmangin model a finfiah tur a ni, a nih loh chuan CWC SUH peak a hmang tur a ni.

3.11.5 **Coastal ram phei tan peak rate factor.** Factor pangngai (484; PRF' = 0.208) hi default a ni. Factor hniam zawk chu heti chauhin hman theih a ni:

- (a) channel nei lo, pipe emaw drain lined nei lo coastal-plain ram phei tan;
- (b) channel nei lo ram reng reng tan pre- leh post-development run pahnihah kawng inang takin; leh
- (c) authority-in Belhchian 3D-a calibrate value-te a pawm hnuah.

Post-development dinhmuna pipe, drain lined emaw kerb-in a tihhul ram chuan factor pangngai a hmang tur a ni.

> Hrilhfiahna. SCS unit hydrograph, lag ratio 0.6 leh 0.133 Tc interval hi NEH Part 630, Ch. 16 (USDA NRCS, 2007) aṭanga lak a ni. Interval hi unit hydrograph geometry aṭanga lo chhuak a ni: tp = Δt/2 + 0.6 Tc leh Tc + Δt = 1.7 tp nen, Δt = 0.133 Tc. SI constant 0.208 hi 484 (cfs, mi², in, h) thlak chiahna a ni. APWA chuan SCS dimensionless unit hydrograph a innghahna atan a hmang (2011, §5602.5). CWC Flood Estimation Report-te hian subzone tin tan SUH parameter regression equation, design ruahpui duration, loss rate nghet leh ARF leh time-distribution curve an pe (CWC 2000; Bung 2 en rawh). Catchment pianphung, a tam zawk thingtlang, kum 2000 report hmaa data aṭanga siam an ni a (a gauge catchment 14-te hi Mizoram pawna bridge site an ni, kum 1961 aṭanga 1983 thleng railway bridge-ah leh kum 1981 aṭanga national-highway bridge-ah gauge, leh pakhat mah Mizoram aṭanga luang lo; CWC hian State huamtu subzone 2(c) tan report a tlangzarh lo), chuvangin pre-development dinhmun an entir a, khawpui dinhmun ni lovin. Chuvang chuan SUH hi post-development model atan ni lovin benchmark atan hman a ni. Clause 3.11.4(d) hian Clause 2.3.3-a hniam ber (floor) dan a entir. India zirchianna-ah HEC-HMS hi CWC subzone SUH chhanna nen calibrate a ni tawh a, chu chuan an pahnih inzawm theih a lantir.

3.11.5-a factor hniam zawk duhthlanna hi NRCS Delmarva unit hydrograph-ah a innghat, chu chuan Delmarva Peninsula-a channel ṭha nei lo coastal-plain catchment phei tan peak rate factor 284 (PRF' ≈ 0.122) a hmang (Welle et al., 1980, NRCS-in a hman angin; New Jersey Department of Agriculture, Delmarva bulletin, 285 hmang). Factor hniam zawk chuan peak hniam zawk leh tlai zawk a pe. Pre-development run-ah chauh hman chuan Q_pre a tihniam ang a, release cap a tikhauh ang; pipe nei post-development run-ah hman chuan Q_post a tlem lutuk ang. Clause 3.11.5(b) hian a pahnih hi a veng.

3.12 Routing

3.12.1 **Storage routing.** Detention leh retention facility, dil (tank), pond leh embankment hnung lama khawlna engpawh kaltlang routing chuan level-pool (modified Puls, storage-indication) routing a hmang tur a ni, heng nen:

- (a) design lei siam (grading) emaw survey aṭanga stage–storage inzawmna;
- (b) outlet (luan chhuahna) tin (orifice, weir, surplus weir, pump) tan stage–discharge inzawmna, Bung 4-a orifice tê ber leh trash screen pawh tiamin; leh

- (c) tailwater-in outlet rating a nghawng chuan, Bung 5-a tailwater ramri.

3.12.2 **Channel routing.** Channel leh drain kaltlang routing chuan Muskingum–Cunge kalphung, emaw channel geometry emaw calibration aṭanga parameter K leh X siam Muskingum kalphung a hmang tur a ni. Muskingum kalphung tan, routing interval Δt chuan $2KX \le \Delta t \le 2K(1 - X)$ a tlin tur a ni.

3.12.3 **Khawlna awm ve mai (incidental storage).** Kawng embankment, culvert emaw ramri bang hnunga khawlna, phalna pek facility ṭhenkhat ni lo, chu design-ah chhiar tel loh tur a ni, design life chhung enkawl a nih tur authority-in a rin tlat loh chuan.

3.12.4 **Dynamic-wave routing.** Dynamic-wave (full Saint-Venant) routing, SWMM emaw HEC-RAS unsteady flow-ah, heng hmunah hian hman tur a ni:

- (a) outfall chu tidal, luipui emaw dil backwater hnuaia a awm (Bung 5, Clause 3.10.4);
- (b) tui luang a kir let thei, emaw network-in loop emaw overflow link a nei; emaw
- (c) design event-ah network a surcharge (tui khat luat a nek chhuahna) a, hydraulic grade line-in design a ruat.

3.12.5 **Dil cascade.** Cascade-a dil tin chu Clause 3.12.1 angin route tur a ni, surplus weir leh sluice rating leh Bung 7-a operating rule ziak nen. Dil tin-a ṭan tui sang zawng chu FTL a ni tur a ni, continuous simulation (Clause 3.13)-in tui sang zawng hniam zawk a finfiah loh chuan.

> Hrilhfiahna. Khawlna tan modified Puls routing leh channel tan Muskingum–Cunge hi APWA phut a ni (KC Metro APWA 5600, 2011, §5602.8). APWA hian embankment hnunga "detention awm ve mai" (incidental detention) pawh enkawl a nih tur loh chuan a paih a, chu chu 3.12.3-in a hmang. CPHEEO detention kalphung hian 3.12.1 ang input pathum a hmang: inflow hydrograph, stage–storage curve leh stage–discharge curve (CPHEEO 2019, Part A §8.5.3). Muskingum nghetna ramri hi pangngai a ni (Chow, Maidment leh Mays, 1988, §8.4). He Kaihhruaina Bu hian 3.12.5-ah dil, reservoir leh detention pond-te chu an outlet emaw kalpui tui sang zawngah a ṭan tir, Mizoram-ah ruahpui nasa chu lei ro chungah ni lovin hun hnawng chhungah a lo thlen avangin: leimin tichhuaktu ruahpui chu ni tam tak a rei, June ni 1–13, 2018 chhunga Serchhip district-a 677 mm sur (SANDRP, chanchin tlangzarh angin) leh May ni 24, 2025 aṭanga June ni 3, 2025 thleng ruahpui, leimin 598 thlentu (DM&R figure, chanchin tlangzarh angin) ang hi. State-ah dil cascade hmuh a ni lo (NEER chhiar dan), leh State-a dil pakhat mah operating rule ziak, tui sang zawng record emaw stage–storage inzawmna nei hmuh a ni lo, leh pakhat mah tuilian thunun nana kalpui hmuh a ni lo [TBC]. Chuvangin ṭan tui sang zawngte chu heti hi an ni (he Kaihhruaina Bu-in a ruat):
>
> - **Dil** (lake emaw pond; dil tê, dil tê emaw tank tê), Saitual bula Tam Dil, Fisheries Department-in sangha khawlna reservoir atana a siam ṭhat leh (chanchin tlangzarh angin; a zau zawng hmuh a ni lo [TBC]), emaw Siaha district-a Palak Dil, Mara Autonomous District Council ram chhungah (Pala Wetland, Ramsar site no. 2484, a Ramsar Information Sheet angin August ni 31, 2021-a thlan, thu lak chhawn angin, leh July ni 26, 2022-a puangchhuak, chanchin tlangzarh angin; tui awmna 135 ha vel), ang hi fûr hun chhung zawng chu a outlet emaw a liamna (spill) tui sang zawng thleng a khat angin ṭan tir tur a ni. Dil pianphung chuan a hming ngei a vawng a, engtikah mah detention pond-ah chantir a ni lo.
> - **Detention pond** outlet zalen (free outlet) kaltlanga luang chhuak chu a outlet hniam ber tui sang zawngah ṭan tir a ni a, phaia luipuiah (Sairang, Bairabi, Vairengte, Tlabung, Chawngte emaw Champhai phai) flap gate nei outfall kaltlanga luang chhuak chu outfall a khar apiangin, Clause 5.8.5(c) leh (d)-a duration chhung, a outlet thleng a khat angin ṭan tir a ni.
> - **Tuirial reservoir** (NEEPCO Tuirial hydroelectric project, Tuirial (Sonai) chungah, Kolasib district-ah) hian full reservoir level 90.5 m leh minimum drawdown level 68.0 m a nei a, full load-ah normal tailwater level 30.7 m nen, 75 m zoned earth-fill tui khuahna (dam), open chute spillway nei hnungah (CERC order in Petition 125/MP/2021). A operator-in maximum water level a tlangzarh ziak tui sang zawngah ṭan tir a ni a, chu hma chu a full reservoir level 90.5 m-ah; minimum drawdown level chu ṭan tui sang zawng atan hman a ni lo, reservoir hi tuilian khawlna atan ni lovin electric siam nan vawn a nih avangin. Maximum water level, spillway design flood emaw tui luan chhuah tir dan (release rule) hmuh a ni lo [TBC].

- **Serlui B reservoir** (Kolasib district; tui khuahna sang 51.3 m leh dung 293 m tia report, chanchin tlangzarh angin) chu a operator-in full emaw maximum level a tlangzarh hma chu a spillway crest survey-ah ṭan tir a ni; a full leh maximum water level hmuh a ni lo [TBC].
- Tui khuahna pahnih tui luan chhuah tirte hi Clause 5.8.5(e)-a tailwater a ni, khawpui tana khawlna a ni lo. Tuirial tui khuahna dam-break zirchianna chuan "lui inkawpna bulah" (near the confluence) peak 3,035.34 m³/s a route (IAHR abstract, 2025, chanchin tlangzarh angin); he Kaihhruaina Bu design tui luang a ni lo.

Gate nei reservoir chu a operator aṭanga gate dan nen model a ni a, tui awmna chu Clause 3.13 hnuaia continuous simulation emaw notify (Gazette-a tarlan) a nih operating rule-in a finfiah hmunah chauh heng tui sang zawng hnuaiah model a ni. Clause 3.13.5(a)-a April ni 1 aṭanga October ni 31 thleng hun chu he Kaihhruaina Bu-in a ruat a ni a, he Kaihhruaina Bu fûr hun a ni. April ni 1-ah a ṭan, south-west monsoon nen ni lovin, April leh May ruahpui-te hi State-a ruahpui tichhe nasa ber zingah an tel avangin: April ni 27–28, 2026 ruahpui avangin district panga aṭanga pakua thlengah school chawlh tir a ni (Serchhip 70.5 mm leh Hnahthial 55 mm, chanchin tlangzarh angin), leh State-a ruah thil thleng ni chiang nei thihna tam ber zawng zawng chu May-ah a tla, Aizawl-a Laipuitlang lungpui tlak (rockslide) (chanchinbu-te angin May ni 11, 2013, emaw chanchinbu pakhat angin May ni 15, 2013; ni a inang lo), May ni 28, 2024-a Cyclone Remal leh May ni 24, 2025 aṭanga June ni 3, 2025 thleng ruahpui (chanchin tlangzarh angin). Aizawl tan IMD normal onset date hmuh a ni lo [TBC]; 2026-ah monsoon chu June ni 6 vel khan Mizoram a thleng (chanchin tlangzarh angin), leh CGWB chuan "May aṭanga September tawp lam thleng ruahpui" (heavy rainfall during May to late September) a sawi (Lunglei district booklet). October ni 31-ah a tawp, fûr hnu (post-monsoon) cyclone-te hi hlauhawmna pahnihna an nih avangin: "fûr hnu hun (October aṭanga December) cyclone-te hi fûr hma hun (April leh May) cyclone-te aiin an nasa zawk" (the cyclones of the Post Monsoon season [October to December] are more intense than those of Pre-Monsoon season [April & May]) (Mizoram Agriculture Department, NAFCC project report, 2016), leh October 2025-ah Chawngte-ah ni khatah 130 mm a sur (chanchin tlangzarh angin); Aizawl normal withdrawal date hmuh a ni lo [TBC]. Flap gate, rack leh pump engpawh hi April ni 1 aṭanga October ni 31 thleng inpeih reng (standby) an ni (Bung 10).

3.13 Continuous simulation

3.13.1 **A ngaih hun.** Continuous simulation chu design ruahpui zirchianna bakah heng tan hian tih tur a ni:

- (a) 25 km² aia tam luang lut regional facility-te; leh
- (b) design-a a khawlna chhiar tel dil cascade nei system engpawh (Bung 7).

Authority chuan ṭan khawlna tui sang zawngin design a thununna facility engpawh tan pawh a phut thei.

3.13.2 **Ruahtui tlak input.**

- (a) IMD emaw phalna pek recording gauge dang, catchment entir thei aṭanga darkar tin record rei ber awm chu hman tur a ni.
- (b) Darkar tin data kum 30 aia a tawi chuan, record chu IMD 0.25° grid ni tin data hmangin tihzau tur a ni. Grid record pum (1901 aṭanga tun thleng) hman a ṭha; a hnuhnung ber kum 30 tal chu hman tur a ni. Ni tin data chu thehluh tura tarlan kalphung hmangin darkar tin-ah ṭhen tur a ni a, kum inkawp chhung darkar tin gauge nen endik tur a ni. Grid value-te chu a remchanna apiangah Clause 2.7.1 hnuaiah point value-ah thlak tur a ni.
- (c) Hmalam boruak (future-climate) run chuan record chu Clause 2.8-a climate factor-te hmangin a scale tur a ni.

3.13.3 **Model chhunga thil awm tur.** Model chuan evaporation nen soil-moisture accounting (IMD pan evaporation emaw a tluk), leihnuai tui emaw base flow, operating rule leh lo tan tui lak (irrigation withdrawal) nen dil khawlna, leh Bung 5-a tailwater series (coastal outfall tan tide sawi lawk leh surge allowance) a huam tur a ni.

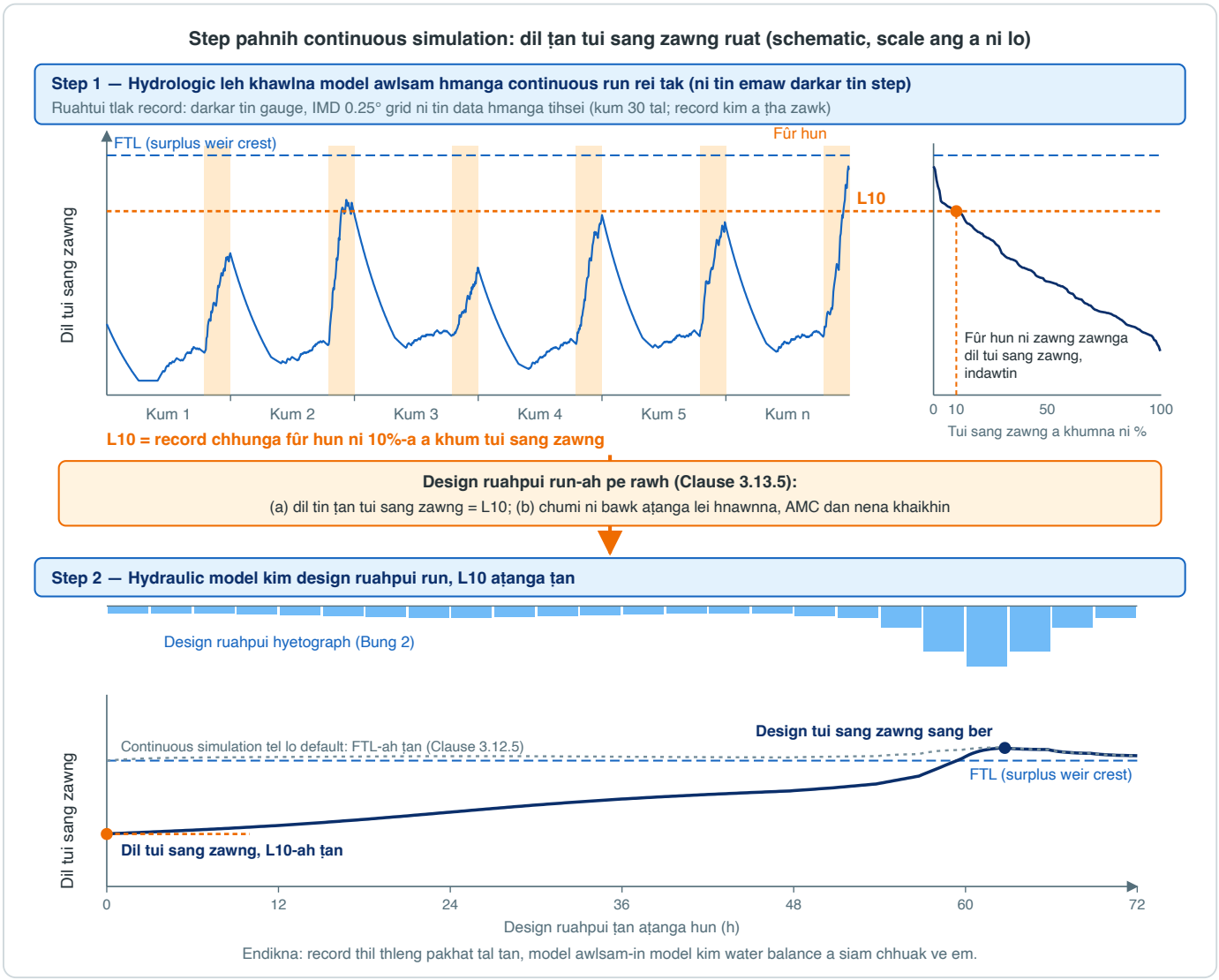
3.13.4 **Result hman dan.** Kum tin tui sang zawng, khawlna leh tui zat sang ber, leh outfall khar rei zawng chu lak chhuah tur a ni a, frequency analysis hmangin fit tur a ni. Result-te chu design ruahpui result nen khaikhin tur a ni. AEP tin-ah result nasa zawk chuan a thunun ang. Ni khat aia tawi chhanna hun (response time) nei drain leh channel-a peak flow-

te chu, continuous record chu ni tin data aṭanga ṭhen a nih chuan, design ruahpui zirchianna aṭanga lak tur a ni, darkar tin peak ṭhen chhuahte hi siam (synthetic) an nih avangin.

3.13.5 **Step pahnih kalphung.** Continuous simulation chuan hydraulic model pum a hman ngai lo. 3.13.3-a lei hnawnna, leihnuai tui, dil khawlna, operating rule leh tailwater entirtu, ni tin emaw darkar tin step-a hydrologic leh khawlna model awlsam a hmang thei. A result-te chu hydraulic model pum design ruahpui run-ah heti hian pek tur a ni:

- (a) **dil tin ṭan tui sang zawng**, record chhunga April ni 1 aṭanga October ni 31 thleng ni 10%-a a khum tui sang zawng angin lak; leh
- (b) **ruahpui hma lei hnawnna dinhmun**, ni inang aṭanga lak, Clause 3.8-a AMC dan nen khaikhin.

Designer chuan model awlsam chuan event record pakhat tal tan model pum water balance a siam chhuak leh thei tih a lantir tur a ni.

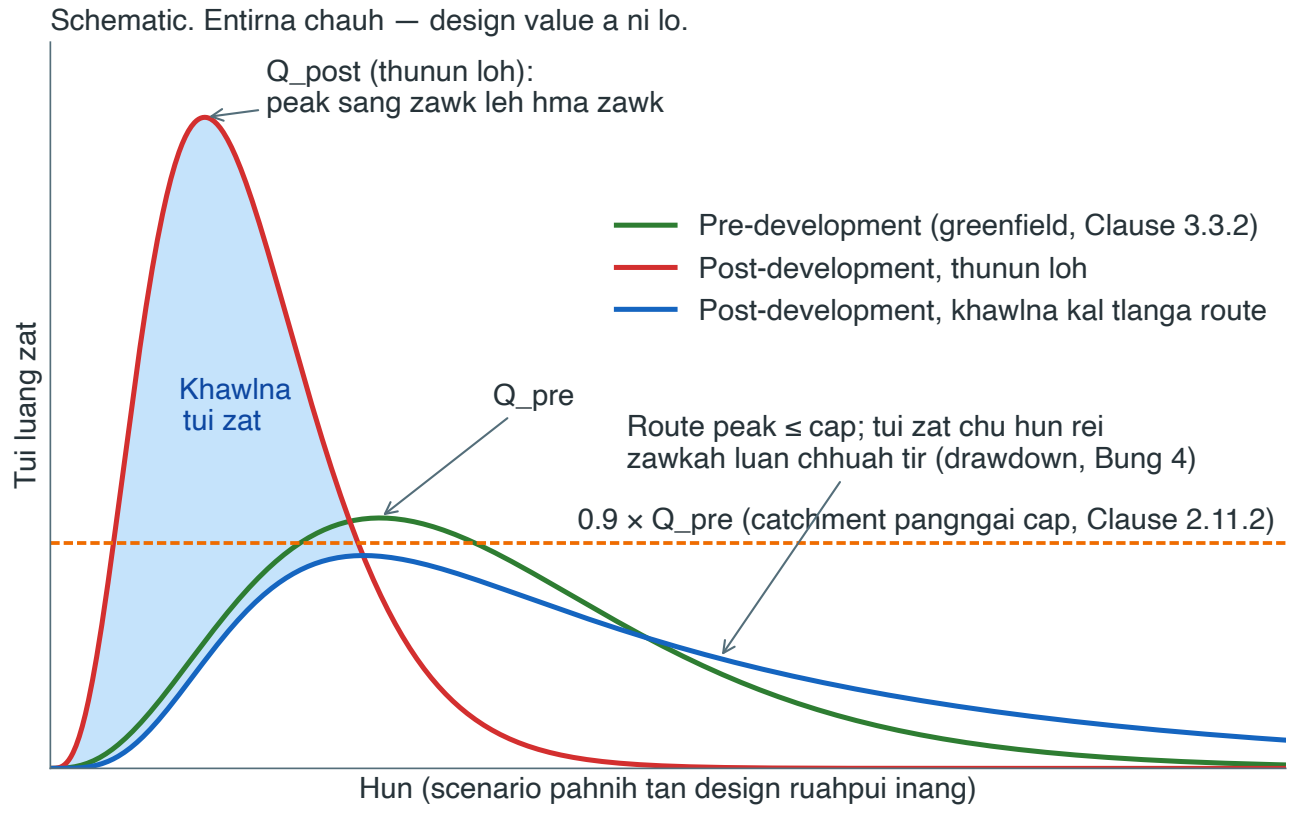


Milem 3.4 — Clause 3.13.5-a step pahnih kalphung. Step 1: hydrologic leh khawlna model awlsam hmanga continuous run rei tak chuan April ni 1 aṭanga October ni 31 thleng ni 10%-a a khum dil tui sang zawng (L10) a pe. Step 2: design ruahpui-te chu chu ṭan tui sang zawng aṭangin hydraulic model pumah run a ni, Clause 3.12.5-a FTL-a ṭan default aiah. Schematic, data dik tak a ni lo. He Kaihhruaina Bu tana milem siam thar, Clause 3.13.5-a he Kaihhruaina Bu-in a ruat step pahnih kalphung entirna.

Hrilhfiahna. Design ruahpui chuan ṭan dinhmun pakhat a ngai a, mahse dil cascade-ah thununtu variable chu ruahpui a lo thlen laia dil-te an khat zawng a ni a, chu chu a hmaa kar tam tak ruah azirin a ni. Australia-a on-site detention system dik tak 20 zirchianna chuan temporal pattern pakhat, emaw pasawm ensemble pawh, innghat design-te chuan ruahtui tlak dik takah "hun zawng zawnga hna thawk thei tur OSD system design rin tlak takin a siam chhuak thei lo" (cannot reliably produce an OSD system design that will always be effective) tih a hmu a, continuous simulation chuan event zing peak-te pre-development level a khum ṭhin tih a lantir (Water Science and Engineering, 2019). 3.13.2(b)-a kum 30 hniam ber hi Clause 2.3.2-a station IDF dan nen a inmil; record rei zawk a ṭha zawk a, IMD grid ni tin record, 1901-a ṭan, hi Mizoram tan series rei hman theih a ni. Record rei zawng hi simulation hman tum aiin a pawimawh lo. Hetah a tum ber chu fûr hun ruahpui a lo thlen laia dil leh lei-te a pangngaiin eng chen nge an khat leh, ruah nasa leh outfall khar eng zat nge an inrual ṭhin tih hriat a ni. Design ruahpui chuan zawhna pahnih zinga pakhat mah a chhang thei lo, ṭan dinhmun ngaih pakhat aṭanga a ṭan avangin. Khawpui drain-a peak flow tan design ruahpui thlak tumna a ni lo. Chuvangin Clause 3.13.5 hian run rei chu khawlna model awlsam, minute tlemte chauh la, hmangin siam a phal a, ṭan dil tui sang zawngte chu hydraulic model chipchiar, design ruahpui tan chauh run, ah a pe. Khawpui 1D–2D model chipchiar kum sawm tam tak chhung continuous taka run hi a tih theih tlem a, phut a ni lo. 3.13.5(a)-a 10% exceedance level hi he Kaihhruaina Bu-in a ruat a ni: fûr hun hnawng mahse danglam bik lo a entir a, design ruahpui chuan dil khat tawh hle a tawk nan, June 2018-a an awm ang khan, Serchhip district-ah June ni 1–13 chhungin ruah 677 mm a sur (SANDRP, chanchin tlangzarh angin), mahse chu thla tan dil emaw Tuirial reservoir tui sang zawng record hmuh a ni lo [TBC].

3.14 Pre- leh post-development khaikhinna kalphung

3.14.1 Clause 2.11 leh Bung 4-in a phut khaikhinna chu heng step-te hmangin tih tur a ni. Result-te chu Form 3-2-ah ziah tur a ni.



Milem 3.5 — Design ruahpui inang tan pre-development, thunun loh post-development leh route post-development hydrograph-te. He Kaihhruaina Bu tana milem siam thar, CPHEEO, Manual on Storm Water Drainage Systems, Part A §8.5, 2019, leh KC Metro APWA Section 5600, 2025.01-a pre- leh post-development detention ngaihdan aṭanga siam danglam. Schematic. Entirna chauh — design value a ni lo.

3.14.2 **Step 1 — Site, catchment leh khaikhinna hmun-te tarlan.**

- (a) Site leh a luang lut hmun tin chu survey aṭangin ramri siam rawh.
- (b) Site aṭanga ruahtui luang chhuahna POC tin hmu chhuak rawh. POC tin chu hrang hranga test tur a ni. Tehna tlin nan ruahtui luang chu catchment pianphung pakhat aṭanga dang-ah luan peng tir loh tur a ni.
- (c) Site pawn lam aṭanga luang lut chu run pahnihah inang takin, a dinhmun awm mek angin model rawh (Clause 3.3.5(b)). Site khawlna a kaltlang chuan, tehna chu POC-a tui luang chhuak pumah hman a ni.

3.14.3 **Step 2 — Lei.** HSG map siam rawh (Clause 3.7), leihnuai tui sang dan (Clause 3.10.1) hmang rawh, leh infiltration test-te ziak rawh.

3.14.4 **Step 3 — Pre-development model.** Clause 3.3.2 angin pre-development model siam rawh: greenfield CN (Table 3.5), Tc (Clause 3.6, n = 0.15 nen), leh tui awmna leh channel awm mekte. AMC II leh AMC III-ah CN chhut rawh.

3.14.5 **Step 4 — Post-development model.** Clause 3.3.3 angin post-development model siam rawh: tui luh theih lohna hmun teh, inzawmna (Clause 3.9), lei tihbuai HSG, CN, Tc, leh retention, detention leh outlet rawtte khawlna angin (Clause 3.12.1).

3.14.6 **Step 5 — Design ruahpui.** Bung 2 aṭangin, AEP phut tin (50%, 10% leh 1%; kum 2, 10 leh 100) leh duration tin {1, 2, 3, 6, 12, 24, 48, 72 h} tan heng hi buatsaih rawh:

- climate factor (Clause 2.8) nena ruahtui tlak zat, site tan ARF = 1.0 (Clause 2.7.4);
- hyetograph (Clause 2.9); leh
- AMC (Clause 2.11.4).

Run pahnihah ruahpui inang hman tur a ni (Clause 2.11.1).

3.14.7 **Step 6 — Pre-development model run rawh** ruahpui tin tan, leh Q_pre(T, d) table-ah dah rawh. Tuilian hlauhawm catchment (flood-sensitive) tan, duration zawng zawnga 10% AEP pre-development peak lian ber hmu chhuak rawh; chu value chu Clause 2.11.3-a cap a ni.

3.14.8 **Step 7 — Thununna tel lovin post-development model run rawh** leh Q_post(T, d) leh ruahtui luang tui zat table-ah dah rawh. Hei hian harsatna lenzawng a lantir a, report a ni a, test a ni lo.

3.14.9 **Step 8 — Retention leh detention belh rawh.**

- (a) Bung 4-a retention volume chu Bung 4 hnuaia finfiah hun chhungin infiltration emaw hman lehna (reuse)-ah bo khawlna angin (POC-ah luan chhuah tir loh) entir rawh.
- (b) Hydrograph la bang chu detention khawlna leh outlet-te kaltlangin route rawh (Clause 3.12.1).
- (c) Outfall chu tidal a nih emaw backwater hnuaia a awm chuan, Bung 5-a tailwater, Clause 2.12-a joint case-te pawh tiamin, hmang rawh.
- (d) Step 9 a tlin thleng khawlna leh outlet-te siam rem rawh.

3.14.10 **Step 9 — Tehna test rawh** POC tin-ah, AEP tin leh duration tin tan:

- (a) catchment pangngai: 50%, 10% leh 1% AEP tan Q_post(T) ≤ 0.9 × Q_pre(T) (Clause 2.11.2);
- (b) tuilian hlauhawm catchment: Q_post(1% AEP) ≤ Q_pre(10% AEP), leh Q_post(50% AEP) ≤ Q_pre(50% AEP) (Clause 2.11.3).

Khawlna tan duration thununtu chu khawlna lian ber mamawh emaw tui sang zawng sang ber petu hi a ni; darkar 24, 48 leh 72 run-te chu report reng a ni (Clause 2.5.2).

3.14.11 **Step 10 — Sensitivity run.** Ruahpui thununtu tan Step 6–9 chu Ia = 0.05S nen (Clause 3.8.5) leh, peak rate factor hniam zawk hman a nih chuan, factor pangngai nen (Clause 3.11.5) nawn leh rawh. Peak leh khawlna mamawh danglamna report rawh.

3.14.12 **Step 11 — Endikna inzawm.** Route model hnuhnung ber hmangin, Bung 4-a drawdown hun (drawdown time), orifice tê ber leh emergency spillway, Bung 5-a outfall khar endikna, leh Bung 5-a luanna hnuailam zirchianna endik rawh.

3.14.13 **Step 12 — Ziak rawh** result-te chu Form 3-1 leh 3-2-ah (Clause 3.17).

> Hrilhfiahna. Step indawt hi event-a innghat hna kalphung pangngai zuina a ni: ramri siam; pre-development CN leh Tc ruat; post-development CN leh Tc tawi zawk ruat; unit hydrograph emaw kinematic model kaltlangin ruahpui inang run; peak leh tui zat khaikhin; leh modified Puls routing hmangin khawlna size ruat. Mizoram thil-te a belh: darkar 48–72 ruahpui, AMC III, leh tailwater. Milem 3.5-in duration rei run-te a pawimawh chhan a lantir: route peak chuan cap a tlin thei a, khawlna chuan post- leh pre-development hydrograph inkar tui zat danglamna a khawl a, chu chu Bung 4 ramri chhungin a hul ngei ngei tur a ni. 3.14.2(b)-a catchment inkara ruahtui luang luan peng tir khapna hian site-in POC pakhatah dan a tlin nan tui luang chu a vengte drain-ah a sawn a dang.

3.15 Model calibration leh validation

3.15.1 **A ngaih hun.** Calibration leh validation hi heng tan hian a ngai:

- (a) 25 km² emaw a aia lian catchment model;
- (b) regional facility leh Clause 3.13 hnuaia continuous simulation;
- (c) khawpui emaw basin tui luanna master plan; leh
- (d) he Bung default aṭanga parameter danglam nei model engpawh (entirnan Clark transform emaw peak rate factor hniam zawk).

3.15.2 **Data.** Calibration chuan ruahtui tlak hmuh (gauge, leh a awmna apiangah radar) leh tui luang emaw tui sang zawng hmuh (IWRD gauging site, Aizawl Municipal Corporation emaw MSDMA level sensor, dil gauge, emaw tuilian chhinchhiahna survey) a hmang tur a ni.

3.15.3 **Event-te.** Calibration tan event inzawm lo pathum tal hman tur a ni a, validation tan event dang pakhat tal. Event pakhat tal chu fûr emaw cyclone event duration rei a ni tur a ni (entirnan May ni 28, 2024 (Cyclone Remal), May ni 24, 2025 aṭanga June ni 3, 2025 thleng, June 2018, July 2019 leh June 2017, data a awmna apiangah).

3.15.4 **Hnathawh ṭhatna (performance).** Thehluh tur chuan event tin tan peak, tui zat leh peak thlen hun hmuh leh model-a lo chhuak, leh continuous model tan Nash–Sutcliffe efficiency (NSE) leh percent bias a report tur a ni. Kaihhruaina atan, calibrate model chuan event peak leh tui zat ±25% chhungin a siam chhuak a ṭha, leh continuous model chuan NSE ≥ 0.5 leh percent bias ±25% chhung a thlen a ṭha.

3.15.5 **Calibration ramri.** He Bung default kalphung-in a pek aia design tui luang hniam zawk hman chhan atan calibration hman loh tur a ni, site bik chhan-te chipchiar taka zirchian leh ziak a nih a, authority a remtih loh chuan.

3.15.6 **A awm dan dik endikna.** Design peak flow-te chu catchment hmun zau zawng nen hmun zau zawng unit tin-a tui luang zat angin plot tur a ni a, CWC SUH result, region gauge chhut leh tuilian hriat lar hlui-te nen khaikhin tur a ni.

> Hrilhfiahna. Clause 3.15.5 leh 3.15.6 hi APWA zuina a ni, chu chuan "baseline unit hydrograph kalphung-in a pek aia hniam tui luang chhut dik tihna atan model calibration hman loh tur a ni" (model calibration shall not be used to justify discharge estimates that are lower than those provided by the baseline unit hydrograph method) a ti a, unit discharge chu luang lut hmun zau zawng nena plot a, regression, gauge leh hun hlui value-te nena khaikhin a

phut (KC Metro APWA 5600, 2011, §5602.9). 3.15.3 leh 3.15.4-a event zat leh performance value-te hi he Kaihhruaina Bu-in a ruat a ni. NSE ≥ 0.5 leh ±25% bias ramri-te hi Moriasi et al. (2007)-a "lungawi awm" (satisfactory) streamflow rating an ni a, thla tin continuous simulation tan siam an ni; hetah event peak leh tui zat tana an hman hi a tihzauhna a ni.

3.16 Software lo pawmna

3.16.1 **Software lo pawm.** Heng hi finfiahna dang ngai lovin lo pawm an ni, thehluh hun laia version hman mek nen:

- (a) EPA Storm Water Management Model (SWMM 5.x);
- (b) USACE HEC-HMS leh HEC-RAS;
- (c) USDA NRCS WinTR-55 leh WinTR-20; leh
- (d) Rational Method leh area pakhat SCS-CN chhutna tan spreadsheet, formula leh input tin lantir nen.

3.16.2 **Software dang.** SWMM emaw HEC engine chunga siam commercial package-te chu engine leh version tarlan a nih chuan lo pawm a ni. Kalphung emaw software dang reng reng chu designer-in sub-area tin tan, chu kalphung leh 3.16.1-a baseline kalphung pakhat aṭanga peak flow, lag, ruahtui luang tui zat leh CN tluk a report a, 5% aia tam danglamna tin a tarlan a, result fimkhur lo zawk petu danglamna tin chhan a sawi fiah chauhin lo pawm a ni.

3.16.3 **Benchmark test problem (software enchhinna atana chhut tur).** Authority chuan benchmark test problem (Belhchian 3C) a tlangzarh tur a ni. 3.16.1-a tarlan loh software chuan tarlan tolerance chhungin a siam chhuak leh tur a ni.

3.16.4 **Model file.** Hydrograph-a innghat design tin nen model input leh output file pangngai (native) thehluh tur a ni.

> Hrilhfiahna. 5% inanna test hi kalphung dang tan APWA dan a ni (KC Metro APWA 5600, 2011, §5602.2D). APWA chuan TR-55, TR-20, HEC-1 leh HEC-HMS chu baseline kalphung angin a sawi (§5602.2B). CPHEEO chuan hydrograph leh continuous model tan SWMM a sawi (CPHEEO 2019, Part A §4.4.2). Model file pangngai thehluh hian authority-in model a run nawn theih a, endik theih loh black-box result laka venhimna ber a ni.

3.17 Thuziak buatsaih (documentation)

Hydrology thehluh tur tin-ah heng hi a tel tur a ni:

1. **Form 3-1, Hydrology Chhutna Tlangpui**, kalphung hman leh a chhan (Table 3.1), software leh version, leh chhutna inkar hun tarlanna.
2. **Catchment map** pre- leh post-development dinhmun tan, sub-area, Tc tana tui luan kawng hman, POC leh site pawn lam aṭanga luang lut lantirna.
3. **Lei:** HSG map leh a hnar leh scale (Clause 3.7), leihnuai tui sang zawng data (Clause 3.10), leh infiltration test result.
4. **Parameter table** sub-area leh dinhmun tin tan: hmun zau zawng, chi leh inzawmna azira tui luh theih lohna hmun, HSG, AMC II leh III-a CN (emaw C leh Cf), Tc worksheet, leh n value.
5. **Ruahtui tlak:** Design Ruahtui Tlak Sheet (Form 2-1) leh hyetograph hmante.
6. **Result:** ruahpui tin tan hydrograph table leh plot; stage–storage leh stage–discharge table; route outflow; leh tui sang zawng sang ber.
7. **Form 3-2, Hmasawnna Hma leh Hnu Khaikhinna**, POC, AEP leh duration tin tan Q_pre, Q_post (thunun loh leh route) leh tehna, leh Clause 3.14.11-a sensitivity run nen.
8. **Calibration report**, Clause 3.15 a hman chuan.

9. **Model file** (Clause 3.16.4).
10. **Engineer mawhphurtu thusawi**, he Bung kalphung leh parameter-te hman a nih thu, a dan zawm lohna (departure) engpawh tarlan leh a chhan sawi nen.

Thu hnar (bung)

- MoHUA / CPHEEO (2019). Manual on Storm Water Drainage Systems, Volume I, Part A: Engineering Design. Ministry of Housing and Urban Affairs, New Delhi. §4.4 (Rational Method, Table 4.2 runoff coefficient, time of concentration, partial area effect), §8.5 (detention).
- Kansas City Metro Chapter APWA (2011). Section 5600 Storm Drainage Systems and Facilities (Feb 16, 2011), §5602.2–5602.9.
- Kansas City Metro Chapter APWA (2025). Section 5600 Storm Drainage Systems and Facilities, Version 2025.01, §5603.4. https://kcmetro.apwa.org/wp-content/uploads/sites/23/2026/01/APWA-Section-5600_Storm-Drainage-Systems-Facilities.pdf
- Mid-America Regional Council (2025). APWA Stormwater Standards Supplement (Policy Supplement). https://www.marc.org/document/apwa-stormwater-standards-supplement
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Belhchian leh Form

Belhchian / Form	A chhunga thu
3A	Mizoram lei series aṭanga HSG zawnna (lookup); hun bik-a leihnuai tui sang ber map
3B	Mizoram CN calibration leh lei khuhna dang (supplementary land cover) (tlang ramngaw leh ramhnuai, lo neihna ram (shifting cultivation), leimin hnu leh leimin bal, tlang kawng leh railway lei laih leh lei vur, terrace lei laih leh lei vur tlang pang, lung laihna (quarry) hmai leh a bal, Champhai phai buh chinna, leh dil leh reservoir kam)
3C	Software lo pawmna tan benchmark test problem

Belhchian / Form	A chhunga thu
3D	Coastal ram phei tan peak rate factor zirchianna
3E	Subzone 2(b) tan CWC SUH parameter, subzone 2(c)-ah endikna atan hman, entirna chhut nen
Form 3-1	Hydrology Chhutna Tlangpui
Form 3-2	Hmasawnna Hma leh Hnu Khaikhinna

BUNG 4

Site Ruahtui Luang Thunun: Retention leh Detention

4.1 A tum leh a huam chin

4.1.1 He Bung hian dan hnuaia awm development (hmasawnna hna) zawng zawngin site aṭanga ruahtui luang (runoff) chhuak chungchangah an zawm tur performance standard a ruat. A huam chin chu:

- (a) ruahtui luang thununna hmalakna hman tur indawt dan (Clause 4.3);
- (b) ruah tlak fo ṭhin retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw), leh tui khawl zat chu detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) aṭanga credit a nih dan (Clause 4.4);
- (c) catchment (ruahtui luan khawmna hmun) pangngai leh tuilian hlauhawm catchment (flood-sensitive) tan luan chhuah tir zat (release rate) tehna (Clause 4.5);
- (d) detention khawlna leh outlet (luan chhuahna) lian zawng ruat dan (Clause 4.6 aṭanga 4.9 thleng);
- (e) facility chi hrang hrang, ruahtui khawl khawm (RWH) chhiar dan, leh leihnuai tui sanna site-te (Clause 4.10 aṭanga 4.12 thleng);
- (f) regional detention (bial pum tan detention) leh fee-in-lieu (site-a tih aia sum pek) (Clause 4.13);
- (g) site tê tan kalphung awlsam: Tier B table-te leh fixed-coefficient route (Clause 4.14); leh
- (h) mipui himna (Clause 4.15).

4.1.2 He Bung hi Bung 1-a ruat angin, **0.1 ha emaw a aia tam** lei tihbuai (land disturbance) emaw, tui luh theih lohna hmun (impervious) thar emaw thlak thar **500 m² emaw a aia tam** emaw-ah a huam. Chu chin hnuaia in mal (single dwelling) leh tui luh theih lohna hmun belh lo kawng a chung chauh siam thar (resurfacing) chu huam a ni lo. In sakna dan-a RWH thupek awm mek (Aizawl Municipal Corporation Building Regulations, 2012 regulation 33, "In zawng zawngah ruahtui khawl khawmna facility ṭha tak siam bawk tur a ni" ("A suitable rain water harvesting facility shall also be provided in all buildings"), regulation 5(6)(ix) hnuaiah plan-te chuan "ruahtui khawl khawmna facility ṭha tak siam tur a tel tur a ni" ("include provision for a suitable rain water harvesting facility") tih nen, Aizawl Municipal Corporation bial chhungah; leh 2025 amendment-in 100 m² aia lian plot-te tan a belh Chapter VIIIA-a ruahtui khawl khawm incentive; heng zinga pakhatin mah tui zat a ruat lo va, an zavaia Clause 4.11 Hrilhfiahna-ah sawi a ni) chu a huam in zawng zawngah, he Bung hi a huam emaw huam lo emaw, hman zel a ni.

4.1.3 Ruahtui tlak chhutna thu (inputs) chu Bung 2 aṭanga lak a ni. Hydrology kalphungte chu Bung 3 aṭanga lak a ni. Tailwater (outfall hnuailama tui sang zawng), luanna hnuailam zirchianna leh outfall (drain tui luan chhuahna) khar endikna chu Bung 5 aṭanga lak a ni. Water quality volume (WQv) tihfaina chu Bung 8 aṭanga lak a ni. He Bung leh chung Bung-te an inkhawih lai-ah chuan, thupek khauh zawk chu zawm tur a ni.

> **Hrilhfiahna.** He Kaihhruaina Bu tana zirchianna laia hmuh India ram pum dan emaw Mizoram dan reng rengin site aṭanga tui luang chhuak zat chin a ruat lo va, site chhunga detention emaw ruahpui (storm) ang zela tui zat khawl emaw a phut lo. Mizoram thuziak hmuh reng rengin khawpui drain (tui luanna; Pachuau: tui luankawr) reng reng tan design ruahpui, return period (kum engzat zelah nge a lo thlen ṭhin), runoff coefficient emaw time of concentration emaw a ruat lo: Master Plan for Aizawl: Vision 2030 chuan khawpui drain-te a sawi a, "Aizawl Urban Area 67% hi kutcha drain a ni a, 18% hi tui luanna system reng reng a nei lo. Hmun 15% chauhin pucca drain a nei" ("67% of Aizawl Urban Area is having kutcha drains and 18% are without any drainage system at all. Only 15% of the area is provided with pucca drains") tiin, leh "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") tiin a hmu a, mahse design innghahna a pe lo; Aizawl

Smart City Ltd-a storm-drain project reng reng hmuh a ni lo; ADB-a North Eastern Region Capital Cities Development Investment Program-a Aizawl thuziak hmuhte chu tui pek leh sewerage tan chauh an ni (ADB project thuziak, zawnna tlangpui-a hmuh angin). In sakna dan pahnih a awm a, Aizawl Municipal Corporation bial chhungah chauh hman an ni. A hmasa chu Aizawl Municipal Corporation Building Regulations, 2012 (AMCBR; UD&PA Notification No. B.13017/8/2012-UD&PA, December ni 20, 2012; Mizoram Gazette Extraordinary Vol. XLII, Issue No. 4, January ni 10, 2013) a ni a, 2019 (No. B.13017/8(2)/2018-UD&PA; final gazette chhiar a ni lo [TBC]), 2023 (No. B.13017/8/2021-UD&PA/Pt, August ni 14, 2023, August ni 28, 2023 aṭanga hman mek, "Council" chu "Corporation"-ah a thlak) leh 2025 (No. B.13017/8/2021-UD&PA/Loose, November ni 21, 2025) Amendment Regulations-in siam ṭhat a ni. A pahnihna chu Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 (SD&SM; No. B.13017/75/2016-UD&PA, April ni 4, 2017; Gazette Extraordinary Vol. XLVI, Issue No. 161, April ni 11, 2017) a ni; amendment a neih leh neih loh hriat a ni lo [TBC]. A pahnih hi Mizoram Municipalities Act, 2007 section 371 hnuaiah Corporation-a Board of Councillors-in a siam a, Urban Development & Poverty Alleviation Department (UD&PA)-in notify (Gazette-a tarlan) a ni a, a pahnih hian "Aizawl Municipal Council-in a huam ram zawng zawngah" ("all the areas covered by the Aizawl Municipal Council") chauh an huam (AMCBR reg. 1(2)). State pum huap in sakna regulation hmuh a ni lo, Lunglei Municipal Council regulation reng reng hmuh a ni lo [TBC], Mizoram (Village Councils) Act, 2025 section 13(6) hnuaia model building bye-laws hmuh a ni lo, leh Lai, Mara emaw Chakma Autonomous District Council in sakna emaw tui luanna regulation reng reng hmuh a ni lo (Kamalanagar-a town-planning no-objection certificate leh kawng sira in sak chungchang Chakma District Council notice-te chu a hming leh a thu tlem tê chauh hriat a ni). AMCBR-a tui luanna thupekte hian in leh plot an humhalh; ruahpui ang zelin engmah an ruat lo. "Drain" chuan "leilung chung tui luan tirna channel khuh lo" ("open channel used for conveying surface water") a huam (reg. 3(17)); site plan-in "sewerage leh leilung chung drain, septic tank leh soak pit awmna leh a lian zawng" ("sewerage and surface drains, position and sizes of septic tank and soak pit") a lantir (5(5)(v)), leh in plan-te chuan "tui luanna leh inchung pang lantir" ("indicating drainage and roof slope") roof plan, "site development leh structure nghet, retaining wall, leilung chung drain ang chi" ("site development and permanent structures like retaining wall, surface drain") leh "ruahtui khawl khawmna ṭha tak siamna" ("provision for a suitable rain water harvesting facility") an lantir (5(6)(iv), (viii) leh (ix)); site chu "tui luanna ṭha nei emaw tui luan tir theih" ("properly drained or capable of being drained") leh "leimin, lei tlak, lei che ang chi hlauhawm hmun a ni lo" ("not an active hazard-prone area such as landslide, subsidences, mass movement") a ni tur a ni (21); plinth chu "site tui luanna ṭha tawk a awm ngei theihna turin" ("so that adequate drainage of site is assured") chawi sang a ni, "a theih chuan … metre 0.45 aia hniam lo" ("preferably … not less than 0.45 metre") (26(2)(a)); in chung tui chu "rain gutter leh conduit khuh … pipe hmanga lei-ah luan chhuah tir … leh spout reng reng kawng emaw mipui hmun emaw, a kiang compound emaw in emaw-ah luan tir phal a ni lo" ("rain gutters and closed conduits … discharged at ground level by pipe … and no spout should be allowed to drain into the road or public area or within the adjacent compound or building") (26(2)(b)); water closet tin-in "septic tank lian tawk, soak pit nen" ("A septic tank of appropriate capacity with soak pit") a nei a, "tui hnar aṭanga metre 15 chhungah" ("within a radius of 15 metres from a water source") a awm tur a ni lo, leh "In zawng zawngah ruahtui khawl khawmna facility ṭha tak siam bawk tur a ni" ("A suitable rain water harvesting facility shall also be provided in all buildings") (33); leh "vantlang himna avangin" ("in the interest of public safety") ruahtui leh tui bal chu mi dang ram kal tlang a ngai chuan, neitu chuan "conduit khuh siam a phal tur a ni" ("shall allow construction of a closed conduit"), "mipui drain hnai ber thleng leilung chunga drain/conduit khuh lian tawk" ("surface drain/closed conduit of adequate capacity to the nearest public drain") nen (37(i) leh (ii)). SD&SM Regulations hian series-a in sakna dan dang zawng aiin tui luanna geometry-ah a kal hla zawk a, mahse design ruahpui a ruat chuang lo. A tum chhan clause chuan "tlang pang laih, lei vur, tlang panga leihnuai tui luh zat tihpun, leh sewerage leh tui luanna chu tlang pangah thunun ṭha lova paih chuan tlang pang a nghet lohzia a tihpung nasa thei" ("slope cutting, filling, increasing the amount of groundwater penetrating into slopes, and disposing of sewerage and drainage onto slopes in a poorly controlled manner can greatly increase slope instability") tiin a vaukhân. Site development permit hi "building permit bakah" ("in addition to a building permit") mamawh a ni (5(1)); Low leimin hlauhawm zone-ah chauh regular track-in, leh Moderate, High leh Very High zone-ah, map-a tarlan loh tlang pang 24° emaw a aia chhoah, m 3 emaw a aia sang lei laihna-ah, m³ 200 aia tam hna emaw structure chelh hna-ah engineered track-in; tlang pang 60° a hleh chuan permit pek a ni lo (14). Engineered plan-ah "drain reng reng-in a enkawl area drainage area leh a ruahtui luang ngaihtuah zat lantirna map" ("A map showing the drainage area and the estimated runoff of the area served by any drains") leh "tui

luanna plan, site grade zawh hnua floor sanzawng nen" ("A drainage plan, including elevations of floors with respect to finish site grade") a tel (6). Regulation 27 chuan lei laih leh lei vur pang-ah m 10 aia sang lo inkar zelah zau zawng m 2 tal terrace (tlang panga hmun zawl siam) a ruat a; terrace swale chu gradient 1 in 20 tal, reinforced concrete mm 75 tal chhah hmanga chhuah, mm 300 tal thuk, paved area m² 0.7 tal nei, leh run pakhatin m² 400 (horizontal-a teh) aia tam "down drain-ah luan chhuah tir lovin" ("without discharging into a down drain") a khawn tur a ni lo; uphill drainage path m 10 aia sei nei cut slope tin chhipah interceptor drain (cut chung lama ruahtui dangtu drain) chhuah, mm 300 tal thuk leh mm 800 tal zau; building pad chu gradient 1 in 50 tal, "phalna pek tui luanna facility lam panin" ("toward approved drainage facilities"); "lei khawrh lo downdrain" ("non-erosive downdrains"); leh site dang hnuai lama site siam chuan "a chung lama site aṭanga tui luang, ek tui emaw tui chiar … tui luan kawng hnai ber thlengin him takin a phurh chhuah" ("convey drainage, sewage or seepage from the adjacent site uphill … in a safe manner to the nearest practicable drainage way") mawhphurhna. Lei vur ke chu "tui zau taka luan liam nan emaw paved drain atan emaw pang siam" ("sloped for sheet overflow or a paved drain") a ni a, "energy dissipater" ("energy dissipaters") nen (25), setback (tui kam aṭanga hmun kalhlen tur) chu "interceptor drain mamawh atan" ("for any required interceptor drains") a pung thei (26), leh permit-in a siam tui luanna chu neitu-in a enkawl (27). Schedule I chuan civil-engineer licensee-te chu "hydrology leh hydraulic chhutna tiamin, drainage structure design" ("Design of drainage structures, including hydrology and hydraulic calculations") tan thiamna nei angin a ruat a, mahse regulation-ah chung chhutnate-in ruahpui eng nge an hman tur a sawi lo. He Bung hian chu chu a pe: Bung 2-a design ruahpui, he Bung-a luan chhuah tir zat leh khawlna, leh Bung 6 leh 9-a capacity, freeboard (tui sang ber chunga zau dah) leh bal (debris) endikna; regulation 27-a geometry chu tui luan tirna layer hniam ber a ni a, design-in a tihlian thei a, a tihtlem thei lo. 2025 amendment chuan empanelled technical personnel-te chu "plot square meter 93 aia tê, Geo Hazard International-in a tarlan leh AMC SD&SM Regulations, 2017-in a sawi low leh moderate geo-hazard zone chhunga in pangngai" ("ordinary buildings … on plots measuring less than 93 square meters and located within low and moderate geo-hazard zones—as identified by Geo Hazard International and referenced in the AMC SD&SM Regulations, 2017") chungchangah self-certify a phal (Annexure B-I), "Aizawl Landslide Hazard Map" ("the Aizawl Landslide Hazard Map") zawm puanchhuahna nen (form C-IV). Chutiang plot chu development lian zawk chanvo a nih loh chuan he Bung chin hnuaiah a awm; a tan chuan he Kaihhruaina Bu hi kaihhruaina (guidance) a ni a, tlang dan (hill rule) leh Clause 4.11-a RWH khawlna, SD&SM geometry nen, chu a taka hniam ber a ni a, leh he Bung-in a huam site ha 1 emaw a aia tê chuan Clause 4.14.3-a fixed-coefficient route a hmang thei. Mizoram Municipalities Act, 2007 chuan "mipui drain zawng zawng, leh mipui kawng reng reng chhunga, a sira emaw a hnuaia drain zawng zawng" ("all public drains, and all drains in, alongside, or under any public street") chu Municipality kutah a dah (s.289(1)), chu chuan "tui luanna emaw sewerage system leh outfall him leh tawk a siam leh enkawl tur a ni" ("shall provide and maintain a system of drainage or sewerage as well as a safe and sufficient outfall") (s.288); mimal drain chuan municipal drain-ah "Chairman phalna ziak lak hnuah" ("after obtaining the written permission of the Chairman") chauh a luan lut thei (s.295), leh remtihna tel lovin municipal drain emaw "tui luan kawng reng reng" ("any water-course") emaw-ah drain luan lut tir phal a ni lo (s.296); Municipality chuan "tui luanna emaw ek tui leh thil tenawm dangte chu ruahtui aṭanga hrang taka siam tur" ("require separate provisions to be made for drainage or sewage and other offensive matters as distinct from rain-water") a phut thei (s.298); leh municipal drain, culvert (kawng hnuaia tui kalna) emaw storm-water channel chungah structure sak phal a ni lo (s.300). Heng zinga pakhatin mah design ruahpui, luan chhuah tir zat, detention tui zat emaw tui liam kawng (overflow path) emaw a ruat lo. Regulation chhiarah chuan (NEER chhiar dan) basement chu tuilian avangin khap a ni lo; tlang pangah in chuan "ground floor level tam tak" ("multiple ground floor levels") a nei (AMCBR reg. 3(11)(iii)), chuvangin a floor hnuai lamte chu tlang chhungah laih luh a ni. Chuvangin he Kaihhruaina Bu hian basement tin leh tlang panga laih luh floor hnuai lam tin tan thupek a belh: mi chenna basement-ah detention khawlna a awm tur a ni lo (Clause 4.10.1); basement ramp chhip tin leh basement kawngka sill tin chu 1% AEP (kum khatah a lo thlen theih dan) tuilian sang zawng aiin m 0.5 tal a sang tur a ni a, basement tui chu non-return valve (tui kir leh dangtu valve) kal tlangin surface drain-ah pump-a chhuah tur a ni (Clause 6.11.1 leh 6.11.4); Zone 2-ah basement a awm tur a ni lo (Clause 7.5.2); 1% AEP tuilian sang zawng hnuaia phai ram-ah, basement chu he Bung-a tuilian hlauhawm catchment dan a zawm a, tui luh theih loh a nih a, leihnuai tui chu lei sanzawng-a awm angin flotation endik a nih chauhin (Clause 4.12.1); leh floor reng reng tlang panga laih luh a nih chuan, Clause 4.11-a tlang dan geotechnical certificate, a bang hnung lama tui chu weep hole leh lei hnuai drain hmangin drain lined-ah luan tir a, lei chhunga dah reng lovin. Tlang pang site tan, regulation-in a hawn lai he Bung hian a pe bawk: site chung lama

tlang pang aṭanga ruahtui luang chu Bung 6-a design ruahpui-ah dan a, in vel-ah luan tir tur a ni a, site aṭanga tui luang zawng zawng chu energy dissipator (tui chakna tihnemna) kal tlangin drain lined emaw lui kawng nghet emaw-ah luan chhuah tir tur a ni a, tlang pang humhalh loh emaw lei vur emaw-ah ngai lo. Hengte hi he Kaihhruaina Bu rawtna a ni a, regulation dan a ni lo. He Bung hi AMCBR, SD&SM Regulations leh Municipalities Act ṭanpuitu technical thuziak atan, an hawn lai design ruahpui, luan chhuah tir zat leh khawl tur tui zat a pe thei turin ziah a ni; competent authority-in chu tum chuan a pawm thei ang, mahse pakhatin mah a pawm lo. Corporation bial pawn lamah he Bung hian sawrkar hna (public works) leh he Kaihhruaina Bu pawmtu pawl reng reng a huam a, chhungkua tan chuan kaihhruaina a ni. A taka chuan storm drain-te hi sewer an ni: "Sewerage system a awm loh avangin, mipuiin septic tank leh soak pit an hmang. Hmun tam takah ek tui chu tihfai lovin drain khuh lo-ah luan tir a ni a, a tawpah luipui-ah a luang lut" ("In absence of sewerage system, people are using septic tanks and soak pits. In most of the places sewage is discharged into open drains without any treatment, which ultimately gets discharged to rivers") (Master Plan for Aizawl: Vision 2030); State-a ek tui chu MLD 51.81 a ni a, "Tihfaina hmanrua awm mek … 10 [MLD] Aizawl khawpui tan chauh" ("Existing Treatment Facilities … 10 [MLD] only for Aizawl city") a ni (NGT OA 606/2018-a State report, August ni 31, 2025-a table); leh CPCB chuan Aizawl-a Chite lui leh Tuikual lui chu Priority II-ah a dah (CPCB, 2025) (Clause 8.9). Drain-in eng pawh phur se, retention leh detention hi site tinah a famkimin hman tur a ni: ruahpui peak (tui luang zat sang ber) huna site-in tui litre khat a luan chhuah tir apiang hian ek tui-in a khat sa tawh, tlang pang leh khawpui hnuaia lui-ah luang chhuak drain chhungah hmun a luah. CPHEEO (2019) manual chuan tui luang chhuak chu pre-development (hmasawnna hma lam) peak thleng chauha tihtlem chu hman dan pangngai angin a sawi a, mahse "shall" a hmang lo va, ruahpui a lo thlen ṭhin dan a sawi lo (CPHEEO Part A §8.5.1). He Bung hian chu sawi dan chu development thununna thupek-ah a chantir.

4.2 Thumal awmzia

Thumal	He Kaihhruaina Bu-a a awmzia
Retention	Ruahtui luang chu infiltration (lei-a tui luh), evapotranspiration (lei leh thing aṭanga tui chhuak) emaw hman nawn (reuse) emaw hmanga leilung chunga tui luanna system aṭanga chhuah hlen, chu tui chuan outfall a thlen ngai lohna turin.
Retention depth	Site zone tan ruah ni-a 90th percentile darkar 24 ruahtui tlak zat (Clause 2.10, Belhchian 2E).
Khawl tur tui zat (RRV)	Post-development (hmasawnna hnu lam) site chunga retention depth aṭanga ruahtui luang zat (Clause 4.4.2).
Detention	Ruahtui luang dah rihna, Clause 4.5-in a ruat zat ang zela outlet thununna kal tlanga luan chhuah tir.
Retention credit	Retention hmalaknate avanga detention khawl tur zat tihtlem, Clause 4.4.6 hnuaia routing hmanga hriat. Tui khawl zat nen a inang lo.
Site aṭanga luan chhuah phal zat (PSD)	AEP tarlan tan site-in tui a luan chhuah tir theih zat sang ber, L/s emaw L/s/ha-a teh.
Site khawl tur tui zat (SSR)	Clause 4.14 kalphung awlsam hnuaia site hectare khat tan detention khawl tur zat.
Multi-stage outlet	Sanzawng hrang hranga kua hrang hrang nei outlet structure, kua tinin AEP hrang a thunun (Milem 4.2).
Tui hniam hun (drawdown time)	Tui khawl zat sang ber hun aṭanga chu tui zat chanvo tarlan luan chhuah zawh thleng hun.
Emergency spillway	Overflow pahnihna, outlet hmasa capacity aia tam tui, emaw outlet hmasa a tawp chuan tui zawng zawng, embankment (dai) chung a liam lova luan tir thei.

Thumal	He Kaihhruaina Bu-a a awmzia
Freeboard	Design tui sang zawng sang ber leh embankment chhip emaw level pawimawh dang inkar sanzawng.
Tuilian hlauhawm catchment (flood-sensitive)	Clause 4.5.3-a tarlan emaw Clause 4.5.4 hnuaia notify catchment.
Authority	Bung 1 hnuaia Approving Authority (phalna petu Authority) (Aizawl Municipal Corporation chu a bial chhungah, OBPAS kal tlanga building permit, Site Development and Slope Modification Regulations, 2017 hnuaia site development permit leh a drain-te zawm tan, no-objection certificate tan a Local Council-te nen; Lunglei Municipal Council chu a bial chhungah, Mizoram Municipalities Act, 2007 hnuaiah (amah regulation hmuh a ni lo [TBC]); Village Council bial chhungah, Village Council, State sawrkarin Mizoram (Village Councils) Act, 2025 section 13(6)-a model building bye-laws a siam hnu chauhin in sak tan (hmuh a ni lo); sawrkar hna tan, a kalpuitu Department; leh Lai, Mara emaw Chakma Autonomous District Council bial chhungah, District Council leh a Village Council-te, District Council-in he Kaihhruaina Bu a pawm chauhin (pakhatin mah a pawm lo), a huam ang zelin).
Tier A / Tier B	Bung 1-a sawifiah pawmna tier-te. Tier A: Aizawl Municipal Corporation, a bial zawng zawng tan. Tier B: Municipal Council-te, Village Council-te leh Autonomous District Council-te.

4.3 Hmalakna indawt dan

4.3.1 Site ruahtui luang thununna design zawng zawngin hmalakna chu a hnuaia indawt dan angin a hmang tur a ni a, step hmasa zawk tinin engvangin nge a tih belh theih loh chu submittal (thehluh tur)-ah a ziak tur a ni:

1. **Humhalh.** Tui awmna (waterbody) awm mek, dil, tui luanna kawng pianphung, wetland, leh tui luh theihna lei leh thlai hringte vawng reng tur. Tuilian khawlna-ah lei vur loh tur (Bung 7).
2. **Khawl.** RRV chu infiltration, hman nawn emaw evapotranspiration hmangin site-ah khawl tur (Clause 4.4).
3. **Dah rih.** Ruahtui luang la bang chu design ruahpui leh duration (ruahpui a rei zawng) tin tan Clause 4.5-a luan chhuah tir zat tehna a tlin theihna turin dah rih tur (Clause 4.6 aṭanga 4.9 thleng).
4. **Luan tir.** 1% AEP (kum 100) tui luang chu ruat sa overland path (lei chunga tui luan kawng) hmangin site kal tlangin dawngtu system-ah him takin luan tir tur (Bung 6), leh luanna hnuailama dawngtu system chu endik tur (Bung 5).

4.3.2 Humhalhna leh retention hian detention mamawh a tihtlem (Clause 4.4.6 leh 4.4.7). Mahse Clause 4.5-a luan chhuah tir zat tehna emaw Bung 5-a luanna hnuailam zirchianna emaw aṭangin site chu an chhuah zalen lo.

> **Hrilhfiahna.** He indawt dan hi Kansas City Metro APWA Section 5600 Version 2025.01-in a hman "ruahtui enkawlna layer-te" ("layers of stormwater management") a zui a: humhalh emaw siam ṭhat leh, khawl, dah rih, luan tir, enkawl (MARC factsheet; MARC Supplement, Nov 2025). Enkawlna hi layer pangana a ni a, Bung 10-ah ruat a ni. 2025.01 manual chuan retention leh ram pianphung humhalhna chu detention lian zawng aṭangin a credit (MARC Supplement, Nov 2025). Clause 4.4.6 hian chu credit chu a hmang a, vawi hnih claim theih loh turin a sawifiah.

4.4 Retention

4.4.1 Thupek

Site chuan RRV a khawl tur a ni. Retention chu a hnuaia mi pakhat emaw a aia tam hmangin tihhlawhtlin tur a ni:

- infiltration hmalakna (soakaway, infiltration trench, infiltration base nei permeable pavement, bioretention);
- tui in tur ni lo mamawhna finfiah sa-in a tihhniam ṭhin ruahtui hman nawn;
- retention-depth ruahpui-ah outfall-a luang lo green roof leh landscape area-te.

Clause 4.4.4-a chin ruatte hman tur a ni.

4.4.2 RRV chhut dan

> RRV (m^3) = 10 × Q_R × A

a awmzia:

- Q_R (mm) chu retention depth P_R aṭanga ruahtui luang thuk zawng a ni (Belhchian 2E). Sub-area tin post-development khuhna tan SCS-CN kalphung hmangin, AMC (ruahpui hma lei hnawnna dinhmun) II-ah, Ia = 0.2S nen chhut a ni (Bung 3); leh
- A (ha) chu outfall-a luang site area a ni.

Q_R chu sub-area tin tan hrang hrangin chhut a, belhkhawm tur a ni. Impervious leh pervious area-te CN point 20 aia tam an inthlauh chuan area-weighted CN hman tur a ni lo.

Volumetric kalphung RRV = 10 × P_R × Rv × A, Rv = 0.05 + 0.009 × I (I = impervious percent) nen, chu ha 0.5 aia tê site-te leh Tier B kalphung hnuaiah hman phal a ni.

> **Hrilhfiahna.** Rv formula hi KC water quality volume-a hman (MARC BMP Manual 2012) kha a ni. Site tê tan endik a awlsam. Site lian zawk tan SCS-CN form hi phut a ni a, chuvangin retention chhutna-in detention routing-a ruahtui luang model ang chiah a hmang. Chu chuan Clause 4.4.6-a credit chhutna a inmil tir.

4.4.3 Finfiahna

Infiltration hmanga retention chu a hnuaia mi hian a nghahchhan tur a ni:

- (a) hmalakna tin awmna leh a thuk zawng-a site infiltration test, Bung 8-a ruat zing zawng angin;
- (b) teh zat **chanve** aia tam lo design infiltration rate; leh
- (c) seasonal high groundwater table (hun bik-a leihnuai tui sang ber) chu hmalakna bul aiin **m 1.0** tal a hniam tih lantirna leihnuai tui finfiahna (Bung 8).

Hman nawn hmanga retention chu RRV hi darkar 72 chhungin tui in tur ni lo hman reng, toilet flush, cooling emaw irrigation ang chi hmanga tihhniam a ni tih lantirna mamawhna chhutna-in a nghahchhan tur a ni.

> **Hrilhfiahna.** Infiltration rate teh zat chunga factor 2 hi a entirna hmasa chiang a awm lo; he Kaihhruaina Bu hian bal-in a khap (clogging) leh test pit leh hmalakna famkim inthlauhna ngaihtuah nan a ruat. Bung 8-in factor dang a ruat thei; a ruat chuan Bung 8 zawm tur a ni.

4.4.4 Retention chin

4.4.4.1 Infiltration hmalakna chu heng hmunahte hian hman tur a ni lo:

- seasonal high groundwater table chu a bul hnuaiah m 1.0 aia hla lo a nih lai (Bung 8);
- lei tihbawlhhlawh (contaminated land)-ah;
- Bung 8-a ruat foundation, well leh septic system aṭanga setback (tui kam aṭanga hmun kalhlen tur) chhungah; emaw
- lei vur-ah, a dah hnua test a nih loh chuan.

4.4.4.2 RRV chu a famkimin khawl theih a nih loh chuan, a tlachham zat chu submittal-ah ziah tur a ni. A tlachham zat chu Bung 8 hnuaiah WQv angin enkawl tur a ni a, retention credit a dawng tur a ni lo.

4.4.5 Retention tihruak

Retention khawlna chu retention-depth ruahpui tawp hnu **darkar 72** chhungin infiltration emaw hman nawn hmangin tihruak tur a ni, Clause 4.4.3-a test-te hmanga finfiah.

4.4.6 Retention credit: a awmzia leh chhut dan

4.4.6.1 **Credit chu eng nge.** Retention credit chu post-development routing-ah retention hmalaknate telh a nih huna detention khawl tur zat tihtlem a ni. Chhut a ni. RRV nen inang angin ngaih a ni lo.

4.4.6.2 **Tier A kalphung (routing).** Clause 4.6.3-a design ruahpui leh duration tin tan:

- (a) retention hmalakna tin chu **ruahpui ṭan huna ruak** khawlna angin chiang takin model rawh, Clause 4.11-in a dang a sawi loh chuan;
- (b) hmalakna chu ruahpui hmalam aṭangin khat tir la, ruahpui chhungin Clause 4.4.3-a design infiltration emaw hman nawn rate chauhin tui a hloh tir rawh;
- (c) a khat veleh, a overflow chu detention facility-ah route rawh; leh
- (d) hydrograph (hun hrang hranga tui luang zat) la bang tan detention lian zawng ruat rawh.

Detention khawl tur zat chu ruahpui leh duration zawng zawnga khawl zat lian ber a ni. Credit chu chu khawl zat leh retention awm lova khawl tur zat inthlauhna a ni. Tihtlem belh reng reng tih tur a ni lo.

4.4.6.3 **Tier B kalphung (awlsam).** Clause 4.14-in a phut detention khawl tur zat chu heti hian tihtlem theih a ni:

> V_credit = C_R × RRV_provided

C_R chu zone, soil group leh drawdown rate tan Belhchian 4B-a retention credit factor a ni. Belhchian 4B tlangzarh a nih hma chu, **C_R = 0**.

4.4.6.4 Clause 4.4.3 hnuaia finfiah loh retention chuan credit a dawng lo.

> **Hrilhfiahna.** "Detention aṭanga credit" ("Credited against detention") (APWA 5600 2025.01) hi kawng hnihin hriatthiam theih a ni. Pakhatin tui khawl zat chu detention zat aṭangin cubic metre khat zelin a paih. A dang chuan retention awm reng chungin ruahpui-te a route a, detention eng zat nge la mamawh a en. Mizoram-ah chuan an chhanna a inthlau hle, darkar 48 leh 72 ruahpui phut ngei ngei (Clause 2.5.2) hian retention hmalakna reng reng chu ni hmasa berah a tikhat a, ni hnuhnung bera peak a lo thlen hma hlein (Clause 2.9.2). Ruahpui chhunga hmalakna chuan infiltrate zel a nih loh chuan, peak-ah a khat a, peak khawl zat tihtlem nan engmah a ti lo.

> Clause 4.6.7-a entirna hian a nasat zawng a lantir. Retention m³ 552 nei (ruahpui chhunga infiltration awm lo) site ha 2 chuan darkar 24 ruahpui tan detention m³ 138 a tlem zawk a mamawh. Chu chu tui khawl zat ṭhena li ṭhena khat vel credit a ni. Darkar 48 leh 72 ruahpui, thu nei ber (govern)-te tan, credit chu zero hnai a ni. Tui khawl zat chu a tlanga paih ta ila, detention chu m³ 545 vel (19% vel) a tlem lutuk ang.
>
> Chuvangin he Kaihhruaina Bu hian credit chu routing result angin a sawifiah. Lei sandy, tui hmanhmawh taka liam thei, ni tam ruahpui chhunga infiltrate zel thei chunga retention chuan credit tak a hlawh ang. Khat chauh thei retention chuan tlem tê a hlawh ang. A pahnih hian physical takin a dik. Belhchian 4B a awm hma C_R = 0 ruat hi Tier B tan default him a ni a, retention hlutna nei lo tih ngaihdan a ni lo: retention chu tui ṭhatna leh recharge (leihnuai tui tihpun) tan phut a ni reng (Bung 8).

4.4.7 Humhalhna credit

Site-a ram pianphung khuhna-a kumkhuaa humhalh area-te chu post-development condition-ah an pre-development CN-in model theih a ni, heng a nih chuan:

- registered covenant emaw dedication emaw hmanga humhalh an nih; leh
- an ruahtui luang chu impervious surface chungah khawm tir a nih loh.

Hei hian RRV leh detention mamawh a tihtlem ve ve. Humhalhna credit dang a awm lo.

4.5 Luan chhuah tir zat tehna

4.5.1 A tlangpui

4.5.1.1 Site aṭanga peak discharge chu pre-development leh post-development condition tan design ruahpui inang chiah hmangin (Clause 2.11.1) hydrograph kalphung (Bung 3) hmangin chhut tur a ni. Rational Method chu khawlna lian zawng ruatna chanvo reng rengah hman tur a ni lo.

4.5.1.2 Pre-development chu greenfield (hmasawnna hna awm lohna ram) a ni: map-a HSG tan dinhmun ṭha taka ram inhawng. Impervious khuhna awm mek chu chhiar a ni lo (Clause 2.11.5, Bung 3). Hei hi redevelopment (siam ṭhatna) tan pawh hman a ni, Clause 4.5.6-a constrained-redevelopment route chauh hnuaiah.

4.5.1.3 Tehna-te hi site aṭanga ruahtui luang a chhuahna hmun tinah hman tur a ni. Site chu outfall pakhat aia tamah a luan chuan, tehna-te chu outfall tin tan a lama luang area tan hman tur a ni. Ruahtui luang chu catchment inkarah sawn tur a ni lo.

4.5.2 Catchment pangngai

50%, 10% leh 1% AEP (kum 2, 10 leh 100) ruahpui tin tan, leh {1, 2, 3, 6, 12, 24, 48, 72 h} chhunga duration tin tan:

> $Q_{post}(T, d) \le 0.9 \times Q_{pre}(T, d)$

4.5.3 Tuilian hlauhawm catchment

4.5.3.1 A hnuaia catchment tarlanahte hian Clause 2.11.3-a **mixed-frequency rule** (AEP hrang hrang inkhaikhinna dan) chu Clause 2.5.2-a duration tin tan hman a ni:

> Q_post(1% AEP, 100-yr) ≤ Q_pre(10% AEP, 10-yr), leh Q_post(50% AEP, 2-yr) ≤ Q_pre(50% AEP, 2-yr).

Cap (luan chhuah tir phal sang ber) tin chu duration a tisang bera pre-development peak a ni: kum 100 endikna tan kum 10 peak, leh kum 2 endikna tan kum 2 peak. Cap chu post-development duration tinah hman a ni (Clause 2.11.3).

4.5.3.2 Tuilian hlauhawm catchment-te chu:

- (a) **Aizawl chhak, Chite lui catchment**: Chite lui leh a lui pengte, Chanmari, Ramthar, Mirawng, Tlak, Bangla, Taite, Bethlehem veng, Lawibual, Hmawngkawn, Zemabawktuikhur, Zuangtui leh Kawmthlang lui-a luang Aizawl ram, Tuirial thleng;
- (b) **Aizawl thlang, Ser lui catchment**: Ser lui leh a lui tê-te-a luang Aizawl ram, Khatla, Tuikual, Vaivakawn leh Chanmari thlang lui nen, Tlawng thleng;
- (c) **Hlimen–Melthum lung laihna (quarry) belt**: Aizawl chhim lam kama, Hlimen leh Melthum lung laihna, hman mek leh hman tawh lo, kal tlang emaw a hnuai lam emaw-a luang ram (Clause 2.3.6(i));
- (d) **Hunthar Veng leh Aizawl-a NH-6 corridor**: Hunthar Veng lei kun hmun (sinking area) leh Hunthar-a NH-6 lei laih pang-te-a luang leh kal tlang ram;
- (e) **Durtlang leh Bawngkawn–Durtlang kawng**: Durtlang ram leh Bawngkawn–Durtlang (Leitan) kawng sir lehlam leh lehlam ram, a hnuaia tlang pang-te nen;
- (f) **Tlawng kama Sairang**: Tlawng-a luang Sairang ram, a phai (valley floor) ram nen;
- (g) **Bairabi leh Vairengte**: sub-area MZ-A1 phai leh lui kam zawl (river terrace)-a khawpui pahnih ram, a chunga luang tlang pang-te nen;
- (h) **Khawthlangtuipui kama Tlabung**: sub-area MZ-D1 phai-a, Khawthlangtuipui-a luang Tlabung ram;
- (i) **Lunglei khawpui**: Lunglei Municipal Council bial ram;
- (j) **Serchhip khawpui**: Serchhip khawpui ram, a lama luang tlang pang-te nen;
- (k) **Champhai khawpui leh Champhai phai**: Champhai khawpui ram leh Champhai phai-a buh chinna zawl (sub-area MZ-C1);
- (l) **Siaha leh Lawngtlai**: Mara leh Lai Autonomous District Council bial-a khawpui pahnih ram, District Council-in a bial tan he Kaihhruaina Bu a pawm chuan (pakhatin mah a pawm lo);
- (m) **Tuirial dam (tui khuahna) hnuaia release lui chhung**: dam hnuaia Tuirial-a luang ram, dam aṭanga tui chhuah tirin luipui a tihsan theih chin thleng luanna hnuailam; leh
- (n) Clause 4.5.4 hnuaia catchment notify reng reng.

A ramri chu Belhchian 4A-a map-a tarlan ang a ni tur a ni.

4.5.4 Tuilian hlauhawm catchment dang notify dan

4.5.4.1 A hnuaia mi pakhat emaw a aia tam a ziak lan a nih chuan, Authority chuan catchment chu tuilian hlauhawm angin notify turin a rawt thei:

- (a) kum 20 kalta chhungin vawi hnih tal, 1% AEP emaw a aia zing zawk event-ah in emaw kawng lian (arterial road) emaw tuilian;
- (b) dinhmun awm mekah 10% AEP tui luang aia capacity hniam zawk drain dawngtu emaw channel;
- (c) fûr hun chanvo chhungin (Bung 5), phai emaw lui kam zawl-a tuilian luipui-in a dan outfall, Sairang leh Bairabi-a Tlawng, Tlabung-a Khawthlangtuipui, Chawngte-a Kau emaw Champhai phai lui-te ang chi, a sang ber hnaia Tuirial emaw Serlui B reservoir (tui khuah) emaw dam pakhat hnuaia lui chhung-a tui chhuah tir emaw-in a dan outfall, emaw lui chho nasa-ah leimin bal (slide debris), lungpui leh bawlhhlawh-in a phum emaw a khap emaw outfall;
- (d) survey hmasa ber hmuh theih aṭanga catchment chhunga map-a tarlan tank leh dil khawlna ṭhena li ṭhena khat aia tam hloh; emaw
- (e) site tui luan chhuah zat tihtlemna innghat basin master plan.

4.5.4.2 A kal dan chu heti hi a ni tur a ni:

1. Authority chuan GIS form-a catchment ramri leh 4.5.4.1 tan finfiahna nen technical note a buatsaih ang.
2. Bung 1 hnuaia din State-level technical committee chuan note chu a endik ang.
3. Draft notification leh map chu mipui rawtna atan ni 60 tal tlangzarh a ni ang.
4. Sawrkarin catchment chu a notify ang a, map chu Belhchian 4A-ah belh a ni ang.
5. Dan chu notification hnu thla 6 emaw a aia rei hnua dilna dawn-te tan hman a ni ang. Chu hma zawka dilna dawn-te chu Clause 4.5.2 hnuaiah endik a ni ang.

4.5.4.3 Catchment notify tawh chu kal dan ang chiah hmangin chauh de-notify theih a ni a, basin zirchianna-in development zawng zawng Clause 4.5.2 hnuaia awm chungin luanna hnuailam system-in Bung 5 a tlin tih a lantir hnuah chauh.

> Hrilhfiahna. Factor 0.9 hi Denver (MHFD) zirchianna aṭanga lak a ni. Chu zirchianna-ah chuan, basin sawm, tin hian hmanlai kum 100 peak 100% luan chhuah tir chungin, outlet-ah hmanlai peak 106% an la siam; tin 90% luan chhuah tir chuan 97% a ni (UDFCD Full Spectrum Detention Release Rate Memorandum, 2012). Mixed-frequency rule hi a entirna hmasa chiang a awm lo; a hnai ber chu Malaysian DID (2008) checklist a ni a, post-development kum 2, 10, 50 leh 100 peak-te chu pre-development kum 2 peak hnuaiah a phut. "100-yr post ≤ 10-yr pre" form bik hi New Berlin, Wisconsin planning sawihona-ah a lang (dan pawm a ni lo). Tarlanna hian Mizoram hlauhawmna pahnih a zui: tui luanna-in a ṭantir leimin, khawpui zawng zawng deuh thaw awmna tlang chhipah, leh phai khawpui tlem tê drain-te chunga lo sang luipui. Mizoram-ah catchment hi tuilian hlauhawm a nih chhan chu a chhunga tui a dil avang ai mahin a chhuak tui-in a hnuaia tlang pang a sawn tir avang a ni zawk: Directorate of Geology and Mineral Resources (chanchinbu-ah "Directorate of Geology and Mining") chuan 2022-23-a a zirchian "leimin lian ṭhena thum ṭhena hnih" ("two-thirds of large-scale landslides") chu "tui luanna ṭha lo avang a ni" ("were due to improper drainage") tih a hmu a (chanchin tlangzarh angin), leh "ram pum zinga 71 per cent aia tam chu Very High aṭanga Moderate Hazard Zone-ah a awm" ("more than 71 per cent of the total area is in Very High to Moderate Hazard Zone") (CAG, Report No. 1 of 2025). Aizawl tarlan pahnih hi khawpui tui luanna system pahnih an zui: Chite lui chuan khawpui "chhak lam ṭhena thum ṭhena hnih aia tam" ("more than two-third of eastern portion") chu Tuirial-ah a luan tir a, Ser lui leh a lui tê-te chuan thlang lam chu Tlawng-ah; master plan chuan Chite, Chanmari, Theihai, Bethlehem, Tuikhurhlu, Mirawng leh Bangla lui chu "fûr hun chhungin tui luan chak tak nen an luang buai a, an tichhe nasa hle" ("turbulent with high velocities of currents during the monsoon season and they are very destructive") tiin a sawi a, Khatla, Tuikual, Vaivakawn leh Chanmari thlang lui chu "lui leh nullah tichhe nasa ber" ("the worst destructive streams and nullahs") tiin (Master Plan for Aizawl: Vision 2030); Chite lui hi Chite sewage treatment plant hnuaia CPCB Priority II stretch a ni a, "Tuikual stream" pawh Priority II a ni (CPCB, 2025; chu chu master plan-a Tuikual lui a nih hi NEER chhiar dan a ni, finfiah tur). Aizawl W-I-ah, area 33% chu "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") tui a chiah reng a, kawng sir drain-a bawlhhlawh puh a ni (master plan). Ramhlun Venglai-a Laipuitlang lungpui tlak (rockslide), May ni 11, 2013, zing dar 3 vela thleng (paper pakhatah May ni 15; ni a inang lo) chuan in 15 a tichhe a; ruang 17 laih chhuah a ni a, mi 8 chhanchhuah a ni (Science Vision paper), emaw review dang angin mi 8 an thi (a zat a inang lo), Middle Bhuban Formation chungah, MIRSAC 2011 map-in "Very High" a tih ramah (Science Vision paper). Quarry-belt tarlan hi chim pahnih a zui: August ni 9, 1992-a South Hlimen lung laihna, "mi 100 deuhthaw nunna a la" ("claimed the lives of almost 100 people") (MIRSAC, 2013, hmalam hna a tarlan), leh Melthum leh Hlimen inkara lung laihna hman tawh lo, May ni 28, 2024 zing dar 6 vela Cyclone Remal-a chim, police chanchin hnuhnung zawk angin mi 15 a thah a, Hlimen-ah mi 5 dang an thi; Aizawl district thihna chu ni chhungin 29-ah a pung a, 7 hmuh loh (May ni 29), report hnuhnung zawk chuan Aizawl hmun pasarih-ah mi 34 thi a sawi a, State thihna chu 27–29 tiin sawi a ni (a zavaia chanchin tlangzarh angin: a zat a inang lo). Master plan chuan khawpui lui hnuaia check dam pariat zingah Melthum leh Hlimen hnuaia check dam a rawt. Hunthar tarlan hi Hunthar Veng lei kun hmun, CAG-in a hmuh lei test awm chhun neihna (report of 2017), leh Hunthar-a NH-6 lei laih, June 2018-a nghet lo leh Remal-ah a chim leh (chanchin tlangzarh angin) a zui. Durtlang tarlan hi July ni 2, 2019-a Durtlang-a BSUP in block 20 zinga 3 chim, mi 3 thi, 11 hliam leh chhungkua 140 sawn, a hnua IIT zirchianna 2020-a rawtnate hlen a nih loh (CAG, Report No. 1 of 2025), leh July ni 23, 2024-a chanchin tlangzarh suo motu public interest litigation-a Gauhati High Court order, "tun aṭang hian Bawngkawn – Durtlang (Leitan) kawng sir lehlam leh lehlamah sak hna

thar reng reng phal a ni tawh lo vang" ("no new construction activity shall henceforth be allowed on either side of the Bawngkawn – Durtlang (Leitan) road") (chanchin tlangzarh angin) a zui. Phai tarlan-te hian luipui tuilian an zui: June 2018-ah Sairang chhungkua-te an tang a; Bairabi leh Vairengte, hmar lama lui kam zawl-a awm, hi "State-a khawpui hniam ber" ("the lowest-lying towns in the State") an ni (NEER chhiar dan), leh September 2026-ah Vairengte-a leimin-in naupang mipa pakhat a thah a, pali a tihliam (chanchin tlangzarh angin); leh Tlabung, Khawthlangtuipui kama awm, June 2017-ah tuilian a tuar a, sub-division chhunga in 350 vel tui-a chim angin sawi a ni (emaw disaster-management officials chhiar dan angin 9 famkim leh 60 aia tam a chanve), June 2018-ah, July 2019-ah (in 400 vel, a 150 khawpui chhungah) leh August 2023-ah, chhungkua 40 an sawn chhuah a ni (a zavaia chanchin tlangzarh angin). "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area") (Mizoram Pollution Control Board, NGT-a OA 593/2017 leh OA 673/2018-a report); heng phai-ah hi chuan chu thusawi chu a dik lo. Lunglei tarlan hi State-a municipal body pahnihna, Surma shale tlang chhip-a "tlang pang chho nasa tak 20% aia tam" ("very steep slopes that are more than 20%") nei (CGWB, Lunglei district booklet), leh May ni 24, 2025 aṭanga June ni 3, 2025 thleng Lunglei district-a leimin 61 (DM&R zat, chanchin tlangzarh angin) a zui. Serchhip tarlan hi khawpui tlang pang-te, a 89.2% chu 30° aia chho (MIRSAC tlang pang chanvo aṭanga NEER chhutna), leh June ni 1, 2018 aṭanga June ni 13, 2018 thleng Serchhip district-a ruah mm 677 sur (SANDRP, chanchin tlangzarh angin) a zui. Champhai tarlan hi May ni 24, 2025 aṭanga June ni 3, 2025 thleng Champhai district-a leimin 209, district zinga tam ber (DM&R zat, chanchin tlangzarh angin), leh tui a dil thei buh chinna phai zawl (record hmuh a ni lo [TBC]) a zui. Siaha leh Lawngtlai tarlan hi chhim lama khawpui pahnih, NIH-DHAARA-a thuk zawng State-a sang ber zinga awmna (kum 50 darkar 24: Siaha mm 304.5, Lawngtlai mm 270.6) a zui; Lai leh Mara Autonomous District Council bial-ah State-a municipal, village-council leh water-resources Act-te hman a ni lo va, District Council-te in sakna emaw tui luanna regulation reng reng hmuh a ni lo, chuvangin tarlanna hian District Council-in he Kaihhruaina Bu a pawm chauhin a huam ang. Release-reach tarlan hi Tuirial dam, dam-break zirchianna-in "lui inkawpna bulah" ("near the confluence") peak m³/s 3,035.34 a route-na (IAHR abstract, 2025, chanchin tlangzarh angin) a zui. Kolasib, Mamit, Khawzawl, Saitual, Hnahthial, Chawngte leh Zokhawthar hi Clause 4.5.4 hnuaia notify theih tur an ni. DM&R thihna official tawp chu lak a ni lo [TBC]. 4.5.4.1-a notification ṭantirtu-te hi a entirna hmasa chiang a awm lo va, he Kaihhruaina Bu-in a ruat a ni. Thla 6 lead time hi Clause 2.14.2-a update dan a zui. Engvangin nge pre-development hnuaia luan chhuah tir a ṭul chu Clause 4.16-in a hrilhfiah.

4.5.5 Outlet hniam ber leh duration tawi kum 2 endikna

4.5.5.1 AEP leh duration reng reng tan PSD chu a stage inmilah **mm 50** orifice (tui chhuahna khur tê) (Clause 4.8.2) discharge aia tlem a nih chuan, chu AEP leh duration tan chuan orifice mm 50 chu a zawm angin ngaih a ni.

4.5.5.2 Darkar 3 emaw a aia tawi duration-a kum 2 tehna tlin nan low-flow orifice tê lutuk, Clause 4.7-a drawdown thupek tlin theih loh khawp a ngai chuan, design siamtu (designer) chuan:

- low-flow orifice chu Clause 4.7 tlingtu kua tê ber angin a ruat tur a ni; leh
- chung duration-te tan kum 2 a hleh zat a report tur a ni.

Authority chuan a hleh zat chu kum 2 stage-a orifice mm 50 discharge aia tlem a nih chuan, emaw Bung 5-a luanna hnuailam zirchianna-in nghawng ṭha lo a awm lo tih a lantir chuan, design chu a lo pawm thei.

Hrilhfiahna. AMC II hnuaiah, greenfield site chuan darkar 1 emaw 2, kum 2 ruahpui-ah ruahtui luang a siam deuh lo, ruah tam zawk chu initial abstraction-ah a bo vang. Pre-development peak second khatah litre engemaw zat, duration zela khaikhin, chuan low-flow orifice tê lutuk a ngai tir. Chu orifice chuan kum 10 tui zat chu darkar 48 chhungin a luan chhuah tir thei lo. Tuilian hlauhawm catchment pawna awm ang maia endik chuan, Clause 4.6.7-a entirna hian darkar 1, kum 2 pre-development peak a tluk nan mm 75 vel low-flow orifice a mamawh ang. kum 10 tui zat 90% drawdown chu orifice fai pawh nen darkar 84 vel a awh ang, darkar 48 chin nen khaikhin chuan. 50% tihtawp (blockage) nena drawdown tlingtu mm 170 orifice chuan darkar 1, kum 2 pre-development peak chu 11 L/s velin a hleh. Clause 4.5.5.2 hian chu inkalh chu drawdown lam ṭanin a chinfel, basin la khat chanve a nih

laia fûr ruahpui dawt a lo thlen chuan event pawimawh zawkah a hlawhchham dawn vang. KC APWA 5600 (2006) chuan trash rack (bal dangna) nen mm 75 (3 in) orifice hniam ber a hmang. He Kaihhruaina Bu hian mm 50 hniam ber a ruat (Clause 4.8.2).

4.5.6 Hmun khawp lo redevelopment site-te

4.5.6.1 **Tlin dan.** He clause-a relief route hi **redevelopment** tan chauh, a hnuaia mi zawng zawng a dik chuan, a awm:

- (a) site awm mek chu tihchhiat hma survey angin **60% impervious** tal a ni;
- (b) site chu **ha 1 emaw a aia tê** a ni; leh
- (c) design siamtu chuan, Form 4-1 nena thehluh Constraint Statement-ah, Clause 4.5.2 emaw 4.5.3-a greenfield tehna chu site-ah tlin theih a ni lo tih a lantir. Statement chuan Clause 4.10-a khawlna option tin endik a ni tih a lantir ngei ngei tur a ni: in chung leh podium khawlna, parking emaw landscape hnuaia tank, sub-base khawlna nei permeable paving, leh landscape-a hmun kua. Option tinin a khawl theih zat pawh a pe ngei ngei tur a ni.

Ram hmasawnna hna la awm lohna-a development thar chu engtikah mah a tling ngai lo.

4.5.6.2 **Site chhunga performance hniam ber.** Site tling chuan a hnuaia mi zawng zawng hi site-ah a siam tur a ni:

- (a) retention tui zat famkim (Clause 4.4) leh WQv tihfaina (Bung 8), relief awm lovin;
- (b) post-development peak discharge chu 50%, 10% leh 1% AEP ruahpui tan, Clause 2.5.2-a duration tinah, **existing-condition peak 50%** aia tam lo. Existing condition chu Clause 3.3.4 hnuaiah model a ni; leh
- (c) luanna hnuailama in emaw kawng reng rengah 1% AEP tui sang zawng pun lohna (Bung 5).

4.5.6.3 **Tlachham zat.** Tlachham zat chu greenfield tehna tlin nan detention khawl tur zat (Clause 4.6) aṭanga 4.5.6.2 hnuaia site-a khawl zat paih a ni. Dilna thehluhtu (applicant) chuan tlachham zat chu Clause 4.13.3-a unit rate-in fee-in-lieu angin a pe tur a ni. Fee chu:

- (a) site awmna basin-a ring-fenced account (hman dan bik nei account)-ah pek tur a ni;
- (b) basin ruahtui luanna master plan (Bung 11)-a tarlan regional detention emaw dil emaw tank tuilian khawlna siam ṭhatna-ah chauh hman tur a ni; leh
- (c) Clause 4.13.4-a mipui ledger (chhinchhiahna bu)-ah ziah tur a ni, chu chuan basin tina tui zat ba leh tui zat pek a lantir tur a ni.

Basin master plan phalna pek a la awm loh chuan, fee chu **kum 5** thleng vawn tur a ni. Chu chhunga plan phalna pek a awm loh chuan, IWRD thuthlung (agreement) nen, basin ang chhunga tank tuilian khawlna siam ṭhatna-ah hman tur a ni.

4.5.6.4 **Tuilian hlauhawm catchment.** Clause 4.5.3-a catchment-ahte hian, route hi condition ang chiahin a awm. Amaherawhchu, Bung 5-a luanna hnuailam zirchianna-in zirchianna chin chhunga 10% AEP event-a in tuilian mek a lantir chuan Authority chuan a hnawl thei.

> Hrilhfiahna. Greenfield hi redevelopment zawng zawng tan tum a ni, khawpui in khat chuan a sak thar ang zelin chauh a ruahtui luang a tihtlem thei si a. Aizawl-a Chanmari, Khatla, Tuikual leh Vaivakawn ang chi bial, an lui chu master plan-in "lui tichhe nasa ber" ("the worst destructive streams") zingah a tarlan, master plan-in tui chiah reng a tih Aizawl W-I chanvo, emaw Lunglei laili [TBC]-a plot tê, in khat famkim-ah chuan greenfield khawlna famkim tan hmun a awm fo lo. Tlin theih loh dan chuan variance leh zawm lohna a hruai a, chu chuan luanna hnuailama tumah a ṭanpui lo. He clause hian UK Non-statutory Technical Standards for Sustainable Drainage (Defra, 2015, S2–S3) kalphung a zui. Hmasawnna hna nei tawh site tan, chung standard chuan peak ruahtui luang chu "theih tawk chin chuan greenfield runoff rate hnai thei ang ber" ("as close as reasonably practicable to the greenfield runoff rate") a phut a, pre-redevelopment rate aia sang ngai lo. 50% tihtlem hniam ber ruat hi a entirna hmasa chiang a awm lo; he Kaihhruaina Bu hian endiktu-te tan "theih tawk chin" ("reasonably practicable") ngaihtuahna

> aiah number chiang pe turin a ruat. Fee-in-lieu chuan tlachham zat chu basin ang chhunga regional khawlna-ah a chantir a, chuvangin basin chuan a vaiin greenfield tluk thununna a dawng reng. Retention leh tui ṭhatna chuan relief an dawng lo, tui zat tê, site zawng zawng deuh thaw-in an khawl theih a nih avangin.

4.6 Detention lian zawng ruat dan

4.6.1 Kalphung

Detention chu facility stage–storage–discharge inzawmna kal tlanga hydrograph routing hmangin, level-pool (Modified Puls) emaw numerical kalphung inang (SWMM, HEC-HMS) hmangin ruat tur a ni. Fixed-ratio leh Rational innghat khawlna formula hman tur a ni lo. Clause 4.14-a kalphung awlsam-te (Tier B table-te leh fixed-coefficient route) chauh hi a dan bik an ni.

4.6.2 Step-te

1. Site leh sub-area-te ramri siam rawh. HSG map siam la, test hmangin finfiah rawh (Bung 3).
2. 50%, 10% leh 1% AEP leh Clause 2.5.2-a duration tin tan design ruahtui tlak chu climate factor nen la chhuak rawh (Bung 2, Form 2-1).
3. Design hyetograph (hun hrang hranga ruahtui tlak zat) siam rawh: ≤ 24 h tan alternating block; 48 leh 72 h tan "peak ni hnuhnung" ("peak day last") pattern (Clause 2.9).
4. Pre-development hydrograph chhut rawh (greenfield CN; sub-area tinah May ni 1 aṭanga October ni 31 thleng duration tin ruahpui tan AMC III, 1% AEP tuilian sang zawng hnuaia phai ram leh dil kam-ah April ni 1 aṭanga October ni 31 thleng, Tuirial emaw Serlui B reservoir, a backwater emaw dam pakhat hnuaia release lui chhung-a luang catchment-ah engtik lai pawhin, leh site leh hun dangah ni 5 chhunga mm 53 aia tam a sur hnuah; a nih loh chuan AMC II).
5. Clause 4.5.2 emaw 4.5.3 hnuaiah AEP leh duration tin tan cap chhut rawh.
6. Ruahpui leh AMC ang chiah hmangin post-development hydrograph chhut rawh, retention hmalaknate tel (Clause 4.4.6).
7. Facility geometry (stage–storage) leh multi-stage outlet (Clause 4.6.5) enchhinna thlang rawh.
8. Ruahpui leh duration tin route rawh. **Minute 5** aia rei lo, leh post-development catchment Tc/3 aia rei lo time step hmang rawh.
9. Luan chhuah tir tin chu a cap nen endik la, drawdown endik rawh (Clause 4.7). Outlet leh khawlna siam rem la, nawn leh rawh.
10. Clause 4.6.6-a tailwater condition leh Bung 5-a luanna hnuailam zirchianna endik rawh.
11. Emergency spillway ruat la, freeboard siam rawh (Clause 4.9).
12. Khawlna, outlet stage tin leh spillway tan ruahpui thu nei ber report rawh (Clause 4.17).

4.6.3 Route tur ruahpui-te

Facility tin chu matrix famkim tan route tur a ni:

Table 4.1 — Detention lian zawng ruat nana route tur design ruahpui-te

AEP	Duration (h)	AMC
50% (kum 2)	1, 2, 3, 6, 12, 24, 48, 72	≤ 6 h tan II; ≥ 12 h tan III
10% (kum 10)	1, 2, 3, 6, 12, 24, 48, 72	≤ 6 h tan II; ≥ 12 h tan III
1% (kum 100)	1, 2, 3, 6, 12, 24, 48, 72	≤ 6 h tan II; ≥ 12 h tan III

Darkar 24, 48 leh 72 run-te hi critical-duration result eng pawh ni se tih ngei ngei tur a ni (Clause 2.5.2). Bung 3-in Ia = 0.05S sensitivity a phut chuan, khawlna thu nei ber case tan run tur a ni.

4.6.4 Ṭanna dinhmun

Run tin chu heti hian ṭan tur a ni:

- detention khawlna ruak, outlet hniam ber invert thleng;
- permanent pool reng reng khat;
- retention hmalaknate ruak, Clause 4.11-in a ruat dan chauh loh chu; leh
- RWH khawlna khat (Clause 4.11).

Darkar 48 leh 72 ruahpui-te hian an hma lama ruah an tel tawh a, chuvangin hmalam khat tirna belh a awm lo.

4.6.5 Multi-stage outlet design

4.6.5.1 Outlet hian tehna tin tan thununna hrang a nei tur a ni, a pangngaiin Milem 4.2-a ang hian chhawp:

- **Stage 1**, invert-ah: low-flow orifice. WQv chu darkar 24–48 chhungin a luan chhuah tir a (Bung 8), kum 2 luan chhuah tir a thunun.
- **Stage 2**: kum 2 level sang ber emaw a hnaia orifice emaw slot. kum 10 luan chhuah tir a thunun.
- **Stage 3**: kum 10 level sang ber emaw a hnaia weir, riser crest emaw orifice lian zawk. kum 100 luan chhuah tir a thunun.
- **Emergency spillway**: outlet hmasa aṭanga hrang (Clause 4.9).

Routing-in cap tin a tlin tih a lantir chuan stage-te chu belhkhawm theih a ni.

4.6.5.2 Rated device hman a nih loh chuan orifice-te chu discharge coefficient 0.60 hmangin chhut tur a ni. Weir-te chuan an pian dan mil coefficient an hmang tur a ni. Submerged-outlet leh tailwater nghawng telh tur a ni (Clause 4.6.6).

4.6.5.3 Vortex flow control leh proprietary device dangte chu supplier-in certified head–discharge curve a pek a, clear opening hniam ber chu mm 50 tal a nih chuan hman theih a ni.

4.6.6 Outlet chunga tailwater

Dawngtu tui sang zawng chu outlet invert aia a san theih apiangah, outlet chu free outfall ni lovin, dawngtu system tailwater nen route tur a ni. Tailwater chu:

- drain dawngtu tan: ruahpui ang chhunga a tui sang zawng, Bung 5 zirchianna aṭangin emaw, Tier B tan, drain obvert;
- tidal emaw backwater nghawng outfall tan: Clause 2.12 leh Bung 5-a level leh joint case-te, outfall khar endikna (Clause 5.10) tel.

Tailwater-in thu a neih chuan, outlet-ah flap gate bun tur a ni (Clause 5.11). Tailwater level hnuaia khawlna chu routing-in gate khar a tel loh chuan hman theih angin chhiar tur a ni lo.

4.6.7 Entirna

Entirna chauh — design value a ni lo. He entirna hian kal dan leh a siam lian zawng a lantir. Inputs-te hi Lunglei khawpui-a tlang pang colony, lui (hill stream)-a luang tan rinawm ang taka siam chawp an ni. NIH-DHAARA value an ni lo va, design atan hman ngei ngei tur a ni lo.

Inputs (chhutna thu):

- Site: ha 2.0, tuilian hlauhawm catchment (Clause 4.5.3).
- Lei khuhna: pre-development chu pervious vek, CN 70. Post-development chu sub-area pahnih angin (Clause 3.9.2): CN 98-a directly connected impervious surface ha 1.57, AMC tan engtikah mah thlak loh, leh CN 70-a pervious open space ha 0.43, pre-development lei ang chungah; AMC II-a area-weighted CN chu 92 a ni. Darkar 12 leh a aia rei ruahpui tan pervious CN chauh AMC III-ah thlak a ni: CN_III = 23·CN / (10 + 0.13·CN) = 84.3 (Clause 3.8.4).
- Time of concentration (Tc, catchment hla ber aṭanga tui lo thlen hun): pre-development-ah minute 45, post-development-ah minute 15 (sub-area pahnih tan hman a ni). SCS triangular unit hydrograph hman a ni; time step chu minute 5 a ni.
- Darkar 24 thuk zawng: kum 2, 10 leh 100 tan mm 110, 200 leh 350 (kum 10 leh 100 value chu Clause 2.11-a ang).
- Duration tawi zawk: P(t) = P24·(t/24)^0.40, ratio set ngaih chawp, Belhchian 2B a ni lo.
- Duration rei zawk: darkar 48 leh 72 thuk zawng chu 1.25 leh 1.40 × P24 angin lak, Clause 2.9.2 angin dah.
- Khawlna: bang ding, plan area m² 2,500.
- Outlet, low-flow orifice 50% tihtawp chungin drawdown a tlin theihna tura ruat (Clause 4.8.3). Belhchian 4C-in he endikna hlawhchham outlet enchhinna a lantir.
    - Stage 1: invert-a mm 170 orifice.
    - Stage 2: mm 460 orifice, a invert chu floor chungah m 0.53.
    - Stage 3: mamawh a ni lo, kum 100 cap chu Stage 1 leh 2-in a tlin vang.

Result-te (discharge L/s-in; khawlna m³-in):

Table 4.2 — Entirna: duration zela peak discharge leh khawlna hman (Entirna chauh — design value a ni lo)

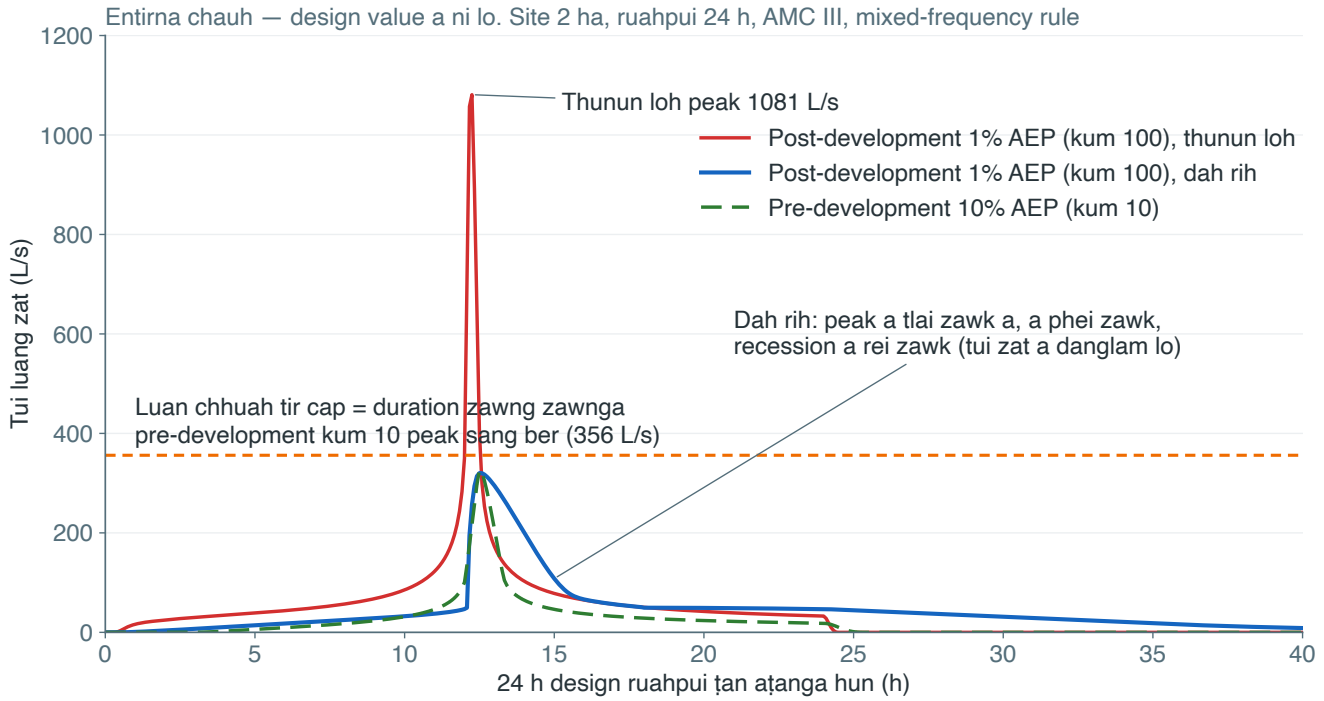
Duration (h)	kum 2 pre	kum 2 post, dah rih	kum 10 pre	kum 10 post, dah rih	kum 100 post, thunun loh	kum 100 post, dah rih	kum 100 khawlna hman	kum 10 drawdown, 50% tihtawp (h)
1	4	15	51	28	922	42	1,426	31.3
2	14	20	84	34	961	79	1,911	32.1
3	19	22	104	37	981	139	1,999	32.8
6	32	25	150	41	1,010	194	2,154	34.2
12	127	30	302	46	1,074	276	2,512	39.0
24	149	32	327	49	1,081	320	2,766	**45.3**
48	173	34	349	82	1,087	343	**2,913**	44.8
72	180	34	356	84	1,089	343	2,911	44.7

A chhiar dan:

- **kum 100 cap.** Cap chu pre-development kum 10 peak lian ber, 356 L/s (72 h) a ni. kum 100 peak dah rih zawng zawng chu chu emaw a hnuaiah a awm; a lian ber chu 343 L/s a ni.
- **kum 2 cap.** Site hi tuilian hlauhawm a ni a, chuvangin kum 2 cap chu pre-development kum 2 peak lian ber, 180 L/s (72 h; Clause 4.5.3.1) a ni. kum 2 peak dah rih lian ber chu 34 L/s a ni. Darkar 1, 2 leh 3-ah kum 2 peak dah rih chu duration ang pre-development peak aiin a sang zawk (15 leh 4 L/s, 20 leh 14 L/s, leh 22 leh 19 L/s). Chu khaikhinna chu hetah phut a ni lo. Clause 4.5.2 hnuaia site tan chuan phut a ni ang a, chutichuan Clause 4.5.5.2 hman a ni ang.
- **Khawlna thu nei ber.** Khawlna chu **darkar 48 leh 72** ruahpui-in thu a nei: m³ 2,913, site m² khat zelah m³ 0.146, thuk zawng sang ber m 1.17-ah. Critical-duration peak ruahpui (hetah darkar 1–3) chauh endiktu design chuan m³ 2,000 vel a siam ang, mamawh ṭhena thum ṭhena hnih vel.

- **Drawdown.** Low-flow orifice 50% tihtawp chungin (Clause 4.8.3), kum 10 khawlna 90% chu darkar 45.3 (darkar 24 ruahpui) chhungin a liam, Clause 4.7-a darkar 48 chhungah. Orifice mm 120 chuan a fai lai chuan darkar 42 velah a tiruak ang a, chanve tihtawp lai chuan darkar 54 aṭanga 75 thleng, chuvangin a hlawhchham. Belhchian 4C-in chu enchhinna leh routing step zelin a lantir.
- **Retention credit.** Entirna retention depth mm 40 nen, RRV = m³ 552, sub-area tin tan chhut (Clause 3.9.4). Ruahpui ṭan aṭanga khat zel, a chhunga infiltration awm lova model chuan, retention chuan darkar 24 khawlna m³ 138-in a tihtlem a, darkar 48 leh 72 khawlna m³ 7 emaw a aia tlemin. Chuvangin he site tan Clause 4.4.6 hnuaia credit chu zero deuh a ni.

A lian zawng tlangpui, site m² khat zelah m³ 0.15 vel, hi Clause 2.11-a sawi nen a inmil.



Milem 4.1 — Entirna (Clause 4.6.7)-a darkar 24 ruahpui tan pre-development kum 10, post-development kum 100 thunun loh leh dah rih hydrograph-te. Entirna chauh — design value a ni lo. He Kaihhruaina Bu tana milem siam thar, MARC/KC APWA Section 5600 leh Georgia Stormwater Management Manual (2016)-a pre/post-development hydrograph ngaihdan aṭanga siam danglam.

> **Hrilhfiahna.** Milem 4.1-in detention-in a tih leh a tih loh a lantir. Peak a tihniam a, a tihtlai bawk. Tui zat erawh a tihtlem lo: curve dah rih hnuaia area chu curve thunun loh hnuaia area nen a inang a, pre-development kum 10 tui zat let hnih aia tam a ni. Tui zat belh chu ruahpui hnu darkar tam tak chhungin site aṭangin a chhuak. Chu luan chhuah rei tak chu luanna hnuailama catchment lian zawk peak nen a inrual thei a (Clause 4.16), leh outfall chu tide-in a khar (tide-locked) lai pawhin a liam ngei ngei tur a ni (Bung 5).

4.7 Drawdown

4.7.1 **Detention.** Duration tin 10% AEP (kum 10) ruahpui-a tui khawl zat sang ber **90%** tal chu khawl zat sang ber hun aṭanga **darkar 48** chhungin, gravity hmangin, Clause 4.6.6-a tailwater nen, luan chhuah tir tur a ni.

4.7.2 **Water quality volume.** WQv chu darkar 24 aia tlem lo leh darkar 48 aia tam lo chhungin luan chhuah tir tur a ni (Bung 8).

4.7.3 **Retention.** Retention khawlna chu darkar 72 chhungin infiltration emaw hman nawn hmangin tihruak tur a ni (Clause 4.4.5).

4.7.4 **Tidal outfall.** Cycle tin chanvo chhungin tide-in gravity drawdown a dan chuan, darkar 48 chin chu tidal tailwater model nen hman a ni. Gravity hmanga tlin theih a nih loh chuan, Clause 5.12 hnuaiah pump hmanga drawdown siam tur a ni.

> Hrilhfiahna. KC APWA 5600 (2006) chuan basin ro chu inflow peak hnu darkar 24 chhungin khawlna 80% tal luan chhuah tir leh darkar 72 chhunga tihruak turin a phut. Singapore PUB chuan detention chu darkar 4 chhunga a dinhmun pangngaia siam ṭhat leh turin a phut. Darkar 48, 90% dan hi PUB ai chuan a rei zawk, Mizoram khawlna-in ni tam tui zat a khawl a ngai vang. Mahse fûr depression pakhatin a tihkhat basin chuan a dawt a lo thlen hmain a tui zat tam zawk a hlawh leh theihna tawk khawpin a la tawi; chu a dawt chu ni engemaw zat chhungin a lo thleng ṭhin: June 2018-ah, Aizawl-in ni khatah mm 148 (June ni 12 ni maithei; chanchin tlangzarh angin) a dawn kha June ni 5-a mi sawm thihna leimin ṭantirtu ruah hnu kar khat vel a ni a, June ni 1, 2018 aṭanga June ni 13, 2018 thleng Serchhip district-a mm 677 sur chhungah (SANDRP, chanchin tlangzarh angin); leh May tawp leh June tir 2025-ah, May ni 24, 2025 aṭanga June ni 3, 2025 thleng ruahpui-in leimin 598 a thlen tir (DM&R zat, chanchin tlangzarh angin).

4.8 Outlet structure-te

4.8.1 **A tlangpui.** Outlet hmasa-te chu heti hi an ni tur a ni:

- enkawltu nghah ngai lo, thil che, valve emaw pump nei lo, Clause 5.12-in pump hmanga drawdown a phalna lai chauh loh chu;
- endik leh tihfai nan leilung chung aṭangin, confined-space (hmun khuh zim) luh ngai lovin, a theih chin chin, thlen theih; leh
- thil daih rei hmanga sak. Coastal area-ah chuan corrosion (thir ei) do thei an ni tur a ni (Clause 4.12.5).

4.8.2 **Orifice hniam ber.** Thununna orifice reng reng chu diameter **mm 50** aia tê a ni tur a ni lo, slot tan chuan a zau lam tê ber mm 50 aia tê a ni tur a ni lo.

4.8.3 **Trash rack leh screen.** Orifice leh weir tin chu trash rack emaw screen emaw hmangin humhalh tur a ni. Rack chuan:

- bar inkar zau zawng chu a humhalh kua tê ber chanve aia lian lo, leh mm 25 aia tê lo a nei tur a ni;
- a humhalh kua area aiin **let 10** tal clear open area a nei tur a ni;
- bal chu tui nen a lo chho a, bar-ah a vuak tang lo turin, a awn tur a ni, emaw riser vel-ah cage angin dah tur a ni;
- tihfai nan paih theih emaw hinge nei a ni tur a ni; leh
- routing tan, drawdown endik huna low-flow orifice-ah **50% tihtawp** angin ngaih tur a ni.

4.8.4 **Anti-vortex device.** Riser crest leh orifice, an diameter let 1.5 aia tam head hnuaia luang thei chuan anti-vortex plate emaw hood emaw an nei tur a ni (Milem 4.2).

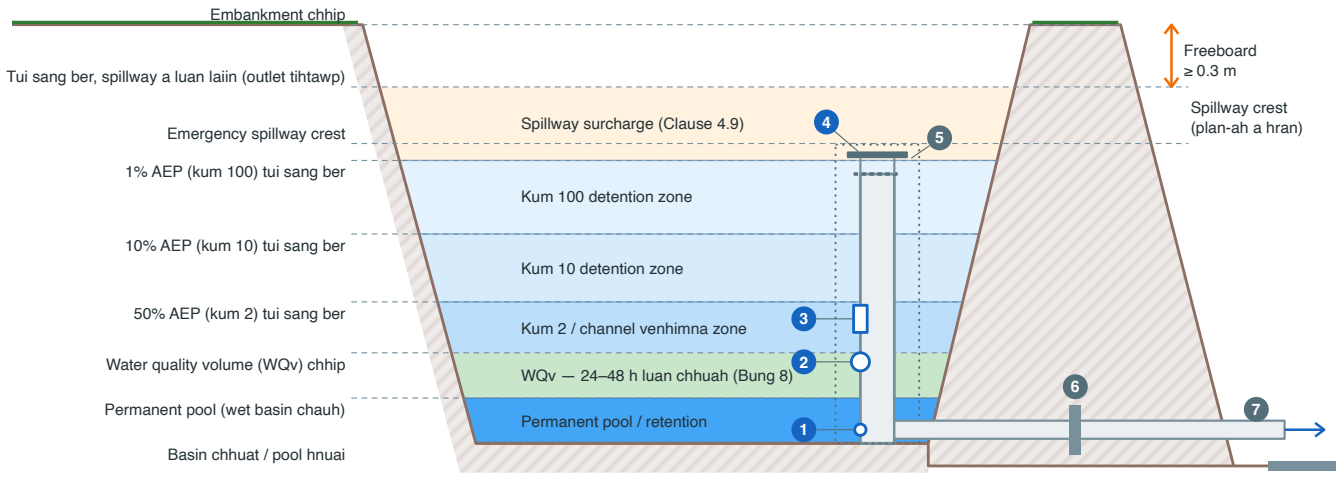
4.8.5 **Outlet barrel.** Embankment kal tlang outlet barrel-te chuan:

- diameter mm 300 tal an ni tur a ni (Bung 6);
- tui luh theih loh joint an nei tur a ni;
- embankment chhunga a sei zawngah filter diaphragm emaw seepage collar emaw an nei tur a ni; leh
- energy-dissipating outfall an nei tur a ni (Bung 9).

4.8.6 **Then hranna.** Ha 1 aia tam huam facility-te chuan enkawl nan outlet then hranna kawng, stop-log slot emaw penstock ang chi, an nei tur a ni. Hman pangngai lai chuan a hawng vek tur a ni.

Hrilhfiahna. Hniam ber mm 50 hi KC APWA 5600 (2006)-a mm 75 (3 in) aiin a tê zawk a, chuvangin trash-rack thupek-te chu a tlukpuiin an khauh zawk. 4.8.3-a ratio-te (bar inkar chu kua chanve, open area chu kua let 10, drawdown endikna tan 50% tihtawp) hi a entirna hmasa chiang a awm lo va, he Kaihhruaina Bu-in a ruat a ni. Tihtawp factor hi Bung 6-a sag inlet tan grate clogging factor 50% nen a inmil. India khawpui drain-te hian bawlhhlawh tam tak an phur a, chuvangin rack ṭha nei lo low-flow orifice chu season pakhat chhungin a tawp ang.

Khawlna chhawp leh multi-stage outlet — schematic cross-section, scale ang a ni lo



Awmzia

1 Stage 1 low-flow orifice (≥ 50 mm, Clause 4.8.2) — WQv 24–48 h chhungin a luan chhuah tir
2 Stage 1 orifice pahnihna — 1 nen, 50% AEP (kum 2) luan chhuah a thunun
3 Stage 2 orifice emaw weir slot — 10% AEP (kum 10) luan chhuah a thunun
4 Stage 3 riser crest / overflow grate, anti-vortex plate nen — 1% AEP (kum 100) luan chhuah a thunun
5 Kawngka zawng zawng huam trash rack (Clause 4.8.3)
6 Outlet barrel-a seepage collar emaw filter diaphragm
7 Outlet barrel, energy dissipation leh outfall apron
Tui sang zawng leh zone chhah zawng hi entirna chauh a ni.

Milem 4.2 — Detention khawlna chhawp (permanent pool, WQv, kum 2, kum 10 leh kum 100 zone, spillway surcharge (tui khat luat a nek chhuahna) leh freeboard) leh multi-stage riser outlet. Schematic, scale ang a ni lo. He Kaihhruaina Bu tana milem siam thar, MARC/KC APWA Section 5600 (2006, 2025.01) leh Mile High Flood District Urban Storm Drainage Criteria Manual, Volume 2 (full-spectrum detention)-a multi-stage outlet leh storage-zone ngaihdan aṭanga siam danglam.

4.9 Emergency spillway, freeboard leh embankment himna

4.9.1 **Spillway capacity.** Detention facility, embankment hmanga a zavaia emaw a chanvo emaw siam, emaw a overflow-in in a thlen theih chuan, **1% AEP (kum 100) peak inflow** luan tir thei emergency spillway a nei tur a ni:

- outlet hmasa chu a tawp vek angin ngaih chungin;
- ruahpui ṭan hunah facility chu spillway crest thleng a khat chungin; leh
- tui sang zawng sang ber aṭanga embankment crest thleng **m 0.3 freeboard** tal nen.

4.9.2 **Hlauhawmna sang facility.** Facility chu a chhiat emaw a overflow emaw-in heng a tih theih chuan hlauhawmna sang (high-hazard) a ni:

- nunna a tihlauhawm;
- mi chenna in emaw facility pawimawh emaw tuilianin a tihchim; emaw
- kawng lian (arterial road) kal theih loh a siam.

Hlauhawmna sang facility-te chu 4.9.1-a condition hnuaiah **0.2% AEP (kum 500)** peak inflow tan pawh endik tur a ni, embankment chung a liam lovin.

4.9.3 **Spillway crest.** Spillway crest chu outlet hmasa hna thawk chunga routing aṭanga 1% AEP tui sang zawng sang ber emaw a chungah a awm tur a ni. Inkar rawt chu m 0.15 a ni.

4.9.4 **Spillway awmna.** Spillway chu:

- lei pianphung emaw reinforced chanvo-ah, lei vur-ah ni lovin, design tui luang famkim tan lei khawih (erosion) laka humhalh a nih loh chuan;
- Bung 6-a 1% AEP overland flow path-ah luang chhuak; leh
- a tui luang in a thlen loh turin dah a ni tur a ni.

4.9.5 **Lei hnuai leh khuh facility.** Tank, vault leh podium khawlna chuan outlet a tawp huna hna thawk overflow kawng an nei tur a ni. Chu kawng chuan 1% AEP inflow chu in, basement emaw lift pit reng reng surcharge lovin overland path-ah a luan tir tur a ni.

4.9.6 **Embankment-te.**

- (a) **m 2** aia sang embankment (luanna hnuailam ke aṭanga crest thleng teh) chu geotechnical engineer thiamna nei-in design tur a ni. Design-ah stability, seepage leh settlement zirchianna a tel tur a ni.
- (b) Sir pang chu mipui thlen theih emaw hlo seh ṭhinna lam reng rengah 3H:1V aia chho a ni tur a ni lo. Clause 4.15-in a phut lai chuan pang chu a phei zawk tur a ni.
- (c) Embankment-te chuan heng an nei tur a ni:
  - crest zau zawng m 3 tal;
  - lei vur nghet, engineered, seepage zirchianna-in a phut lai chuan core emaw cut-off emaw nen; leh
  - thing emaw thlai lian awm lohna.
- (d) Dam Safety Act, 2021 huam chhunga embankment structure chu he Kaihhruaina Bu bakah chu Act hnuaiah a awm.

4.9.7 **Laih facility.** Facility, a vel lei hnuaiah a zavaia awm, embankment nei lo chuan 4.9.6 a tlin ngai lo. Mahse 4.9.1 chu a tlin tho tur a ni, overflow kawng chu spillway angin ngaih chungin.

> Hrilhfiahna. Spillway tehna (1% inflow, outlet tawp, basin khat, m 0.3 freeboard; hlauhawmna sang tan 0.2%) hi KC APWA 5600 (2006) dan a zui: spillway chuan 1% ruahpui chu dam chhip thleng ft 1 (m 0.3) freeboard nen a luan tir a, khawlna zero leh outlet hmasa tawp angin ngai chungin, crest chu 1% tui chung sang ber aiin ft 0.5 (m 0.15) tal a sang. KC chuan ft 10 (m 3) aia sang dam-te chu SCS TR-60 Class C angin a design. Embankment m 2 ṭantirna, 3H:1V pang (KC wet pond) leh crest zau zawng m 3 hi a entirna hmasa chiang a awm lo va, he Kaihhruaina Bu-in a ruat a ni.

4.10 Facility chi hrang hrang

4.10.1 **A tlangpui.** Clause 4.5 aṭanga 4.9 thleng tlin khawlna reng reng hman theih a ni. Leilung chunga khawlna, hmuh theih leh confined-space luh ngai lova endik theih chu thlan zawk a ni. Khawlna chu mi chenna basement emaw tuilianin nunna a tihlauhawm theihna hmun reng rengah dah tur a ni lo.

4.10.2 **Lei hnuai tank leh vault.**

- (a) Drain dawngtu-in a phal chuan gravity outlet phut a ni. Pump hmanga outlet chu Clause 5.12 hnuaiah chauh, registered maintenance declaration nen (Bung 10), phal a ni.
- (b) Outlet chamber chung leh inlet tin chungah luhna kawng siam tur a ni. m² 500 aia lian tank-ah, m 30 aia hla lo inkarah an awm tur a ni.

- (c) Floor chu outlet-a sump lamah 1% tal a hniam tur a ni, low-flow orifice invert hnuaiah sediment pocket nen.
- (d) Tank chu thli luh theihna (ventilation) nei tur a ni.
- (e) Inlet-te chu silt trap (leidip dawnna) emaw gross pollutant trap emaw kal tlang tur a ni (Bung 8).
- (f) Flotation leh leihnuai tui luh chu Clause 4.12 hnuaiah endik tur a ni.

4.10.3 **In chung detention.**

- (a) Outlet tawp chunga tui dil zawng zawng rit tawk tura design in chung phei-ah phal a ni. Tui dil thuk zawng chu **mm 150** a hleh tur a ni lo, structural engineer-in thuk zawk a certify loh chuan.
- (b) In chung outlet tin chuan certified rating nei flow-control ring emaw weir emaw a nei tur a ni a, in chung area tin chuan outlet thunun-te aṭanga hrang, 1% AEP inflow luan tir thei overflow scupper pakhat tal a nei tur a ni.
- (c) RWH khawlkhawmna atana hman in chung chuan in chung detention a pe thei bawk. Tui dah rih chu thununna kal tlangin luan chhuah tir a ni a, RWH sump-ah ni lovin.

4.10.4 **Podium leh landscape-deck detention.**

- (a) Lei chungah emaw basement car park chungah emaw phal a ni, structure chu a hnawng famkim leh tui dil tan design a nih a, tui luh theih loh a nih chuan.
- (b) In chung detention (4.10.3) tan luan chhuah tir, overflow leh himna dan-te hman a ni.

4.10.5 **Parking-lot detention.**

- (a) Leilung chunga parking-ah chauh phal a ni. Tui dil thuk zawng chu heng aia tam tur a ni lo:
  - parking bay reng rengah 10% AEP ruahpui-ah **mm 200** leh 1% AEP ruahpui-ah **mm 300**;
  - accessible route, ramp leh pedestrian crossing-ah zero; leh
  - fire-tender access route-ah 10% AEP ruahpui-ah zero.
- (b) Sign-te-in hmun chu tuilian a tuar ṭhin tih an vaukhân tur a ni.
- (c) Tui dil chu in bang a thleng tur a ni lo, bang chu 1% level leh freeboard chung thleng tui luh theih loh a nih loh chuan (Bung 6).

4.10.6 **Hman tam theihna detention (park, infiamna mual, open space reservation).**

- (a) Open space ram chu detention atan hman theih a ni, a hman bul ber chu 50% AEP ruahpui tal-ah hman theih a nih reng chuan.
- (b) Khawlna area-te chu Clause 4.7-a hun chhunga a zavaia a liam theihna turin grade tur a ni.
- (c) Low-flow channel emaw underdrain-in ruah sur lohna hun leh tui luang zing-te a phur tur a ni, park chu tui a chiah reng loh nan.
- (d) Clause 4.15-a thuk zawng leh pang chin-te hman a ni.
- (e) Infiamna hmanrua leh ṭhutna-te chu 10% AEP level chungah dah tur a ni.

4.10.7 **Pond leh wet basin.**

- (a) Permanent pool chu a area tam zawkah m 1.2 tal a thuk tur a ni, hlo tho leh thosi pung dan nan, a kamah thlai phun safety bench nen (Clause 4.15).
- (b) Permanent pool chunga khawlna chauh detention angin chhiar a ni.

> **Hrilhfiahna.**
>
> - In chung thuk zawng (mm 150) leh parking thuk zawng (mm 200 leh 300) hi a entirna hmasa chiang a awm lo. He Kaihhruaina Bu hian outlet tawp chu hlauhawm a nih hmaa hriat theih nan a ruat.
> - Pool thuk zawng m 1.2 hi KC APWA 5600 (2006)-a ft 4 permanent pool hniam ber nen a inang. He Kaihhruaina Bu hian hlo leh thosi thunun nan a hmang ber.
> - Pump hmanga detention tank-te hian Singapore-ah maintenance declaration an mamawh (PUB Addendum No. 3, April 2025). He Kaihhruaina Bu hian Bung 10 kal tlangin kalphung ang chiah a hmang.

- Mizoram tlang chhipah open space a tlem a, a tam zawk chu tlang pang a ni. AMCBR chuan m² 93 aia tê plot-ah ground coverage 71% thleng a phal a, m² 1,000 aia lian plot-ah 50%-ah a hniam (reg. 39), leh soft-cover chanvo a ruat lo; 2025 amendment chuan m² 100 aia lian plot-a incentive hlawh green-building hmalakna zingah "Hardscape tihtlem" ("Reduction of Hardscape") a tarlang a (Chapter VIIIA), mahse a phut lo. Chuvangin 4.10.6 hnuaia hman tam theihna detention chu ram zawl-ah chauh a theih: infiamna mual, terrace emaw cut-and-fill site-a building pad, emaw phai emaw lui kam zawl-a open space. Tlang dan huam ram, chu chu 10° aia chho tlang pang pianphung, tlang pang eng ang pawha Surma-group shale, colluvium, lei vur, lei laih bal (cut-spoil), leimin bal, map-a tarlan Moderate, High emaw Very High leimin hlauhawm zone leh lei laih emaw bang chung lama a san zawng let hnih chhunga ram-ah chuan, open space chu tui dil nan hman a ni lo va, detention chu lined, tui luh theih loh tank-ah, 4.10.3 leh 4.10.4 hnuaia in chung leh podium-ah, emaw tlang dan geotechnical certificate-in a huam chauhin open space zawl-ah, leh High emaw Very High hazard zone-ah chuan lined tank-ah chauh siam a ni (Clause 4.11). Terrace emaw building pad-a detention area chuan SD&SM reg. 27-a pad gradient 1 in 50 chu a outlet lamah a vawng a, a zavaia a liam theihna turin (Clause 4.15.7), leh a overflow chu drain lined-ah a kal a, a hnuaia tlang pang-ah ngai lo. Phai ram-ah chuan leilung chunga khawlna hi thlan zawk a ni (Clause 4.12.4), mahse a floor chu Clause 4.12.1-a design groundwater level chungah dah a ni emaw, lined a ni emaw. He tum atan ram chi thum hi open space a ni lo. Ram chunga dil chu Clause 4.3.1 step 1 hnuaiah humhalh a ni a, a outlet level aṭanga ṭan (Clause 3.12.5) tui chung angin model a ni (Clause 3.3.2(e)), chuvangin chu level chunga a tuilian khawlna chauh chhiar theih a ni a, Bung 7-in a phal ang chauhin; dil chu detention pond-ah chantir a ni ngai lo va, engineered khawlna chu detention pond (ruahtui dah rihna dil siam) tih a ni a, dil emaw tuikhur emaw tih a ni ngai lo. Lui kama Bung 7-a he Kaihhruaina Bu stream corridor (lui leh drain kama humhalh tur ram zau), leh SD&SM reg. 28-in vawn reng a phut riverine reserve chu a sira development tan detention angin chhiar a ni lo. Leh tui lakna hmun chunga tuikhur (spring) catchment chu detention atan grade emaw tui dil tir emaw a ni lo, tuikhur aṭanga m 15 chhungah storm outfall, soakaway emaw drain tui luan chhuah a awm lo va, a catchment chu Bung 8-a tuikhur dan (spring rule) hnuaiah humhalh a nih avangin.
- Clause 4.15.5 hnuaia sign leh thuk zawng chhinchhiahna-te, leh 4.10.5(b)-a tuilian vaukhânna sign-te chu Mizo leh English-in an ni; Lai, Mara leh Chakma Autonomous District Council bial-ah chuan District Council emaw competent authority emaw-in a thupek chuan hmun-a hman ṭawng-in pawh an ni bawk (he Kaihhruaina Bu-in a ruat). He dan hi Mizoram Official Language Act, 1974 (Act No. 3 of 1975) a zui a, chu Act chuan Mizo ṭawng chu State official language-ah a siam a, May ni 6, 1996-a notification (No. H.12017/14/90-LJD, scan ṭha lo aṭanga number chhiar) hnuaiah August ni 1, 1977 aṭanga hman ṭan a ni; English pawh official tum atan hman theih a nih hi thu lak chhawn aṭang chauhin hriat a ni (section chu chhiar a ni lo). Mizo ṭawng hi Roman hawrawpin ziah a ni. District Council bial-a hmun-a hman ṭawng-te chu he Kaihhruaina Bu tan zirchian a ni lo [TBC], leh sign chu a vaukhân mipui-in an chhiar thiam theih tur a ni.

4.11 Ruahtui khawl khawm leh detention chhiar dan

4.11.1 **Vawi hnih chhiar loh.** RWH khawlna (RWH thupek hnuaia sump, tank, recharge pit leh well siam) chu detention angin chhiar tur a ni **lo**.

4.11.2 **RWH sump khat angin ngaih.** He Bung hnuaia routing zawng zawng tan, RWH sump leh tank-te chu season tinah, **ruahpui tin ṭan hunah khat** angin ngaih tur a ni. An overflow chu detention facility-ah, emaw detention a kal pelh chuan outfall-ah direct-in route tur a ni. Chutiang a nih chuan kal pelh tui luang chu PSD-ah chhiar a ni.

4.11.3 **Tank inzawm (combined tank).** Tank pakhatin RWH leh detention a pe ve ve thei, heng a nih chauhin:

- (a) detention zone chu RWH overflow level **chungah** a zavaia a awm;
- (b) detention zone chu RWH overflow level-a dah amah gravity control orifice ngei hmangin tihruak a ni a, Clause 4.7 leh 4.8 a tlin;
- (c) pump, valve emaw hmangtu hmalakna reng rengin detention zone-ah tui a vawng thei lo; leh

- (d) zone pahnih leh orifice level chu drawing-ah leh maintenance declaration-ah lantir a ni.

RWH overflow level leh detention overflow level inkar tui zat chauh detention angin chhiar a ni.

4.11.4 **Recharge structure-te.** Recharge pit, trench, shaft leh well-te chu Clause 4.4.3 aṭanga 4.4.5 thleng an tlin chuan **retention** angin chhiar theih a ni (detention ni lovin). A bik takin, seasonal high groundwater table chu an bul hnuaiah m 1.0 tal a awm tur a ni. Routing-ah chuan fûr hun leihnuai tui level nen Clause 4.4.6 hnuaiah enkawl an ni.

4.11.5 **RWH chu phut ngei ngei a ni reng.** He Bung-a engmah hian Aizawl Municipal Corporation Building Regulations, 2012 regulation 5(6)(ix) leh 33-a RWH thupek, neitu-in incentive a lak chuan an Chapter VIIIA (2025)-a green norm-te, building permit emaw site development permit condition reng reng, State sawrkarin Mizoram (Village Councils) Act, 2025 section 13(6) hnuaia a siam dawn model building bye-laws reng reng (hmuh a ni lo [TBC]), Mizoram Water Resources (Management and Regulation) Act, 2024 section 16(2)(ix) hnuaia WARDMA thupek (direction) reng reng, Central Ground Water Authority inkaihhruaina (guidelines) a huam lai, emaw approving authority ruahtui khawl khawm dan emaw thupek reng reng a tihtlem lo.

> **Hrilhfiahna.** Mizoram-ah ruahtui khawl khawm hi instrument pakhatin a phut a, a lian zawng erawh a ruat lo. Aizawl Municipal Corporation bial chhungah, Aizawl Municipal Corporation Building Regulations, 2012 (AMCBR) regulation 33 chuan "In zawng zawngah ruahtui khawl khawmna facility ṭha tak siam bawk tur a ni" ("A suitable rain water harvesting facility shall also be provided in all buildings") a ti a, in plan-te chuan "ruahtui khawl khawmna facility ṭha tak siam tur a tel tur a ni" ("include provision for a suitable rain water harvesting facility") (reg. 5(6)(ix)). 2025 amendment chuan Chapter VIIIA, "Green Building leh Sustainability" ("Green Buildings and Sustainability") a belh a, chu hnuaiah "plot sq.m 100 aia lian hrang hranga in zawng zawngin green norm-te an zawm thei" ("all buildings on various plot sizes above 100 sq.m may comply with the green norms"), incentive, FAR belh emaw fee ngaihdam ang chi nen, "(a) Tui Humhalhna leh Enkawlna (i) Ruahtui Khawl Khawm … (iv) Hardscape Tihtlem" ("(a) Water Conservation and Management (i) Rain Water Harvesting … (iv) Reduction of Hardscape") tan; hengte hi incentive an ni a, condition an ni lo. Master Plan for Aizawl: Vision 2030 chuan RWH chu "vantlang in zawng zawngah … phut ngei ngei" ("mandatory … in all public buildings") turin a rawt a, chu chu plan rawtna a ni. Heng zinga pakhatin mah khawl tur tui zat, roof-area rate, drawdown emaw infiltration test emaw a pe lo (NEER chhiar dan), leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 (SD&SM) chuan ruahtui khawl khawm mawhphurhna a ruat lo. Corporation bial pawn lamah ruahtui khawl khawm dan reng reng hmuh a ni lo; Mizoram Water Resources (Management and Regulation) Act, 2024, Autonomous District Council-te huam lo, chuan Irrigation & Water Resources Department (IWRD) chu "leihnuai tui recharge tihpun nan ruahtui khawl khawm tihchak" ("promote rain water harvesting to augment ground water recharge") turin a ruat a (s.14(1)(b)(viii)), WARDMA chu "ruahtui khawl khawm telin tui humhalh leh leihnuai tui recharge" ("water conservation and groundwater recharge, including rain water harvesting") thupek turin a phal (s.16(2)(ix)). Mizoram-ah ruahtui khawl khawm hi khawlna leh tui pekna a ni a, recharge a ni lo. Aizawl Urban Area-ah chhungkua 27.16%-in ruahtui an hmang a, 1.01%-in tuikhur tui (master plan, Table 8.2); sawrkar tui pek chu "44 lpcd" tia sawi a ni a, tui 35% chu chhiar theih loh (chanchin tlangzarh angin; ni chiang a awm lo); leh thla ro-ah tuikhur-te chuan "ni khatah liter 3,000 aṭanga 20,000 thleng" ("3,000 to 20,000 liters per day") chauh an pe (CGWB, Lunglei district booklet). Leihnuai tui a tlachham lo: extraction stage chu 2011-ah 3.52% a ni a (CGWB, *Ground Water Scenario of Mizoram*), GWRA 2024-ah 3.95%, unit 26 endik zawng zawng Safe (thu lak chhawn angin), leh leihnuai tui hmasawnna thunun tura notify area chu "NIL" a ni (CGWB). Chuvangin he Kaihhruaina Bu hian credit tan infiltration dan pahnih leh lian zawng ruat dan pakhat a siam (a zavaia he Kaihhruaina Bu-in a ruat), leh ruahtui khawlna chu heti hian a credit:
>
> - AMCBR reg. 33 hnuaia RWH tank chu RWH khawlna a ni. Detention a ni lo (Clause 4.11.1), leh ruahpui tin ṭan hunah khat angin ngaih a ni (Clause 4.11.2), fûr hun chhungin ruahpui hmasa ber hnuah a khat ṭhin avangin. Tank chuan Clause 4.11.3 hnuaia tank inzawm anga sak a nih chauhin detention a pe thei, a RWH overflow level chunga detention zone, amah orifice ngei kal tlanga liam nen; chu zone chauh chhiar a ni.
> - **RWH credit dan.** AMCBR reg. 33-in tui zat a ruat loh avangin, he Kaihhruaina Bu hnuaia credit hlawh turin RWH khawlna chuan in chung area m² khat zelah L 25 tal (in chung chunga ruah mm 25 vel) a khawl tur a ni. He value hi he series-a North-East value a ni; tlang ram edition-te-a m² khat zela L 20 hi entirna hmasa a

ni a, Mizoram chhungkua-te-in tui pek atan in chung tui an khawl tawh ṭhin a, January aṭanga March thleng thla ro-ah tuikhur-te chuan ni khatah litre 3,000 aṭanga 20,000 thleng chauh an pek avangin (CGWB, Lunglei) tihsan a ni. Clause 4.4-a **retention** thupek-ah chuan darkar 72 chhunga tui in tur ni lo hman reng, toilet flush emaw silna ang chi, Clause 4.4.3 hnuaia lantir, hmanga a ruak chin chauh chhiar a ni; huan tui pek hi fûr hun chhungin hman reng a ni lo. Chu tank chu retention hmalakna dang ang bawkin Clause 4.4.6 hnuaiah model a ni a; fûr design ruahpui tin ṭan hunah khat angin ngaih a ni a, detention angin chhiar a ni ngai lo. He dan hian regulation thupek chu teh theih a siam a; a thlak lo va, tank lian zawk chu phal reng a ni. Tlang dan huam ram, State zawng zawng deuh thaw, ah chuan khawlna leh hman nawn hi retention siamna kawng a ni a, m² khat zela L 25 hi a chanvo hmasa ber a ni.

- Recharge pit, trench, shaft leh well-te chu Clause 4.11.4 leh a hnuaia recharge dan an tlin chauhin retention angin chhiar a ni: site test-a teh rate chanve-in darkar 72 chhunga an liam chin chauh credit a ni (Clause 4.4.3 leh 4.4.5), an bul chu seasonal high water table chungah m 1.0 tal, leh credit chu Clause 4.4.6 hnuaia routing hmangin hmuh a ni, an tui zat paih hmangin ni lovin.
- **Tlang dan (hill rule).** Belhchian 2A-a sub-area tinah, sub-area MZ-A1, MZ-C1 leh MZ-D1 chhunga tlang pang-te pawh tel, tum taka infiltration hmalakna (soakaway, soak emaw percolation pit, recharge pit, shaft emaw well, infiltration trench, emaw tui chhuah tir base nei permeable paving) reng reng sak emaw credit emaw tur a ni lo: 10° aia chho lei pianphung-ah; tlang pang eng ang pawha Surma-group shale, siltstone emaw mudstone-ah; a pang eng ang pawh ni se colluvium, lei vur, lei laih bal emaw leimin bal chungah; map-a tarlan Moderate, High emaw Very High leimin hlauhawm zone-ah (SD&SM Regulations-a sawifiah Aizawl Municipal Corporation Landslide Hazard Maps (leimin hlauhawmna map), MIRSAC *Atlas of Micro-level Landslide Hazard Zonation of Aizawl City and Selected Towns*, emaw Serchhip khawpui zonation); emaw lei laih pang emaw retaining wall chung lamah, lei laih emaw bang san zawng let hnih chhungah — geotechnical engineer emaw engineering geologist thiamna nei-in a pek geotechnical certificate-in tui belh chuan tlang pang a tinghet lo vang tih a lantir loh chuan; leh High emaw Very High leimin hlauhawm zone-ah chuan, certificate eng pawh pe se, reng reng. Chutiang site-ah chuan in chung ruahtui luang chu a chunga credit dan hnuaiah ruahtui khawlna-ah a kal a, a overflow chu silt trap leh energy dissipator kal tlanga lui kawng nghet-a luang chhuak drain lined-ah, tlang pang humhalh loh-ah ngai lovin. Lei hian a chhan a pe. Bokabil leh Bhuban tlang chhip-te hi "tui luh theihna leh infiltration hniam" ("characterized by low permeability and infiltration") an ni a, "ruahtui luang chhuahna zone" ("run off zone") angin an awm (CGWB, Lunglei); "shale leh siltstone awmna lithological unit-te hi sandstone unit khauh leh nghet aiin leimin a tlak theih zawk" ("Lithological units comprising shale and siltstone are more susceptible to landslide than the hard and compact sandstone unit"), shale tawlh chu weight sang ber pek a ni (MIRSAC, Serchhip town); leh "khawpui leh a chhehvela lei hi a la naupang a, a bawrh" ("The soil in and around the city is young and in a loose state") (master plan). Chutiang tlang pang-a tui dah lut chuan aquifer a recharge lo; tlang pang chhunga pore pressure a tisang zawk. Leimin chanchin-in a hnua thleng a lantir: May ni 11, 2013-a Aizawl-a Laipuitlang lungpui tlak (paper pakhatah May ni 15), Middle Bhuban Formation chungah, ruang 17 laih chhuah (Science Vision paper) emaw mi 8 thi (review dang; a zat a inang lo); May ni 28, 2024-a Cyclone Remal-a Melthum leh Hlimen inkara lung laihna hman tawh lo chim (chanchin tlangzarh angin); leh Directorate of Geology and Mineral Resources-in 2022-23-a a zirchian "leimin lian ṭhena thum ṭhena hnih" ("two-thirds of large-scale landslides") chu "tui luanna ṭha lo avang a ni" ("were due to improper drainage") tih a hmuhchhuah (chanchin tlangzarh angin). A thupek innghahna-te chu: SD&SM Regulations, a tum chhan clause-in "tlang panga leihnuai tui lut zat tihpun, leh sewerage leh tui luanna chu thunun ṭha lova tlang pangah paih" ("increasing the amount of groundwater penetrating into slopes, and disposing of sewerage and drainage onto slopes in a poorly controlled manner") chu tlang pang nghet lohna chhan angin a sawi a, "nghetna atana a ngai angin" ("as necessary for stability") lei hnuai tui luanna leh interceptor drain leh down-drain (tlang pang zawh chhuk drain) a phut a (reg. 27), lei vur ke chu "tui zau taka luan liam nan emaw paved drain atan emaw pang siam … energy dissipater nen" ("sloped for sheet overflow or a paved drain … with energy dissipaters") (reg. 25), leh lei vur hnung lama "leilung chunga tui leh lei hnuai tui, tuikhur ang chi, thununna" ("the control of both surface water and subsurface water, such as springs") (reg. 26) a phut a, Moderate, High leh Very High zone tinah geotechnical report nena engineered site development a phut; AMCBR reg. 21(iv), chu hnuaiah site chu "leimin, lei tlak, lei che ang chi hlauhawm hmun a ni lo" ("not an active hazard-prone area such as landslide, subsidences, mass movement") a ni tur a

ni; leh Landslide Policy Committee for Aizawl City-a Roadmap to Stability (February 2014), chu chuan Public Health Engineering Department (PHED) chu "ruahtui leh tui bal chu tlang pang inhawng aṭanga khawm a, hla takah luan tir a, tlang pang nghet lo thei a tihhnawng loh tur hmunah paih" ("capture and transport rain and waste water away from exposed hillslopes and ejected at locations that will not saturate potentially unstable slopes") turin a ngen a, "Aizawl City chhunga septic tank, leach field leh soak pit zawng zawng paih bo" ("eliminate all septic tanks, leach fields and soak pits within Aizawl City") turin a au. Heng site-ah hian retention chu khawlna leh hman nawn hmangin siam a ni a, detention chu lined tank hmangin, tlang panga pond emaw basin emaw hmangin ni lovin (Clause 4.10 Hrilhfiahna). Clause 4.4.3-a leihnuai tui inkar m 1.0 hian tlang panga infiltration hmalakna chu a phal theih a siam lo: tlang pang chhunga perched water leh pore pressure hi hlauhawmna an ni, water table thlen thuk zawng ni lovin.

- **AMCBR reg. 33 leh soak pit: inkalhna, sawi chiang.** Regulation 33 chuan water closet tin tan "septic tank lian tawk, soak pit nen" ("A septic tank of appropriate capacity with soak pit") a phut. Hlauhawm tlang pang-ah chu soak pit chu Roadmap to Stability-in a paih duh leh tlang dan-in ruahtui tan a khap hmalakna a ni. He Kaihhruaina Bu hian regulation 33, ruahtui ni lo ek tui chungchang thu nei, chu a khalh lo. Inkalhna chu a sawi chiang a: he Kaihhruaina Bu hnuaiah ruahtui, in chung tui emaw in chhunga tui bal (sullage) emaw soak pit-ah dah a ni lo va, soak pit chuan infiltration credit a hlawh lo; tlang dan huam ramah soak pit a awm chuan, inkalhna chu site submission-ah ziah a ni (Bung 8).
- **Recharge dan.** Mizoram-ah recharge hi design tum a ni lo. Tum taka recharge chu test tawh phai alluvium leh lui kam zawl, Champhai phai (sub-area MZ-C1) leh Tlabung (MZ-D1), Bairabi leh Vairengte (MZ-A1) leh Tlawng kam zawl-te, texture angin HSG B emaw C, 10° emaw a aia hniam ram phei-ah, tlang pang aṭanga hla leh 1% AEP tuilian sang zawng chungah chauh phal a ni; chutah chuan structure hmaah silt trap, filter leh first-flush (ruah tlak hmasa ber tui bal) diverter, field infiltration test, lei hnuaiah m 2.0 tal seasonal high water table leh Clause 4.11.4 leh 4.12-a inkar a mamawh. 1% AEP tuilian sang zawng hnuaia phai ram-ah, dil kam-ah (Bung 7 hnuaia a Zone 1 leh Zone 2), tuikhur aṭanga m 15 chhungah (Bung 8-a tuikhur dan), emaw water table chu lei aṭanga m 2.0 chhunga a awmna apiangah phal a ni ngai lo: Lunglei district phai pond tê-te-ah tui chu "lei chung aṭanga 2.0 m hnuai chhungah" ("within 2.0 m below ground level") a awm (CGWB, Lunglei). Hmun dang zawng zawngah ruahtui khawl khawm hi khawlna leh hman nawn a ni.
- **Water Resources Act leh recharge: inkalhna, sawi chiang.** 2024 Act section 14(1)(b)(viii) leh 16(2)(ix) chuan "leihnuai tui recharge tihpun nan" ("to augment ground water recharge") ruahtui khawl khawm leh "leihnuai tui recharge, ruahtui khawl khawm tel" ("groundwater recharge, including rain water harvesting") a sawi. Tlang ramah he Kaihhruaina Bu hian a pahnih hi ruahtui khawlna leh hman nawn, Act-a "tui humhalhna" ("water conservation")-in a huam, angin a hriatthiam a, tlang pang chhunga recharge angin ni lovin, chutiang chuan a sawi chiang; Act chu a khalh lo va, WARDMA thupek reng reng chu a chhuah lai chuan zawm tur a ni. Test tawh phai ramah recharge dan hman a ni.
- **Tuikhur (spring).** Tuikhur (tui chhuahna emaw tui lakna hmun; dan-ah chuan, "tui pekna lak theihna hmun reng reng" ("any place wherein water supply is obtained"), Mizoram (Village Councils) Act, 2025, s.2(29)) chu Bung 8-a tuikhur dan hnuaiah humhalh a ni: a aṭanga m 15 chhungah storm outfall, soakaway emaw drain tui luan chhuah a awm lo, a chhungah emaw a chung hnai takah ruahtui route a ni lo, tuikhur chhuahna dang, phum emaw kal tlang drain emaw lei vur a awm lo, leh tui lakna hmun chunga a catchment map-a tarlan-ah paving leh kawng ruahtui luang infiltration a awm lo (he Kaihhruaina Bu-in a ruat). "Mizoram hi tuikhur awmna a ni" ("Mizoram is an abode of springs") (CGWB, State profile), tuikhur-te hi 2024 Act-a "khawtlang tui hnar" ("community water resources") zingah an tel (s.2(1)(i)), leh "Khawpui ṭhanna hian tuikhur ang chi tui hnar hlui-te a tihro" ("Urbanisation has led to drying up of traditional water sources, like tuikhur") (Senhri Journal, chanchin tlangzarh angin). Tuikhur chu khawlna atan hman a ni ngai lo.
- **Ruahtui luang bawlhhlawh.** Fuel station, workshop, lung laihna leh a ang chi aṭanga ruahtui luang, leh ek tui emaw in chhunga tui bal phur drain reng reng, Aizawl drain tam zawk ang hi (Clause 4.1 Hrilhfiahna), aṭanga ruahtui luang chu recharge tur a ni lo; kawng leh parking ruahtui luang chu, recharge dan-in a phal chuan, filter nei leilung chunga hmalakna, thlai phun basin emaw trench ang chi, kal tlang chauhin recharge tur a ni a, pit, bore emaw well-ah direct-in ngai lo (Bung 8).

> Tlang chhipah, lei chhunga tui dah lut chu tlang pang chhungah a kal a, phai-ah chuan luipui-in a tihsan water table a tawng. Fûr hun chhungin RWH tank chu ruahpui hmasa ber hnuah a khat. Chuvangin RWH chu detention anga ngaih chuan a mamawh huna awm lo khawlna a credit dawn a ni. Chuvang chuan he Kaihhruaina Bu hian RWH tank chu ruahpui tin ṭan hunah khat angin a ngai. Chu ngaihdan chu season tinah hman hian dan awlsam pakhat a vawng. Tank inzawm thupek (4.11.3) hian neitu chu structure pakhat a sak phal a, ruahpui a lo thlen huna detention chanvo a ruak chuan. m² khat zela L 25 credit dan, tlang dan, recharge dan, AMCBR reg. 33 leh 2024 Act inkalhna enkawl dan leh ruahtui luang bawlhhlawh dan hi he Kaihhruaina Bu-in a ruat a ni. Mizoram thu hnar reng rengin infiltration tan tlang pang chin a ruat lo: SD&SM Regulations-a 24° chu map-a tarlan loh ram-in engineered site development a mamawhna tlang pang chin a ni a, an 60° leh master plan-a 36° chu in sak chin an ni. 10° chin hi he series-a tlang ram edition-te ang bawkin he Kaihhruaina Bu-in a ruat a ni, chung tlang pang aiin a hniam hle, in chelh thei tlang pang pawh tui dah lut-in a tinghet lo thei a nih avangin; shale condition chu tlang pang eng ang pawhah hman a ni, CGWB leh MIRSAC-in shale chu tui luh theih loh leh leimin tuar ber unit anga an sawi avangin; High leh Very High zone, certificate tel lova paih chhuah, chu SD&SM Regulations-in engineered site development a phut tawhna leh map-in leimin a dahna zone an nih avangin ruat a ni; leh lei laih emaw bang san zawng let hnih inkar hi State tana geotechnical zirchianna kaihhruaina a lo awm hma chu fimkhurna atan he Kaihhruaina Bu-in a ruat a ni [TBC].

4.12 Leihnuai tui sanna leh coastal lei sandy site-te

4.12.1 **Design groundwater level.** Sairang, Bairabi leh Vairengte-a, Khawthlangtuipui kama Tlabung-a leh Kau kama Chawngte-a phai leh lui kam zawl-a site tin, Champhai phai, dil-te leh Tuirial leh Serlui B reservoir kam, leh perched water, tuikhur emaw tui chiar nei tlang site-te, emaw kum chhunga engtik lai pawha leihnuai tui table chu lei chung aṭanga m 3 chhunga a awmna hmun reng reng chuan facility tan design groundwater level (DGWL) a siam tur a ni. DGWL chu fûr chhung emaw fûr hnu-a seasonal high level a ni, heng aṭangin:

- (a) April–November season famkim pakhat tal chhunga site piezometer chhiar; emaw
- (b) (a) a awm loh chuan, observation well hnai ber tan CGWB emaw IWRD record sang zawk, **m 0.5** belh, leh a kianga luipui, lui, dil emaw reservoir reng reng design tuilian sang zawng.

Tlawng, Tuirial leh Khawthlangtuipui phai leh lui kam zawl-a site-te (Sairang, Bairabi, Vairengte leh Tlabung-a), Champhai phai, dil leh reservoir kam, leh tlang pang-a tuikhur hnuaia tui chiar zone-te-ah 4.12.3-a flotation endikna tan, (a) a awm loh chuan, DGWL chu lei sanzawng awm mek angin lak tur a ni.

4.12.2 **Lined khawlna.** DGWL chu khawlna facility bul hnuaiah m 1.0 aia hla lo a nih chuan:

- (a) facility chu tui luh theih loh (lined emaw tui luh theih loh concrete) a ni tur a ni a, infiltration credit a awm lo (Clause 4.4.4); emaw
- (b) lined a nih loh chuan, DGWL hnuaia tui zat chu detention angin chhiar tur a ni lo va, leihnuai tui lut chu routed inflow-ah belh tur a ni.

4.12.3 **Uplift leh flotation.** Lei hnuai tank, vault, lined pond emaw chamber tin chu flotation tan endik tur a ni:

- facility ruak chungin;
- leihnuai tui DGWL-a awm chungin; leh
- coastal site tan, Bung 5-a major-system tailwater level a san zawk chuan, chutah leihnuai tui awm bawk chungin.

Uplift laka factor of safety, permanent dead load chauh chhiar a, geotechnical design-in a nghahchhan loh chuan bang friction ngaihthah chungin, **1.2** tal a ni tur a ni. Ballast, toe extension emaw tension pile hmanga anchor theih a ni.

4.12.4 **Khawlna thuk lo leh lei chung khawlna thlan zawk.** DGWL chu lei aṭanga m 1.5 chhunga a awmna site-ah, a theih chuan khawlna chu lei chungah siam a ṭha: in chung, podium, landscape emaw leilung chunga khawlna. Tank thuk pumpelh a ṭha.

4.12.5 **Daih reina.** Tui al emaw al tlem leihnuai tui emaw tidal tui nena inkhawih concrete leh metal chanvo-te chu IS 456:2000 hnuaia coastal dinhmun mil exposure class tan design tur a ni. Outlet fitting, trash rack leh gate-te chu stainless steel, HDPE, FRP emaw corrosion do thei thil dang a ni tur a ni.

4.12.6 **Leihnuai tui thuk nei lei sandy.** DGWL chu bul hnuaiah m 1.0 emaw a aia hla a nih chuan, lei sandy-a infiltration retention chu fuih a ni. Clause 4.4.3-a design infiltration rate hman a ni a, aquifer thuk lo tihbawlhhlawhna chungchang Bung 8 thupek-te tlin tur a ni.

> Hrilhfiahna. Mizoram hi tuifinriat a hnaih lo (landlocked) a ni a, chuvangin he clause-a coastal thupek-te, 4.12.1 leh 4.12.3-a tidal tui level leh 4.12.5-a saline exposure, chu State-ah hman a ni lo (Mizoram-ah a awm lo), leh he Kaihhruaina Bu tana thu hnar chhiar-ah leihnuai tui al report a awm lo; Lunglei district-a tuikhur test-te chuan electrical conductivity 31–249 µS/cm leh pH 6.9–8.3 an nei (CGWB, Lunglei district booklet). Tlang chhipah leihnuai tui chu a thuk emaw lung pawt (fracture)-ah a awm, mahse tlang pang-a khawlna chu lei chhunga dah a ni lo reng: leihnuai tui a thuk lai pawhin tlang site-ah tank thuk chu thlan zawk a ni lo, tlang pang-a tank chhuak chu hming dang pu infiltration hmalakna a nih avangin. Tlang pang-a khawlna chu lined leh tui luh theih loh a ni tur a ni, a chhuak leh a overflow chu drain lined-ah kal tir a, tlang pang-a laih luh emaw retaining wall bula sak tank chuan Clause 4.11-a tlang dan geotechnical certificate a nei. Hmun hniam tlem tê hi hnawng case an ni. Sairang, Bairabi, Vairengte, Tlabung leh Chawngte-a phai leh lui kam zawl-ah leh Champhai phai-ah water table chu lei aṭanga m 2 chhungah a awm thei a (Lunglei district phai pond tê-te-ah tui chu "lei chung aṭanga 2.0 m hnuai chhungah" ("within 2.0 m below ground level") a awm, CGWB, Lunglei), leh luipui a san huna a zui; dil emaw Tuirial leh Serlui B reservoir kam-ah lei chu tui level-ah a awm; leh tlang pang-a tuikhur hnuaiah lei chu kum tlun a hnawng thei. Chutah chuan lined loh tank chu ruahpui hmain leihnuai tui-in a khat a, lined tank ruak chu a lang thei, a bik takin tuilian luipui, a outlet level-a dil emaw a sang ber hnaia reservoir-in a kianga water table a tihsan huna. Chuvangin 4.12.1(b)-a design groundwater level hian a kianga luipui, lui, dil emaw reservoir design tuilian sang zawng chu well record aia a san zawk chuan a la a, phai leh lui kam zawl, dil leh reservoir kam leh tuikhur hnuaia tui chiar zone-ah chuan piezometer-in a dang a lantir loh chuan flotation endikna tan lei sanzawng awm mek angin lak a ni. Chutah chuan khawlna chu lei chungah, in chung, podium leh landscape-ah (4.12.4) siam a ṭha zawk a, lei hnuaia khawlna chu lined, anchor leh a ruak lai flotation endik a ni. 4.12.1(a)-a April–November monitoring season hi he Kaihhruaina Bu-in a ruat a ni, he Kaihhruaina Bu fûr hun April ni 1 aṭanga October ni 31 thleng leh a hnua tui sang huam turin, October aṭanga December thleng fûr hnu cyclone-te (Mizoram Agriculture Department, NAFCC project report, 2016) chuan season tawp hnuah luipui a tisang thei a nih avangin. State-a observation well-te chu CGWB, North Eastern Region ta an ni: State observation-well network hmuh a ni lo, chuvangin 4.12.1(b)-in a sawi IWRD record chu a la awm lo [TBC]; CGWB chuan Lunglei district-ah "leihnuai tui lak a awm loh avangin tui sang zawng kal dan (trend) pawh hriat theih a ni lo" ("Water level trend is also not available due to lack of ground water abstraction") a ti a, khawpui site mal tan water-table thuk zawng lak a ni lo [TBC]. Factor 1.2, m 0.5 belh leh phai, tui awmna kam leh tuikhur hnuaia tui chiar zone tan "lei sanzawng" ("ground level") default hi a entirna hmasa chiang a awm lo; zirchianna laiin Mizoram tan site-scale seasonal leihnuai tui thuk zawng tlangzarh hmuh a nih loh avangin he Kaihhruaina Bu-in a ruat a ni.

4.13 Regional detention leh fee-in-lieu

4.13.1 **A phalna hmun.** Bung 11 hnuaia phalna pek Basin Ruahtui Luanna Master Plan (BSMP)-in a huam basin-ah, development chuan a detention thupek a zavaia emaw a chanvo emaw heng hmangin a tlin thei:

- (a) plan-a tarlan regional detention facility; emaw
- (b) plan-a tarlan dil emaw tank khawlna siam ṭhatna tana fee-in-lieu pek.

4.13.2 **Condition-te.** Regional detention emaw fee-in-lieu chu heng a nih chauhin lo pawm tur a ni:

- (a) regional facility emaw tank siam ṭhat chu hna a thawk mek, emaw sum pek a ni a **kum 3** chhunga hna thawk tura ruat a ni. Chu hma chu, site-a detention rih (interim) mamawh a ni.
- (b) site aṭanga facility thleng tui luan tirna chuan 1% AEP post-development tui luang chu an inkara in emaw kawng-a tui sang zawng tihsang lovin a phur (Bung 5);
- (c) tank-a khawlna credit chu **tuilian khawlna** chauh a ni. Hei hi full tank level (FTL, dil tui khat sang ber level) leh bund leh surplus weir-in him taka a dawn theih tui sang zawng sang ber inkar tui zat, leh notify operating rule-in fûr hmaa tihruak tura a tiam FTL hnuaia tui zat reng reng belh a ni. April aṭanga October thleng irrigation emaw tui pek atana vawn FTL hnuaia khawlna chu credit tur a ni lo.
- (d) tank chuan Bung 7 a tlin: survey FTL, operating rule ziak, leh surplus weir enkawl;
- (e) site chuan **retention** (Clause 4.4) leh **WQv** tihfaina (Bung 8) chu site-ah a siam reng; leh
- (f) tuilian hlauhawm catchment-ah, regional facility chuan a contributing area zawng zawng tan mixed-frequency rule a tlin.

4.13.3 **Fee.** Fee-in-lieu chu heti hian chhut tur a ni:

> Fee = (Clause 4.6 hnuaia site-a detention khawl tur zat, m³) × (unit rate, ₹/m³, Authority-in a notify)

Unit rate chuan ram, sak leh kum 10 enkawlna a tel tur a ni. Fee-te chu ring-fenced basin account-ah vawn tur a ni a, plan-a facility tarlan-ah chauh hman tur a ni.

4.13.4 **Ledger.** Authority chuan heng mipui ledger a vawng tur a ni:

- regional facility tin-a detention tui zat credit;
- tui zat pek; leh
- fee dawn leh hman.

> Hrilhfiahna. Malaysian DID (2008) checklist chuan ha 0.1 aia lian site tan site-a detention aiin community pond a thlan zawk. Site-a detention zirchianna-te chuan a hlawkna chu hmun-ah a innghat a, luanna hnuailam hla zelah a tlahniam tih an lantir (Colorado State University thesis; Kansas City tan McEnroe), leh catchment hniam lama pond chu main-stem peak nen a inrual thei tih (*Water* 2016). Chuvangin regional khawlna chu basin modelling hmangin hmun ruat tur a ni, a belhkhawm mai ni lovin.
>
> Mizoram-ah tank Act leh dil cascade (tank cascade) a awm lo va, a khawpui-te-a dil reng reng ziak lan rule hnuaia tuilian thununna atana kalpui hmuh a ni lo (NEER chhiar dan). A regional khawlna hi chi thum a ni a, pakhat mah regional detention facility a la ni lo: dil-te, chung zingah Tam Dil, Saitual aṭanga km 6 vela awm, Fisheries Department-in fishery reservoir atana a siam ṭhat (chanchin tlangzarh angin; area hmuh a ni lo [TBC]), leh Palak Dil, Siaha district-a Pala Wetland, Mara Autonomous District Council bial chhunga awm, Ramsar site (no. 2484), a Ramsar Information Sheet-in August ni 31, 2021-a thlan (thu lak chhawn angin) leh July ni 26, 2022-a puangchhuak (chanchin tlangzarh angin), ha 1,850 vel, tui awmna ha 135 vel nei; Kolasib district-a Tuirial leh Serlui B hydroelectric project reservoir-te; leh Master Plan for Aizawl: Vision 2030-in "Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum leh Hlimen hnuaiah" ("below Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum and Hlimen") a rawt check dam pariat, an design leh dinhmun hmuh a ni lo (plan-a tui luanna map, Map 8.3, lak chhuah a ni lo [TBC]). State Wetland Authority notification hmuh a ni lo [TBC]. Thu pali a lo chhuak:
>
> - Record-a dil chu khawlna hna thawk a ni lo thei a, dil hi detention pond a ni lo. Dil chu survey-in a bul, a kam leh a outlet a lantir hnuah chauh credit a ni a, a outlet level chunga khawlna tan chauh; dil pianphung chuan a hming ngei a vawng a, detention pond-ah chantir a ni ngai lo, leh engineered khawlna chu detention pond tih a ni a, dil emaw tuikhur emaw tih a ni ngai lo.

- Lui-a check dam chu bal leh sediment structure a ni hmasa. Aizawl lui chho, tichhe nasa-ah check dam chu leidip leh leimin bal-in a khat a, chuvangin a khawlna chu Basin Ruahtui Luanna Master Plan (Bung 11) hnuaiah chauh, design, stage–storage inzawmna, Bung 10 hnuaia tihfai schedule leh a neitu thuthlung ziak nen, development tan credit a ni a, ruahpui a lo thlen huna a ruak tura plan-in a lantir tui zat tan chauh; leh check dam reng reng chuan Clause 4.11-a tlang dan-in a humhalh tlang pang bulah tui a dan phal a ni lo.
- Reservoir-te hi capacity bang a ni lo. Tuirial reservoir chu NEEPCO-in full reservoir level m 90.5 leh minimum drawdown level m 68.0 inkarah electric atan a vawng a (CERC order in Petition 125/MP/2021), full reservoir level hnuaia a khawlna chu credit a ni lo (Clause 4.13.2(c)), a level chu a lama luang ram tailwater a ni a, a tui chhuah tir chu a hnuaia lui chhung tailwater a ni (Clause 5.8.5(e)); Serlui B reservoir tan level hmuh a ni lo [TBC]. Reservoir pakhat emaw-a ruahtui luang liam chu a operator thuthlung ziak, tui zat leh level tarlan nen chauh rinchhan theih a ni (he Kaihhruaina Bu-in a ruat).
- Tuikhur hi ruahtui khawlna a ni lo. Tuikhur chu Bung 8-a tuikhur dan hnuaiah humhalh a ni a, Mizoram Water Resources (Management and Regulation) Act, 2024-a "khawtlang tui hnar" ("community water resources"), "tuikhur, dil tê, dil lian, dil, tui khawl khawmna structure hlui, tuikhur laih" ("springs, ponds, lakes, tanks, traditional water harvesting structures, wells") tel (s.2(1)(i)), chu Village leh Local Water Resources Committee-te-in "tui hnar hriat tawhte bawlhhlawh laka veng" ("Prevent pollution of identified water sources") (Autonomous District Council-te pawn lamah) an humhalh; chung zinga pakhat mah regional detention angin credit a ni lo.

Mizoram khawpui reng reng drain-te an neitu-te zinga ṭhentu notification a awm lo (NEER chhiar dan). State-in dan a chhuah hma chu [TBC], he Kaihhruaina Bu hian Bung 1-a hna ṭhen dan a zui: Corporation bial chhunga mipui drain leh mipui kawng sir drain-te chu Aizawl Municipal Corporation ta, "tui luanna emaw sewerage system leh outfall him leh tawk a siam leh enkawl tur a ni" ("shall provide and maintain a system of drainage or sewerage as well as a safe and sufficient outfall") (Mizoram Municipalities Act, 2007, ss.80(d), 288, 289(1) leh 290–291), a Local Council-te nen; State kawng leh highway kawng sir drain-te chu a taka Public Works Department ta, kawng chu Corporation kutah hlan a nih loh avangin (CAG, Report No. 1 of 2025), statute-ah chuan drain ang chiah chu Corporation-ah a awm (s.289(1)) chung pawhin, he inkhawih hi he Kaihhruaina Bu hian a sawi a, a chinfel lo; national-highway drain-te chu national-highway agency-te ta; lui pianphung leh riverine reserve-te chu Environment, Forests & Climate Change Department leh Land Revenue & Settlement Department ta; sewer leh Chite sewage treatment plant chu PHED leh SIPMIU ta (s.289(3)-in hlan a phal); dam leh an release lui chhung-te chu NEEPCO (Tuirial) leh State power department (Serlui B) ta; Lunglei drain-te chu Municipalities Act hnuaiah Lunglei Municipal Council ta (regulation hmuh a ni lo [TBC]); municipality pawn lama khaw drain-te chu Village Council ta ("Tihfaina leh tui luanna" ("Sanitation and drainages"), Mizoram (Village Councils) Act, 2025 s.15(1)(q) hnuaia hlan theih mawhphurhna); leh Autonomous District Council bial-ah, District Council leh a Village Council-te ta [TBC]. Khawpui tinin drain register an vawng a, lui chhung tin neitu, a thlen lui, a leimin hlauhawm map class leh a outfall a tarlang. Hei hi he Kaihhruaina Bu hna ṭhen dan a ni a, statute hnuaia mi a ni lo; ram chu mimal ta emaw land pass hnuaia neih a nih chuan, drainage corridor (tui luanna atana humhalh ram) emaw easement (mi ram kal tlanga hman phalna) emaw chu master plan-ah hauh a ni emaw thuthlung hmangin humhim a ni emaw a, lak a ni lo.

Thu hmasa ber hi Mizoram-ah condition 4.13.2(c) innghahna a ni. Dil chuan a outlet level chungah chauh tuilian khawlna a pe, notify operating rule-in fûr hun hmaa tihniam tura a tiam loh chuan. Kum 3 hna thawk chin leh kum 10 enkawlna belh hi a entirna hmasa chiang a awm lo va, he Kaihhruaina Bu-in a ruat a ni.

4.14 Site tê tan kalphung awlsam

4.14.1 **A huam chin.** Tier B local body-te chuan tuilian hlauhawm catchment pawna **ha 2 emaw a aia tê** site tan kalphung awlsam an phal thei. Tuilian hlauhawm catchment-ah chuan, **ha 0.5 emaw a aia tê** site tan hman theih a ni. Site dang zawng zawngin Clause 4.6 an hmang tur a ni. Table 4.3 (Belhchian 4B) tlangzarh a nih hma chu, Tier B site zawng zawngin Clause 4.6 an hmang bawk tur a ni.

4.14.2 **Kalphung.**

1. Site zone, HSG leh post-development imperviousness tan PSD (L/s/ha) leh SSR (m³/ha) chu **Table 4.3** (Belhchian 4B) aṭangin chhiar rawh.
2. Khawl tur zat: V = SSR × A − V_credit (Clause 4.4.6.3).
3. Luan chhuah phal zat: kum 2 leh kum 100 stage tan Q_PSD,T = PSD_T × A.
4. Belhchian 4B-a standard outlet table (thuk zawng tarlana PSD tan orifice lian zawng) aṭangin low-flow orifice leh a chung thununna thlang rawh, mm 50 hniam ber zawmin.
5. Clause 4.9 hnuaiah spillway emaw overflow, Clause 4.11-a RWH chhiar dan leh Clause 4.15-a himna thupek-te siam rawh.
6. Form 4-2 (Tier B Site Sheet) ziak famkim rawh.

Table 4.3 — Tier B site aṭanga luan chhuah phal zat leh site khawl tur tui zat (template)

Zone (Belhchian 2A)	HSG	Imperviousness	PSD kum 2 (L/s/ha)	PSD kum 100 (L/s/ha), pangngai	PSD kum 100 (L/s/ha), tuilian hlauhawm	SSR (m³/ha), pangngai	SSR (m³/ha), tuilian hlauhawm
MZ-Z1 Hmar lam tlang: MZ-A Hmar lam tlang (Kolasib–Kawnpui–Bilkhawthlir), Clause 2.3.6(c)(ii)-a thuk zawngah; site NIH-DHAARA cell a san zawk chuan, Clause 4.6 hman a ni	C / D	50% / 70% / 90%	[TBC]	[TBC]	[TBC]	[TBC]	[TBC]
MZ-Z1 Hmar lam tlang: MZ-A1 Hmar lam phai (Bairabi–Vairengte), Clause 2.3.6(c)(ii)-a thuk zawngah; site NIH-DHAARA cell a san zawk chuan, Vairengte-ah ang hian, Clause 4.6 hman a ni	B / C / D	50% / 70% / 90%	[TBC]	[TBC]	[TBC]	[TBC]	[TBC]
MZ-Z2 Laili tlang chhip: MZ-B Laili tlang chhip (Aizawl–Sairang–Serchhip–Thenzawl–Hnahthial–Mamit), Clause 2.3.6(c)(i)-a hniam ber (floor)-ah; site NIH-DHAARA cell a san zawk chuan, Thenzawl leh Hnahthial-ah ang hian, Clause 4.6 hman a ni	C / D	50% / 70% / 90%	[TBC]	[TBC]	[TBC]	[TBC]	[TBC]
MZ-Z3 Chhak lam tlang sang: MZ-C Chhak lam tlang sang (Champhai–Khawzawl–Saitual–Ngopa–Zokhawthar), Clause 2.3.6(c)(i) leh (c)(iii)-a hniam ber (floor)-ah	C / D	50% / 70% / 90%	[TBC]	[TBC]	[TBC]	[TBC]	[TBC]
MZ-Z3 Chhak lam tlang sang: MZ-C1 Champhai phai, Clause 2.3.6(c)(i) leh (c)(iii)-a hniam ber (floor)-ah	B / C / D	50% / 70% / 90%	[TBC]	[TBC]	[TBC]	[TBC]	[TBC]
MZ-Z4 Chhim lam tlang: MZ-D Chhim lam tlang (Lunglei–Lawngtlai–Siaha–Chawngte–Tuipang)	—	—	Tarlan a ni lo: Clause 4.6 hman a ni (Clause 2.3.6(c)(i))	—	—	—	—

Zone (Belhchian 2A)	HSG	Imperviousness	PSD kum 2 (L/s/ha)	PSD kum 100 (L/s/ha), pangngai	PSD kum 100 (L/s/ha), tuilian hlauhawm	SSR (m³/ha), pangngai	SSR (m³/ha), tuilian hlauhawm
MZ-Z4 Chhim lam tlang: MZ-D1 Tlabung phai (Tlabung)	—	—	Tarlan a ni lo: Clause 4.6 hman a ni (Clause 2.3.6(c)(i))	—	—	—	—

Chhut dan entirna (entirna chauh — design value a ni lo).

Tier B Municipality-a ha 0.4 chenna layout, tuilian hlauhawm catchment-ah, directly connected impervious area 80% vel nen (area-weighted post-development CN 92 vel). Table 4.3 chu chhut tawh a, Clause 4.6.7 entirna hectare khat zel tluk a pe niin ngai ta ila:

- PSD kum 100 = 356 / 2.0 = 178 L/s/ha
- SSR = 2,913 / 2.0 ≈ 1,460 m³/ha
- PSD kum 2 ≈ 17 L/s/ha

Chutichuan:

- Khawlna: V = 1,460 × 0.4 = **584 m³**. C_R = 0, chuvangin retention credit a awm lo.
- kum 100 luan chhuah tir: 178 × 0.4 = **71 L/s**.
- kum 2 luan chhuah tir: 17 × 0.4 = **7 L/s**. Head m 1 velah hei hian mm 60 vel low-flow orifice a mamawh, mm 50 hniam ber chungah (Clause 4.8.2).
- Layout option-te:
  - m² 400 lei hnuai tank, m 1.5 thuk; emaw
  - m 0.3-a m² 250 podium khawlna (m³ 75) leh m² 350 tank m 1.5 thuk (m³ 525).
  - In chung m² 1,200 chunga mm 150-a in chung khawlna (m³ 180) chuan tank chanvo a thlak thei.
- RWH sump-te hi belh an ni a, khat angin ngaih an ni (Clause 4.11).

> **Hrilhfiahna.** Australia council-te chuan site aṭanga luan chhuah phal zat leh site khawl tur tui zat table-te chu chutiang bawkin an hmang (Sydney Water OSD guide; Upper Parramatta River Catchment Trust handbook-in SSR m³/ha 455 vel a tarlang). Hetah entirna SSR, m³/ha 1,460 vel, hi a lian zawk hle. Chu chu mixed-frequency cap leh AMC III-a darkar 48–72 ruahpui phut ngei ngei belhkhawm nghawng beisei a ni. Malaysia-a MSMA 2 chuan ha 5 aia tê site tan OSD kalphung awlsam ang chi a pe. MARC policy supplement chuan Kansas City municipality tê zawk-te tan regional standard chhungah pawm theih tur thlan dang a pe; Clause 4.14 hian Tier B tan chu entawn a zui.

4.14.3 **Fixed-coefficient route.** Clause 4.6 leh 4.14.2 aia thlan dang atan, **ha 1 emaw a aia tê** site reng reng design siamtu chuan, Approving Authority eng hnuaiah pawh leh catchment engah pawh, Clause 4.14.4 aṭanga 4.14.7 thleng hmangin detention a ruat thei. Route hi heng lai hian hman tur a ni lo:

- (a) site chuan a design-ah tank emaw tui awmna khawlna a chhiar (Bung 7);
- (b) site chanvo reng reng tui awmna setback chhungah a awm (Bung 7); emaw
- (c) site chu luanna hnuailam design-a a khawlna chhiar dil cascade (tank cascade)-ah a luang.

Route hian cap-te chu fixed coefficient hmangin a ruat a, Table 4.3 a mamawh lo. Chuvangin Belhchian 4B tlangzarh a nih hmain hman theih a ni. Retention (Clause 4.4), drawdown (Clause 4.7), outlet (Clause 4.8), spillway (Clause 4.9), luanna hnuailam leh tailwater endikna (Bung 5) leh tui ṭhatna (Bung 8) chu hman a ni reng.

4.14.4 **Cap-te.** Site aṭanga ruahtui luang chhuahna hmun tinah cap pahnih hman a ni:

Q_cap,10 = 2.78 × C_10 × i_10 × A leh Q_cap,2 = 2.78 × C_2 × i_2 × A

a awmzia: Q_cap chu L/s-in; A chu site area (ha); i_10 leh i_2 chu site-a duration **minute 15** tan 10% AEP (kum 10) leh 50% AEP (kum 2) ruahtui tlak chakna (mm/h, intensity), Bung 2 thu hnar aṭanga, Clause 2.8-a climate factor nen; leh C_10 leh C_2 chu site hydrologic soil group (Clause 3.7) tan Table 4.3A-a fixed coefficient-te an ni. Soil group pakhat aia tam nei site tan, coefficient-te chu area-weighted a ni.

Table 4.3A — Fixed release coefficient-te (provisional, a rih chhung atan)

Hydrologic soil group	C_10	C_2
A (sandy, tui liam ṭha)	0.05	0.02
B	0.08	0.03
C	0.15	0.08
D (clay, tui liam ṭha lo)	0.25	0.15

Q_cap,10 chu catchment tinah, **1% AEP (kum 100) ruahpui thleng leh a tel ruahpui tin** tan luan chhuah tir sang ber a ni. Q_cap,2 chu 50% AEP (kum 2) ruahpui tan luan chhuah tir sang ber a ni. Cap chu a stage inmilah orifice mm 50 discharge aia tê a nih chuan, orifice mm 50 chu a zawm angin ngaih a ni (Clause 4.5.5.1).

4.14.5 **Khawlna.** Detention khawlna V (m³) chu V_100 leh V_2 zinga lian zawk a ni, an tin chu Clause 2.5.2-a duration d (darkar 1 aṭanga 72 thleng) zawng zawnga lian ber:

V_100 = max over d of [10 × C_v × P_100(d) × A − 1.8 × Q_cap,10 × d]

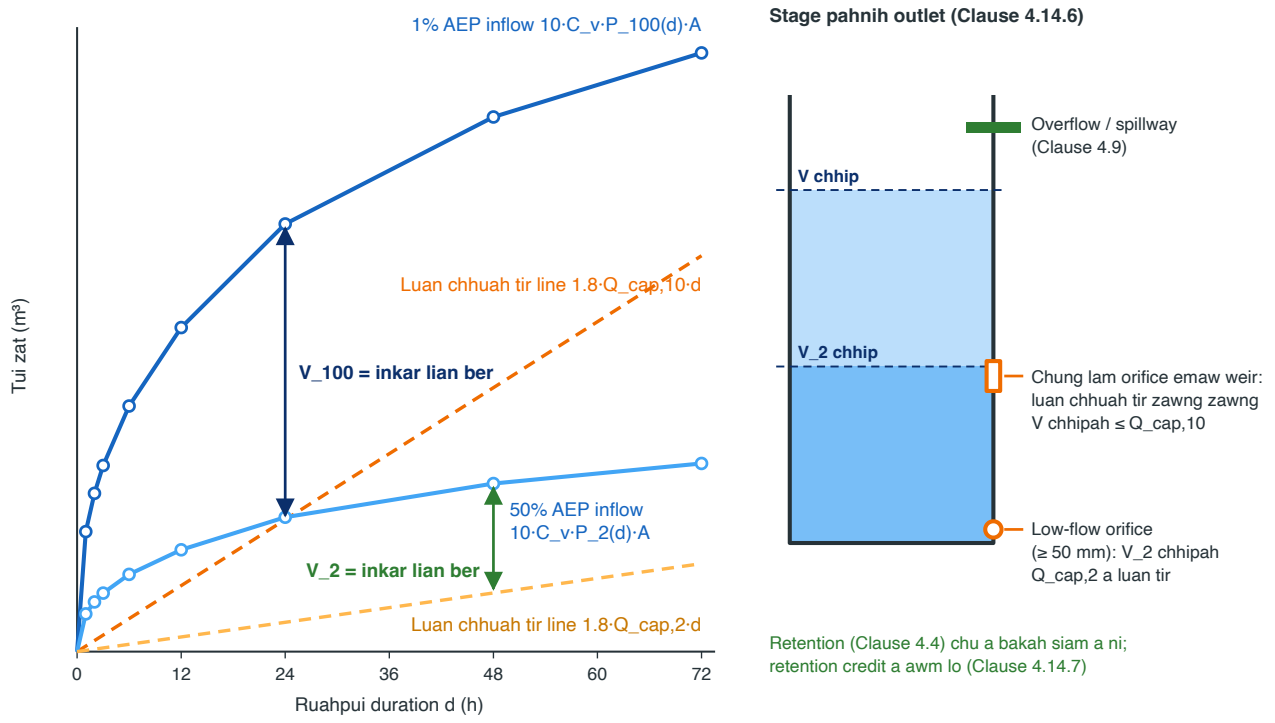
V_2 = max over d of [10 × C_v × P_2(d) × A − 1.8 × Q_cap,2 × d]

a awmzia: P_100(d) leh P_2(d) chu duration d (darkar) tan 1% leh 50% AEP ruahtui tlak zat (mm), climate factor nen; leh C_v chu post-development volumetric coefficient: Table 3.2-a composite C (range tin chanve chung lam), 1% AEP tan Table 3.3-a Cf-in puntir. Darkar 12 emaw a aia rei duration tan, pervious surface tin C chu **0.50** aia tlem lovin lak tur a ni. Factor 1.8 hian ruahpui chhungin cap chanve average luan chhuah tir a ngai (3.6 × 0.5).

4.14.6 **Outlet.** Outlet chu stage pahnih thununna a ni tur a ni: V_2 khawlna a khat huna Q_cap,2 luan tir low-flow orifice, leh V chhipah luan chhuah tir zawng zawng Q_cap,10-ah thunun orifice chung lam emaw weir. Belhchian 4B-a outlet table chu tlangzarh a nih hnuah hman theih a ni.

4.14.7 **Retention.** Clause 4.4-a retention tui zat chu V bakah siam a ni. He route hnuaiah retention credit (Clause 4.4.6) lak a ni lo.

Ha 1 emaw a aia tê site tan fixed-coefficient route (Clause 4.14.3–4.14.7) — schematic, scale ang a ni lo



Dot-te: Clause 2.5.2 duration-te (1, 2, 3, 6, 12, 24, 48, 72 h). d ≥ 12 h tan pervious C ≥ 0.50.

Q_cap,10 = 2.78 × C_10 × i_10 × A ; Q_cap,2 = 2.78 × C_2 × i_2 × A ; (L/s; A chu ha-in; i chu mm/h-in)

C_10, C_2 chu lei group angin Table 4.3A aṭangin; i_10, i_2 chu climate factor nen duration minute 15 tan (Clause 2.8)

V = max(V_100, V_2); V_T = d tina [10 × C_v × P_T(d) × A – 1.8 × Q_cap × d] sang ber (m³) ; 1.8 = 3.6 × 0.5 (cap chanve luan chhuah average)

Milem 4.3 — Ha 1 emaw a aia tê site tan fixed-coefficient route (Clause 4.14.3 aṭanga 4.14.7 thleng): Table 4.3A aṭanga cap Q_cap,10 leh Q_cap,2; khawlna V, Clause 2.5.2-a duration-te zawng zawngah, cumulative inflow 10·C_v·P(d)·A leh luan chhuah tir line 1.8·Q_cap·d inkar lian ber angin, 1% leh 50% AEP ruahpui tan; leh V_2 chhipah Q_cap,2 leh V chhipah Q_cap,10 luan tir stage pahnih outlet. Schematic, scale ang a ni lo. He Kaihhruaina Bu tana milem siam thar, rainfall mass-curve (inflow paih outflow) khawlna ngaihdan leh PUB Code of Practice on Surface Water Drainage, 7th ed. (cl. 7.1.5)-a single-coefficient peak cap aṭanga siam danglam.

Hrilhfiahna. Fixed-coefficient route hi Singapore a zui a, chu chuan ha 0.2 emaw a aia lian development tin aṭanga peak ruahtui luang chu runoff coefficient pakhat, C = 0.55, kum 10 ruahpui-a hmangin a cap (PUB Code of Practice on Surface Water Drainage, 7th ed., cl. 7.1.5, Addendum No. 3, 2025). Hman a awlsam a, endik pawh a awlsam: cap hian site area, soil group leh intensity pahnih chauh a mamawh. PUB-a 0.55 hi hetah hman a ni lo, Singapore baseline chu khawpui tui luanna system awm mek a ni a, he Kaihhruaina Bu baseline erawh greenfield ram a nih avangin (Clause 4.5.1.2). Table 4.3A-a coefficient-te hi Clause 3.3-a greenfield curve number-te (soil group A aṭanga D tan CN 39, 61, 74 leh 80) aṭangin he Kaihhruaina Bu-in a ruat a ni. Aizawl tlang chhip-a darkar 1 thuk zawng pangngai tan chung curve number-te-in an pek ruahtui luang leh ruahtui tlak ratio, hniam lama rounded an ni. Chuvangin **provisional** an ni. State Stormwater Technical Committee chuan Belhchian 4B a chhuah huna zone tin tan NIH-DHAARA value nen khaikhinin a nemnghet emaw a siam ṭhat emaw tur a ni.

Route hi tum takin kalphung famkim aiin a **khauh zawk** a, chutichuan awlsamna man chu luanna hnuailama mipui ni lovin developer khawlna-in a pe. kum 100 luan chhuah tir chu hmun tinah greenfield kum 10 peak vel-ah vawn a ni, chu chu Clause 4.5.3-a tuilian hlauhawm dan a ni; khawlna chuan outlet-in a average-in cap chanve chauh a luan chhuah tir angin a ngai; pervious lei chu ruahpui rei-ah hnawng angin ngaih a ni; leh retention credit lak a ni lo. Tank tê zawk duh design siamtu chuan Clause 4.6-a kalphung famkim a hmang thei. Khawlna formula hi

rainfall-mass (inflow paih outflow) kalphung a ni. Clause 3.4.2 chuan khawlna tan ruahtui tlak innghat peak kalphung a khap, hydrograph pianphung an ngaihthah avangin; he route hi a conservative ngaihdan-te-in site tê tan chu dik lohna a huam a, darkar 24 aṭanga 72 thleng duration-te endik reng a nih avangin dan bik sawi chiang a ni.

4.15 Himna, daidanna (fencing) leh hman tam theihna

4.15.1 **Mipui thlen theih khawlna tan thuk zawng chin.** Khawlna area (park, infiamna mual, open space, school hmun) mipuiin an thlen theih chuan:

- (a) 10% AEP ruahpui-a thuk zawng sang ber: **m 0.45**;
- (b) 1% AEP ruahpui-a thuk zawng sang ber: **m 1.2**, 4.15.3 hnuaia daidan zone-ah chauh loh chu;
- (c) sir pang: **4H:1V** aia chho lo, chhuah nan perimeter ṭhena li ṭhena khat tal **6H:1V** emaw a aia phei; leh
- (d) khawlna area chhungah emaw a kamah **m 0.3** aia sang tlak (vertical drop) a awm lo.

4.15.2 **Wet basin.** Permanent pool-te chuan heng an nei tur a ni:

- normal water level hnuaiah m 0.3 aia thuk lo, m 3 tal zau safety bench; leh
- luh duh lohna siamtu emergent thlai phun kam.

4.15.3 **Daidanna.** Khawlna chanvo, heng nei reng reng velah, **m 1.2** tal sang, lawn theih loh design, kawngka kalh theih nei daidanna phut a ni:

- **m 0.6** aia sang vertical wall emaw headwall tlak nei;
- 1% AEP ruahpui-ah m 1.2 aia thuk, 4H:1V aia chho pang nen; emaw
- mm 300 aia lian, grate nei lo kua nei outlet structure.

4.15.4 **Outlet-te.** Mipui thlen theih mm 300 aia lian inlet leh outlet kua tin chu grate emaw rack emaw bun tur a ni. Grate chu mi a bula tang chuan a chhuak thei turin design tur a ni: luan hnaih chakna hniam, awn, open area lian nen.

4.15.5 **Sign leh thuk zawng chhinchhiahna.** Mipui thlen theih khawlna tinah ruah sur laia hmun chu tuilian a tuar ṭhin tih sawi Mizo leh English sign-te, leh a thuk berah thuk zawng chhinchhiahna a awm tur a ni.

4.15.6 **Confined space-te.** Lei hnuai tank-te chuan kalh theih khuhna an nei tur a ni. Confined space angin chhinchhiah tur an ni a, maintenance declaration (Bung 10)-in luh dan a sawi tur a ni.

4.15.7 **Thosi leh rannung thununna (vector control).** Khawlna ro chu a zavaia a liam tur a ni a (Clause 4.7), darkar 72 aia rei tui dil hmun hniam a nei tur a ni lo. Wet basin-te chuan Clause 4.10.7 an tlin tur a ni.

> **Hrilhfiahna.** Clause 4.15-a number chin-te hi entawn tur chiang pakhat a awm lo. Ram dang hman dan pangngai aṭanga lak an ni, entirnan KC APWA 5600 (2006), chu chuan dry-pond perimeter ṭhena li ṭhena khat tal 5:1 emaw a aia phei, property line aṭanga ft 20 (m 6) inkar leh ft 15 (m 4.6) enkawlna strip a phut. Hetah hian an khauh deuh zawk, open space ram leh school-a hman tam theihna khawlna chu fûr chhungin naupang-te-in an hmang dawn avangin. Khawlna ro-a tui dil chu thosi pung theihna a ni a, chuvangin a zavaia a liam (Clause 4.15.7) hi mipui hriselna thupek a ni, nuamna ni lovin.

4.16 Innghahna: engvangin nge peak tluk tir chauh a hlawhchham

Hrilhfiahna. He Clause hian thupek a nei lo. Engvangin nge he Bung hian pre-development rate **hnuaia** luan chhuah tir, retention, duration rei endikna leh luanna hnuailam zirchianna a phut, peak tluk tir mai aiin, a ziak.

1. **Hun.** Detention hian site peak a tihniam a, a hydrograph erawh a tizau (Milem 4.1). Luanna hnuailamah, site tam tak aṭanga luan chhuah tir zau-te chu an inkhawih a, main-stem peak nen an inkhawih bawk. Denver zirchianna-ah, basin sawm, tin hian hmanlai kum 100 peak 100% luan chhuah tir chuan outlet-ah hmanlai peak 106% an siam. Site tinah 90% luan chhuah tir chauhin 97%-ah a hruai (UDFCD memo, 2012). Colorado State University thesis chuan hmun ngaihtuah lo site-a detention chuan "peak tui luang chu post-development peak aiin a tisang thei" ("can actually increase peak flows above post-development peaks") tih a hmu. Optimisation zirchianna pakhatin luanna hnuailam pond chu luanna chunglam pond aiin a ṭha lo zawk tih a hmu, a outflow chu main stem nen a inrual avangin (Water 2016, 8(7):290).
2. **Tui zat.** Detention hian tui zat a paih lo. Entirna-ah, post-development kum 100 ruahpui chuan pre-development kum 10 ruahpui ruahtui luang zat let thum vel a siam (Clause 2.11). Retention, emaw drain dawngtu ni lo hmun dangah a tiruak khawlna chauhin tui zat a tihtlem.
3. **A lian zawng.** Kansas City modelling (McEnroe, 2005) chuan uniform 3 cfs/ac thununna chuan 200-ac watershed-ah Q100 chu 36% a tihtlem tih a hmu. Hmun tina thununna ang chiah nen, 14 sq mi-ah Q100 chu 40% a la pung a, a hlawkna chu 1–2 sq mi vel aia lianah a bo. KC committee chuan "'match existing' hian lui a tichhe thei" ("'match existing' can harm streams") tiin a tlukna a siam (MARC Evolution deck). Georgia chuan chhan ang bawkah ten-percent luanna hnuailam zirchianna phut ngei ngei a siam: "Peak tui luang hun leh ruahtui luang zat nghawng avangin, structural hmalakna ṭhenkhat chuan luanna hnuailamah discharge peak chu pre-development level-ah an tihniam thei lo" ("Due to peak flow timing and runoff volume effects, some structural practices fail to reduce discharge peaks to pre-development levels downstream") (GSMM 2016).
4. **Design-storm innghahna.** Australia zirchianna pakhatin site-a detention system tak 20 a zirchiang a, temporal pattern sawm pawh hmang design-te chuan ruah tak hnuaiah "hun zawng zawnga hna thawk thei tur OSD system design rin tlak takin a siam chhuak thei lo" ("cannot reliably produce an OSD system design that will always be effective") tih a hmu (Water Science and Engineering, 2019). Hei vang hian Clause 4.6.3 chuan critical ruahpui pakhat aiin duration matrix famkim a route.
5. **Outfall khar.** Mizoram-ah outfall tam zawk chu lui chho (lui)-ah a zalen takin a tla a, kawng hnihin an khar. Tlang chhipah outfall chu ruahpui-in a phur thil-in a khar: master plan chuan khawpui drain-te "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") tih a hmu a, Aizawl W-I area 33%-a "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") tui chiah chu kawng sir drain-a bawlhhlawh a puh (Master Plan for Aizawl: Vision 2030); leimin bal leh lungpui-in culvert inlet leh lui kal tlangna-te a phum a, Hunthar-a NH-6 chu ruahpui tam berah a dal ṭhin tih sawi a ni, June 2018-ah leh May 2024-a Cyclone Remal-ah ang khan (chanchin tlangzarh angin). Chutianga outlet phum drain chuan ruahpui sanna hunah tui a luan chhuah tir tawh lo va, a phur tui chu drain aṭangin a chhuak a, a hnuaia tlang pang-ah a luang, chu chu drain tawpin leimin a ṭantir dan a ni. Phai-ah chuan outfall chu luipui-in a khar: Khawthlangtuipui kama Tlabung chu June 2017, June 2018, July 2019 leh August 2023-ah tuilian a tuar a (chanchin tlangzarh angin), June 2018-ah Tlawng-in Sairang chhungkua-te a tang tir a (chanchin tlangzarh angin), leh Bairabi leh Vairengte chu hmar lama lui kam zawl-ah an awm; chutah chuan luipui chu ni tam ruahpui chhung zawng drain-te chungah a awm thei a, Khawthlangtuipui (Bangladesh-a luang zel Karnaphuli), Chhimtuipui (Myanmar-a luang zel Kaladan) emaw Tiau-ah luanna hnuailama India thununna a awm lo. Tuirial leh Serlui B dam hnuaiah outfall chu tui chhuah tir ngei hian a dan thei. Outlet khar hnunga khat chu ek tui leh in chhunga tui bal nena inpawlh ruahtui a ni, drain-te-in an phur avangin (Clause 4.1 Hrilhfiahna). Mizoram outfall reng rengah flap gate emaw pump inventory, outfall reng reng khar rei zawng record leh operating rule hmuh a ni lo [TBC]; Bung 5-in luipui leh reservoir level leh khar rei zawng ngaih tur a ruat (Clause 5.8.5(a) aṭanga (e) thleng):

> tlang lui-ah darkar 24 aia tlem lo, phai-ah, Tlabung-ah leh dam hnuaiah darkar 72 aia tlem lo. Outfall khar hnunga orifice ṭha famkim nei basin chu a khat mai. Luan chhuah tir zat dan reng rengin chu chu a siam ṭha thei lo; Bung 5-a outfall khar endikna hmangin enkawl a ni.
>
> He Kaihhruaina Bu-a chhanna hi layer tam a ni:
>
> - pre-development hnuaia luan chhuah tir (Clause 4.5);
> - ruahpui zing-te khawl (Clause 4.4);
> - fûr ruahpui rei-te route (Clause 4.6.3);
> - dil system-a regional khawlna thlan zawk (Clause 4.13); leh
> - luanna hnuailam leh outfall-ah endik (Bung 5).
>
> Kansas City chanchin ngei hian a man a lantir. Test site pakhatah, peak tluk tir chuan ac-ft 3.0 khawlna a mamawh a, 2011 comprehensive criteria chuan ac-ft 4.9 a mamawh (MARC Evolution deck). Detention tam lutuk chuan khawlna tam zawk a ngai. Chu chu site ramri chauh ni lova catchment humhalhna man a ni.

4.17 Thehluh tur (submittal) thupek-te

Site ruahtui luang thununna submittal tinah heng tel **Site Ruahtui Luang Thunun Report** (Form 4-1) a tel tur a ni:

1. Design Ruahtui Tlak Sheet (Form 2-1) leh hydrology inputs (Bung 3);
2. Clause 4.3.1 hnuaia hmalakna indawt dan finfiahna;
3. RRV chhutna, infiltration test, leihnuai tui finfiahna leh drawdown chhutna (Clause 4.4);
4. retention credit chhutna (Clause 4.4.6);
5. luan chhuah tir zat tehna hman, pangngai emaw tuilian hlauhawm, Belhchian 4A map lak chhuah nen (Clause 4.5);
6. AEP leh duration tin tan Clause 4.6.7 format-a result table, thu nei ber case tarlan bik nen;
7. stage–storage leh stage–discharge table leh plot-te, leh thu nei ber case-te tan inflow/outflow hydrograph-te;
8. drawdown chhutna (Clause 4.7);
9. outlet chipchiar, orifice lian zawng leh level, trash rack leh anti-vortex device tel (Clause 4.8);
10. spillway emaw overflow chhutna, freeboard leh hlauhawmna classification, leh a ngaih lai chuan geotechnical report (Clause 4.9);
11. RWH leh detention chhiar dan, zone level lantirna tank cross-section-te nen (Clause 4.11);
12. design groundwater level leh flotation endikna (Clause 4.12);
13. luanna hnuailam leh tailwater report (Bung 5, Form 5-1); leh
14. himna thupek-te (Clause 4.15) leh maintenance declaration draft (Bung 10).

Clause 4.14.2 hmang Tier B site-te chuan item 6 leh 7 aiah Form 4-2 an thehluh tur a ni. Fixed-coefficient route (Clause 4.14.3) hmang site-te chuan item 6 leh 7 aiah Form 4-3 an thehluh tur a ni.

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Belhchian leh Form

Belhchian / Form	A chhunga thu
4A	Tuilian hlauhawm catchment ramri (GIS); leihnuai tui thuk lohna zone map
4B	Tier B table-te: PSD leh SSR (Table 4.3), retention credit factor C_R, standard outlet lian zawng; fixed release coefficient nemnghet (Table 4.3A)
4C	Chhut dan entirna (Tier A), routing table famkim nen
Form 4-1	Site Ruahtui Luang Thunun Report
Form 4-2	Tier B Site Sheet
Form 4-3	Fixed-coefficient Route Sheet (Clause 4.14.3 aṭanga 4.14.7 thleng)

BUNG 5

Luanna Hnuailam leh Tailwater Zirchianna

5.1 Tum leh huam chin

5.1.1 He bung hian endikna pahnih a ruat a, dan hnuaia hmasawnna hna (development) zawng zawng leh sawrkar tui luanna project zawng zawng chuan an tlin ngei ngei tur a ni.

- **Luanna hnuailam zirchianna** (downstream analysis; Clause 5.3 aṭanga 5.5 thleng) hian project-in a outfall (drain tui luan chhuahna) hnuaiah tuilian a tihnasat loh a finfiah.
- **Tailwater (outfall hnuailama tui sang zawng) zirchianna** (Clause 5.6 aṭanga 5.13 thleng) hian system-in tui a luan luhna tui sang zawng a ruat a, tide, storm surge, tuifinriat sang lam pun (sea-level rise), luipui backwater leh sand bar-in luipui kuam a khar te pawh a huam. Outfall a khar laia system-in a tuar zawh theih ngei pawh a phut bawk.

5.1.2 He bung hi heng hnenah hian hman tur a ni:

- (a) Bung 4 huam site zawng zawng;
- (b) Bung 6 hnuaia tui luanna system tenau (minor) leh lian (major) project zawng zawng; leh
- (c) Clause 4.13 leh Bung 7 hnuaia regional detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) emaw dil (tank) siam ṭhatna project zawng zawng.

5.1.3 Ruahtui tlak leh a rual thlen (joint occurrence) input-te chu Bung 2, a bik takin Clause 2.5.3 leh 2.12 aṭanga lak a ni. Hydrology kalphungte chu Bung 3 aṭanga lak a ni. Site aṭanga luan chhuah tir zat (release) tehna chu Bung 4 aṭanga lak a ni. Gate, culvert leh pump-te hydraulic design chu Bung 9 angin a ni.

5.1.4 **Mizoram-ah tidal outfall a awm lo.** Mizoram hi tuifinriat a hnaih lo (landlocked) leh tlangram a ni: tuifinriat kam (coast) a nei lo, tide (tuifinriat tui sang leh hniam) a nei lo, Coastal Regulation Zone a nei hek lo, leh Remal (May ni 28, 2024) ang cyclone-te hi ruah angin chauh a thleng ṭhin a, chu chu Bung 2-ah sawi a ni a, tidal emaw surge level angin a thleng lo. State-a outfall pakhat mah tuifinriat, tidal creek emaw estuary-ah a luang lut lo a, chuvangin he bung-a tide, storm surge, tuifinriat sang lam pun emaw luipui kuam (river mouth) innghahna thuruatte hi Mizoram-ah hman a ni lo: Clause 5.7 leh Belhchian 5A, Table 5.2-a case J1 aṭanga J3 thleng, Clause 5.10.3-a tidal khar hun (lock window)-te, Clause 5.11.3(a)-a tuifinriat tui (seawater) phut dan (gate leh seat-te chu thir ei theih loh (corrosion-resistant) thil hmanga siam tur a ni reng a, gravel, lung leh leimin bal (slide debris)-in a hrual chhiat loh (abrasion) tur a ni bawk), leh Clause 5.13. He Kaihhruaina Bu Clause number-te chu a State edition dangte nen a inmil nan vawn a ni. Mizoram-ah tui dawngtu (receiving water) hi chi ruk a ni: tlang lui chhoh nasa (lui), State-a outfall tam zawk chu tlang chhip emaw tlang pang aṭangin zalen takin a tla lut ṭhin; Aizawl-a luite, Tuirial-a luang Chite lui leh Tlawng-a luang Ser lui, gauge nei lo, fûr hunah luang nasa (turbulent) leh khawpui in chhunga tui bal (sullage) phur; phai emaw lui kam zawl (terrace) a hnuaia awm luipui, Sairang leh Bairabi-a Tlawng, Champhai leh Zokhawthar-a Tiau leh Chawngte-a Kau (Tuichawng) ang; Tlabung-a Khawthlangtuipui, State-a luipui tuilian khawpui; Tuirial dam emaw Serlui B dam reservoir (tui khuah), an hnuaia luipui lui chhung, emaw dil (lake emaw pond); emaw State chhuahsan luipui, luanna hnuailama Bangladesh, Myanmar emaw Barak phai lam pan; leh:

- (a) a tailwater chu Clause 5.6 leh 5.8-in, Clause 5.8.5 telin, a ruat;
- (b) Clause 5.10 aṭanga 5.12 thleng, Form 5-1 emaw Bung 6-in J1 tailwater emaw J1 tidal curve a sawi apiangah, Clause 5.6.2 emaw 5.8.5-a tui luanna system tenau tailwater hman tur a ni a, tui dawngtu sang zawng a danglam ṭhin chuan time series angin; J2 tailwater emaw HAT + surge + SLA a sawi apiangah, tui luanna system lian

tailwater hman tur a ni: Clause 5.8.4(b)-a design-AEP luipui sang zawng, emaw Clause 5.8.5-a system lian tailwater, outfall-ah a sang zawk zawk; leh

- (c) lui tuilian, luipui, reservoir emaw drain dawngtu-in outfall a khar apiangah Clause 5.10-a outfall khar endikna (outfall-closed check) hman tur a ni a, tidal khar hun aiah Clause 5.8.5(a) aṭanga (f) thleng khar (lock) leh khar dan-te hman a ni.

Hrilhfiahna. Mizoram khawpuite drain (tui luanna)-te hi site design-in a hmuh loh hmunah an chhia ṭhin a, chhiatna pawimawh ber chu tuilian a ni lo. Khawpui deuh thaw zawng zawng hi tlang chhip emaw tlang pang-ah an awm: Aizawl tlang pang-te chu "300 to 450" (30° aṭanga 45° thleng, master plan-a an chhut angin) a ni a, Serchhip khawpui 89% vel chu 30° aia chhoh nasa zawk a ni (MIRSAC; NEER chhutna). Chu tlang pang-a tui luh tir chuan a tisawn ṭhin: Directorate of Geology and Mineral Resources (chanchinbu-ah "Directorate of Geology and Mining") chuan 2022-23-a leimin lian a zirchian ṭhena thum ṭhena hnih chu "tui luanna ṭha lo" ("improper drainage") avanga ni-in a sawi a (chanchin tlangzarh angin), Corporation-in tlang pang chungchanga a regulation ngei pawhin "sewerage leh tui luanna chu thunun ṭha lova tlang pangah paih" ("disposing of sewerage and drainage onto slopes in a poorly controlled manner") chu mihring thiltih "tlang pang nghet lohna a tipung nasa thei" ("can greatly increase slope instability") zingah a tel tir (SD&SM, reg. 1). Chuvangin outfall tam zawkah zawhna hmasa ber chu a hnuaia tui sang zawng ni lovin, tui hian channel nghet a thleng em tih hi a ni. Aizawl hi chhak lamah Chite lui kal tlangin Tuirial-ah a luang a, chu lui chuan khawpui "chhak lam ṭhena thum ṭhena hnih aia tam" ("more than two-third of eastern portion") a dawng a, thlang lamah Ser lui leh a lui tê-te kal tlangin Tlawng-ah a luang; master plan chuan chhak lam lui pasarih chu "fûr hun chhungin tui luan chak tak nen an luang buai" ("turbulent with high velocities of currents during the monsoon season") leh "a tichhe nasa hle" ("very destructive") a ti a, thlang lam lui pali chu "lui leh nullah tichhe nasa ber" ("the worst destructive streams and nullahs") a ti (Master Plan for Aizawl: Vision 2030). Chungte zinga pakhat mah gauge a nei lo a, khawpui hmun tam zawk tan luipui tailwater a awm lo. Phai erawh a dang. Khawthlangtuipui kama Tlabung chu June 2017-ah tuilianin a chim a, chutih lai chuan sub-division-ah in 350 vel tuiin a chim tih report a ni (district official-te chhiar danin 9 chu a pumin, 60 aia tam chu a ṭhenkhatin), July 2019-ah in 400 vel, khawpui chhunga 150 telin, a tuar a, August 2023-ah chhungkaw 40 sawn chhuah an ni; Sairang chhungkuate chu June 2018-ah Tlawng-in a khung (zawng zawng chanchin tlangzarh angin). CWC hian State-ah tui sang zawng enna site (level-monitoring site) pasarih a nei a, chung zinga panga chu hman a ni lo, forecasting site a nei lo, leh site reng rengah warning emaw danger level a nei lo; tuilian sang ber (highest flood level) tarlan awm chhun chu Tuirial lui-a Turial-ah 149.0 m, June ni 17, 1995 a ni a, datum sawi a ni lo (SANDRP, 2018, CWC data copy, chanchin tlangzarh angin). Tuirial dam hnuaiah luipui hi NEEPCO-a ta a ni a, dam-break study pakhatin "lui inkawpna bulah" ("near the confluence") peak 3,035.34 m³/s a route tih report a ni (chanchin tlangzarh angin). Outfall-te hi pawl pakhat ta a ni a, a chunga drain-te erawh pawl dangte ta an ni: kawng drain-te chu Aizawl Municipal Corporation-ah a innghat a, State kawng drain-te chu a tak takah PWD-a ta an ni, luite leh an riverine reserve-te chu EF&CC leh Land Revenue & Settlement Department-a ta an ni, dam-te chu NEEPCO leh State power department-a ta an ni, khaw drain-te chu Village Council-te ta, leh chhim lamah District Council-te ta (Bung 6, Clause 6.9). State-in National Green Tribunal hnenah "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area") a ti (OA 593/2017 leh OA 673/2018-a MPCB report); chu chu tlang chhip-ah a dik a, phai-ah erawh a dik lo. Zirchianna hunah thuziak hmuh reng rengin State-a lui, luipui emaw reservoir outfall reng reng tan design level a ruat lo a, khawpui drain reng reng tan design standard a ruat hek lo. Bung 4-a luan chhuah tir zat (release rate) zawng zawng tlin detention tank pawh, a tui liam (overflow) chu venhim loh tlang pang-ah a luan chuan, a hnuaia lui-in a dawn zat a phur zawh loh chuan, emaw Tlabung-a luipui chu a outlet aia a san chuan, a chhe tho tho ang. He bung hian heng chhiat dan (failure mode)-te hi design-a tel turin a siam. Mizoram hian tidal outfall a nei lo a, chuvangin Clause 5.1.4-in he bung-a tuifinriat kam thuruat (coastal provision) te khawi nge bang a, eng nge an aia luah tih a sawi.

5.2 Thumal awmzia

Thumal	He Kaihhruaina Bu-a a awmzia
Analysis point (zirchianna hmun)	Luanna hnuailam system-a project hma leh hnu dinhmun khaikhinna hmun (Clause 5.3.3).
Contributing catchment	Zirchianna hmun pakhata ruahtui luang lut zawng zawngna hmun pum (catchment: ruahtui luan khawmna hmun), site chhung leh pawn.
Major drain	Basin plan emaw Belhchian 5B-ah major drain anga tarlan channel, emaw luipui reng reng, IWRD canal, Aizawl chhak lama Chite lui leh a lui peng (tributary)-te leh Aizawl thlang lama Ser lui leh a lui tê-te, Lunglei leh tlang chhip khawpui dangte luite, Sairang, Bairabi, Vairengte, Tlabung, Chawngte phai emaw Champhai phai-a flap gate kal tlanga luang chhuak drain zawng zawng, Aizawl Municipal Corporation, Lunglei Municipal Council, Village Council, District Council, PWD, PHED emaw national-highway agency-in a siam emaw a neih drain, a chhung zau zawng 1.0 m emaw a aia zau, leh hmun 8 ha emaw a aia tam tui luanna lui emaw channel pianphung dang zawng zawng, emaw tidal creek.
Chart datum (CD)	Tide table leh nautical chart tlangzarh-te datum, tidal sang zawng tehna bulṭhut.
Mean sea level (MSL)	Tide gauge-ah hun rei tak chhunga tuifinriat sang zawng chawhrual.
MHWS	Mean high water springs: spring tide-a tui sang (high water)-te chawhrual.
HAT	Highest astronomical tide: tidal cycle kim (kum 18.6) chhunga boruak dinhmun pangngai hnuaia tide sang ber chhut lawk.
Storm surge	Thli leh boruak hnehna (pressure) hniam avanga astronomical tide chunga tuifinriat sang lam pun, a bik takin cyclone lai.
Still-water level	Astronomical tide leh surge belh khawm, tuifinriat fawn (wave) hrang hrang tel lovin.
Sea-level allowance (SLA)	Design life chhunga tuifinriat sang lam pun tan tunlai tidal sang zawng-a belh tur (Clause 5.7.4).
Tailwater	Drain, outlet emaw khawlna (storage) hnuai lam tawpa tui sang zawng.
Tide-lock	Tailwater chu chunglam tui sang zawng ang emaw a aia sang a nih avanga gravity outfall-in tui a luan chhuah theih loh dinhmun.
Lock window	Clause 5.10-a outfall khar endikna-in gravity luan chhuah zero a tihna hun (khar hun).
Sand bar	Luipui kuam emaw creek luhna a ṭhenkhat emaw a pumin a khartu tuifinriat kam chiahhlei kham.
Project datum	Project drawing-a levelling datum hman. Survey of India benchmark nen a inzawm ngei ngei tur a ni (Clause 5.7.2).

5.3 Luanna hnuailam zirchianna huam chin

5.3.1 Luanna hnuailam zirchianna chu site emaw project outfall tinah ṭan tur a ni. Luanna hnuailam panin heng zinga a **hmasa ber** thlengin zawm zel tur a ni:

- (a) project area chu contributing catchment-a **10% emaw a aia tlem** a nihna hmun;
- (b) surplus weir emaw outlet thunun theih nei **dil (tank), dil** emaw tui awmna (waterbody) dang a dawt; emaw
- (c) **major drain** a dawt, emaw tuifinriat.

A tawpna hmun ngei pawh zirchian tur a ni (Milem 5.1).

5.3.2 5.3.1(b) hnuaia zirchianna chu dil (tank) emaw dil-ah a tawp chuan, heng hi a tarlang tur a ni:

- dil (tank)-a tui sang ber (maximum water level) danglamna; leh
- Clause 5.4.3-a AEP leh duration-te tan surplus-weir tui luang zat danglamna.

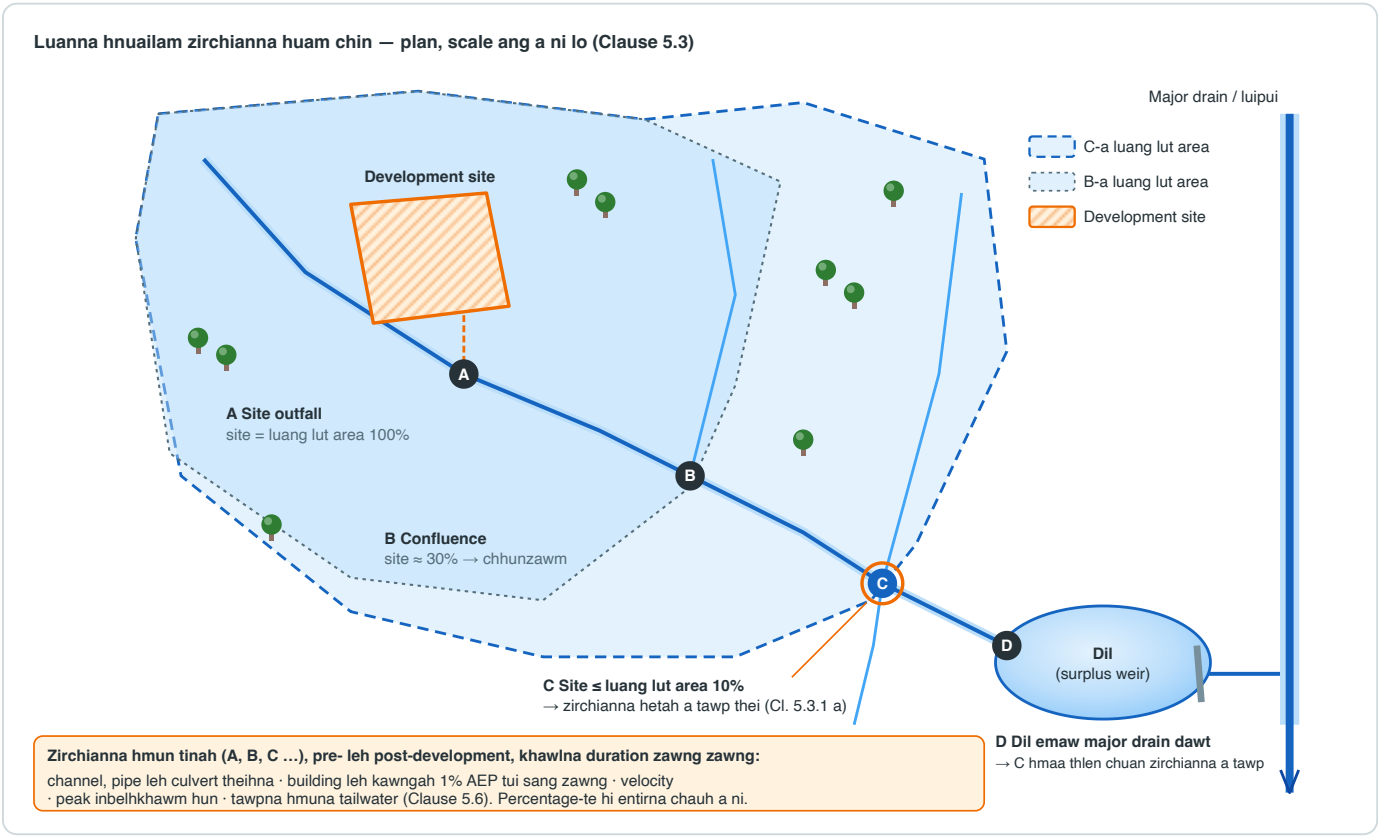
Tui sang ber a san lam chuan, zirchianna chu surplus weir hnuai lamah tawpna hmun dawt thlengin zawm zel tur a ni.

5.3.3 Zirchianna hmun-te chu a tlem berah heng hmunah hian siam tur a ni:

- (a) site outfall tinah;
- (b) drain emaw channel, a contributing catchment chu chu hmuna drain dawngtu catchment chanve tal a nih chuan, nena an lui inkawpna (confluence) tinah;
- (c) culvert, bridge emaw kawng kal tlanna tinah;
- (d) local body, Aizawl Municipal Corporation, MSDMA emaw IWRD-in tuilian ṭhinna hmun (flood-prone) anga an chhinchhiah hmun tinah; leh
- (e) a kalna kawng zawha 1% AEP tuilian zau zawng chhunga in emaw kawng ṭhen tinah. In-te an inhnaih tlat chuan entirna hmun (representative point) hman theih a ni.

5.3.4 **Site tê.** Site **0.5 ha** aia tê tan, heng zawng zawng hi a dik chuan, Authority (phalna petu Authority)-in zirchianna kim aiah luanna hnuailam thusawi tawi (Form 5-2) a lo pawm thei:

- sawrkar drain dawngtu chuan a tui luanna system tenau design tui luang zat (Bung 6) a phur theihna chhinchhiah a nei;
- luanna hnuailam 500 m chhungah tuilian ṭhinna hmun chhinchhiah a awm lo; leh
- site chu tidal emaw backwater nghawng outfall-ah a luang lo.



Milem 5.1 — Luanna hnuailam zirchianna huam chin: zirchianna hmun A–D, hmun tina luang lut area, 10% hmun, leh tawpna hmun dang atana dil emaw major drain dawt. Schematic; percentage-te hi entirna chauh a ni. He Kaihhruaina Bu tana milem siam thar, Georgia Stormwater Management Manual (2016, Vol. 2 §3.1.9) leh KC APWA Section 5600 (2006, 5601.5)-a ten-percent rule aṭanga siam danglam.

> **Hrilhfiahna.** 10% rule hi a entirna hmasa (precedent) nghet a awm. KC APWA 5600 (2006) chuan luanna hnuailam system chu "development ram zau zawng chu watershed pum 10% aia a tlem hmun thlengin" ("to the point the development's land mass is less than 10% of the total watershed") zirchian turin a phut. Georgia manual chuan ten-percent zirchianna chu standard tih ngei ngei tur (mandatory) atan a siam (GSMM 2016, Standard #8). Dil (tank) emaw major drain tawpna hmun hi a entirna hmasa chiang a awm lo; he Kaihhruaina Bu hian Mizoram tan a belh a ni. Tlang chhip khawpuiah, colony drain chu lui zawhin a hnuai hla taka luipui-ah a luang a, Aizawl drain-te chhak lamah Chite lui kal tlangin Tuirial-ah leh thlang lamah Ser lui kal tlangin Tlawng-ah an luan ang hian, leh Tuirial leh Serlui B dam reservoir-te chu hmar lam luipui-ah an awm a, 10% hmun chu luanna hnuailam kilometre tam tak, dil (tank) tam tak kal tlangin a awm thei. Surplus weir hna thawk nei dil (tank) chuan hydrograph (hun hrang hranga tui luang zat) a tidanglam vek a, chuvangin zirchianna chu chutah tihtawp a, dil sang zawng tarlan a ṭha zawk. Clause 5.3.2 hian chu tawpna hmun chuan dil sang zawng pun a thup loh nan a veng. Site tê thusawi (5.3.4) leh a 500 m hlatna hi a entirna hmasa chiang a awm lo va, he Kaihhruaina Bu-in a ruat a ni.

5.4 Zirchianna-in a endik ngei ngei tur

5.4.1 **Scenario-te.** Zirchianna tinin heng hi a khaikhin tur a ni:

- (a) **Tunah awm (existing)**: tunlai luanna hnuailam system leh contributing catchment pum tunlai ram hman dan (land use), project site chu project hma dinhmuna awm; leh
- (b) **Project nen (with project)**: chu bawk, project leh a thununna zawng zawng (Bung 4) awm tawh nen.

Authority basin plan-in nakin lawka ram hman dan a ruat chuan, Authority-in heng hi a phut bawk thei:

- (c) **Nakin (future)**: plan angin catchment pum hmasawn vek, Bung 4 standard zawng zawng angin, project nen leh project tel lovin.

5.4.2 **Zirchianna hmun tina endik tur zat-te:**

- (a) **Phur theihna (capacity)**: tui luang zat sang ber (peak flow) chu channel, pipe, culvert leh kawng kal tlanna zawng zawng phur theihna nen khaikhin, chu element tui luanna system tenau AEP (Bung 6) leh 1% AEP tan;
- (b) **Tuilian sang zawng**: in-ah (a kawngka hniam berah) leh kawngah (a laili chhip (crown) leh a thuk berah) 1% AEP tui sang ber;
- (c) **Luan chakna (velocity)**: 50%, 10% leh 1% AEP tan luan chakna sang ber;
- (d) **Peak inrual hun**: lui inkawpna (confluence) tina hydrograph (hun hrang hranga tui luang zat), project tui luang chhuak leh drain dawngtu peak thlen hun (time to peak) lantir; leh
- (e) **Tui chim rei zawng (duration of inundation)**: kawng leh in-ah, Bung 6 thuk zawng tawp (depth limit) aia a san hun chhung.

5.4.3 **Ruahpui.** Zirchianna hian heng hi a hmang tur a ni:

- 50%, 10% leh 1% AEP;
- Clause 2.5.2-a duration set, a tlem berah zirchianna hmun tina tui sang ber thlentu duration-te (heng hi site-a mi aia rei zawk an ni ṭhin ang); leh
- case tinah darkar 24, 48 leh 72 ruahpui.

Clause 2.11.4-a AMC rule hman tur a ni. Areal reduction chu Clause 2.7 angin, zirchianna hmun tina contributing catchment chungah hman tur a ni a, site khawlna (storage) chungah chuan engtikah mah hman loh tur a ni.

5.4.4 **Kalphung.** Zirchianna chuan:

- lui inkawpna-ah hydrograph-te belh khawm theitu hydrograph kalphung (SWMM, HEC-HMS, emaw a tluk) a hmang tur a ni;

- tailwater emaw backwater-in zirchianna hmun reng reng a nghawng apiangah backwater nei hydraulic model (SWMM dynamic wave, HEC-RAS, emaw a tluk) a telh tur a ni; leh
- zirchianna hmun reng rengah Rational Method a hman loh tur a ni, hun (timing) a entir thei loh avangin.

Site pawn area-te chu an tunlai ram hman dan angin model tur a ni. Chunglam (upstream) detention chu a siam, a enkawl leh a chhinchhiah a nih chauhvin telh tur a ni.

5.4.5 **Tailwater.** Model hnuai lam tawp chuan Clause 5.6 aṭanga 5.9 thleng tailwater leh, a hman theih chuan, Clause 5.13-a sand-bar dinhmun a hmang tur a ni.

> Hrilhfiahna. Clause 5.4.2(d) hi a awm chhan chu detention hian site tui a thlen zat chauh ni lovin, a thlen hun pawh a tidanglam vang a ni (Clause 4.16). Colorado State University thesis pakhat leh *Water* (2016) optimisation study pakhat pawhin site aṭanga luan chhuah tir tlai chu luipui laili (main stem) peak nen a inrual thei a, a tisang thei tih an hmu. Georgia manual chuan a chhuah dan chiang takin a sawi: structural practice ṭhenkhat chuan "luanna hnuailamah peak luang zat chu hmasawnna hma lam level thlengin an tihniam thei lo" ("fail to reduce discharge peaks to pre-development levels downstream") a ni, "peak flow thlen hun leh ruahtui luang zat nghawng" ("peak flow timing and runoff volume effects") avangin (GSMM 2016). Tui chim rei zawng endikna (5.4.2(e)) hi Mizoram phai, an outfall-te luipui darkar emaw ni tam sang taka a awm reng hnuaia awmah, leh bawlhhlawh-in a dang tlang chhip drain-ah a pawimawh: Tlabung-ah Khawthlangtuipui chuan June 2017-ah sub-division-ah in 350 vel a chim (district official-te chhiar danin 9 chu a pumin, 60 aia tam chu a ṭhenkhatin) leh July 2019-ah in 400 vel, khawpui chhunga 150 telin, a chim a, August 2023-ah chhungkaw 40 sawn chhuah an ni (zawng zawng chanchin tlangzarh angin), tui a awm rei zawng erawh hmuh a ni lo [TBC]; Sairang-ah June 2018-ah chhungkuate Tlawng-in a khung (chanchin tlangzarh angin); leh Aizawl W-I-ah area ṭhena thum ṭhena khat chu "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") tui a lian (water-logged) tih hmuh a ni a, kawng sir drain-a bawlhhlawh (solid waste) vanga ni-in an sawi (Master Plan for Aizawl: Vision 2030). Luan chhuah tir hun ti rei detention chuan peak a tihniam lai pawhin chu hun chu a ti rei thei.

5.5 Lo pawm theihna tehna

5.5.1 Project chu lo pawm theih a ni, zirchianna hmun tin leh Clause 5.4.3-a AEP leh duration tin tan, "project nen" leh "tunah awm" khaikhin chuan:

- (a) 1% AEP tui sang ber chu mihring awmna in reng rengah, in reng reng kawngka hniam berah emaw kawng carriageway reng rengah **10 mm** aia a sang lo;
- (b) tunah awm case-a tuilianin a chim loh in reng reng chu project nen a chim lo va, tunah awm case-a Bung 6 freeboard (tui sang ber chunga zau dah) emaw thuk zawng tawp tlin in emaw kawng reng reng chu a tlin lohna a thleng lo;
- (c) peak flow chu element tin tui luanna system tenau AEP-ah emaw 1% AEP-ah tunah awm peak aia a tam lo;
- (d) lined channel-a luan chakna sang ber chu lining tana luan chakna phal (permissible velocity) chhungah a awm (Bung 6: 3.0 m/s a sang ber); leh
- (e) unlined emaw pianphung channel-ah, 50% leh 10% AEP tana luan chakna sang ber chu **10%** aia a pung lo, Bung 9 hnuaia venhimna siam a nih loh chuan.

5.5.2 5.4.2(e) hnuaia tui chim rei zawng chu tarlan tur a ni. Arterial emaw emergency kawngah kawng kal theih loh hun ti rei project chu Authority-in a hnawl thei.

5.5.3 **Tehna a tlin loh chuan**, project chuan heng zinga pakhat emaw a aia tam a tih tur a ni:

- (a) luan chhuah tir zat tihhniam emaw khawlna tihpun (Bung 4);
- (b) luanna hnuailam system neitu remtihna nen, luanna hnuailam tihṭhatna siam. Heng hian harsatna chu luanna hnuailam zawk lamah an sawn loh tur a ni a, he bung hnuaiah zirchian leh tur a ni;

- (c) Clause 4.13 hnuaia regional facility-ah sum thawh; emaw
- (d) Clause 5.5.4 hnuaiah, luan chhuah tir dan (release strategy) thlak.

5.5.4 **Hun (timing) chungchanga exception.** Zirchiannain detention hian hun avangin luanna hnuailam tui sang zawng a tisang tih a lantir chuan, Authority-in Clause 4.5-a site release-rate tehna a tidanglam thei. Hei hi site chu contributing catchment hnuai lam hmun sawma ṭhena khatah, major drain, tidal creek emaw tuifinriat-ah a luan lut nghal chauhvin, leh heng thuruat hnuaiah chauh a ni:

- (a) strategy tidanglam chuan 5.5.1 a tlin;
- (b) retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) phut dan (Clause 4.4) leh WQv tihfaina (Bung 8) a kimin tlin a ni; leh
- (c) outfall khar endikna (Clause 5.10) tlin a ni.

> **Hrilhfiahna.** 10 mm phal zat (5.5.1(a)) hi a entirna hmasa chiang a awm lo. One-dimensional model pangngai chhut dikna (numerical precision) ang emaw a aia hniam a nih tum a ni a, chutiang chuan "pun lo" ("no increase") chu number tihkimna (rounding) inhnial lovin enchhin theih a ni. 10% luan chakna phal zat pawh he Kaihhruaina Bu-in a ruat a ni. 5.5.4-a hun exception hi Georgia manual a zui a, chutah chuan luanna hnuailam zirchiannain "peak thununna a ngai lo" ("that peak controls are not needed") tih a lantir thei a, a thlah (waive) phal a ni (GSMM 2016, Standard #8). Hetah hi chuan catchment hnuai lama site-te tan chauh a ni a, chu hmun chu luipui laili peak nena inrual (synchronisation) a awm theih ber hmun a ni (*Water* 2016, 8(7):290). A chunglam hmunah hman theih a ni lo, scale chungchang finfiahna (Clause 4.16) chuan chunglam site tam tak aṭanga luan chhuah tir hma chuan peak a tisang tih a lantir avangin.

5.6 Tailwater: thu pangngai leh tidal ni lo outfall

5.6.1 Drain, outlet leh khawlna (storage) zawng zawng chu tailwater tarlan nen design tur a ni. Free outfall (tui zalen taka luan chhuahna) chu outlet invert (tui luanna hniam ber) chu case endik mek tana tui dawngtu sang zawng sang ber aia a san chauhvin ngaih tur a ni.

5.6.2 **Tui luanna system tenau tailwater, tidal ni lo.** Tailwater chu tui luanna system tenau peak lai hunah system dawngtu tui sang zawng a ni, luanna hnuailam model aṭanga lak. Model a awm loh chuan, heng hi hmang rawh:

- pipe dawngtu tan, a obvert (pipe chhung chung ber); emaw
- drain khuh lo dawngtu tan, a kam kim sang zawng (full-bank level), freeboard (Bung 6) paih.

5.6.3 **Tui luanna system lian tailwater, tidal ni lo.** Tailwater chu system dawngtu 1% AEP tui sang zawng a ni, Clause 5.8-in level hniam zawk inrual a phal loh chuan.

5.6.4 **Tidal leh backwater outfall.** Clause 5.7 aṭanga 5.13 thleng pawh hman belh tur a ni.

5.6.5 **Khawlna element-te.** Detention, dil (tank) leh pump hmang sump-te chu tailwater chu tide emaw system dawngtu hydrograph angin a danglam apiangah, level danglam lo ni lovin, hun zela danglam tailwater (Clause 4.6.6) nen route tur a ni.

5.7 Tidal tailwater: datum, surge leh tuifinriat sang lam pun allowance

5.7.1 **Design tailwater level-te.** Tuifinriat, tidal creek, estuary, backwater leh luipui leh canal tidal lui chhung-a outfall-te tan:

Table 5.1 — Tidal outfall-te tana design tailwater level

Design case	Tailwater
Tui luanna system tenau design (Bung 6)	**MHWS + SLA**
Tui luanna system lian design leh khawlna design	**HAT + surge + SLA**, surge term chu Clause 5.7.3-a hrilhfiah angin
Joint case (Clause 2.12(b))	1% AEP still-water level + SLA

SLA chu **a tlem berah +0.3 m** a ni (Clause 5.7.4). Case tlan turte chu Clause 5.9-ah tarlan a ni.

5.7.2 **Thu hnar leh datum-te.**

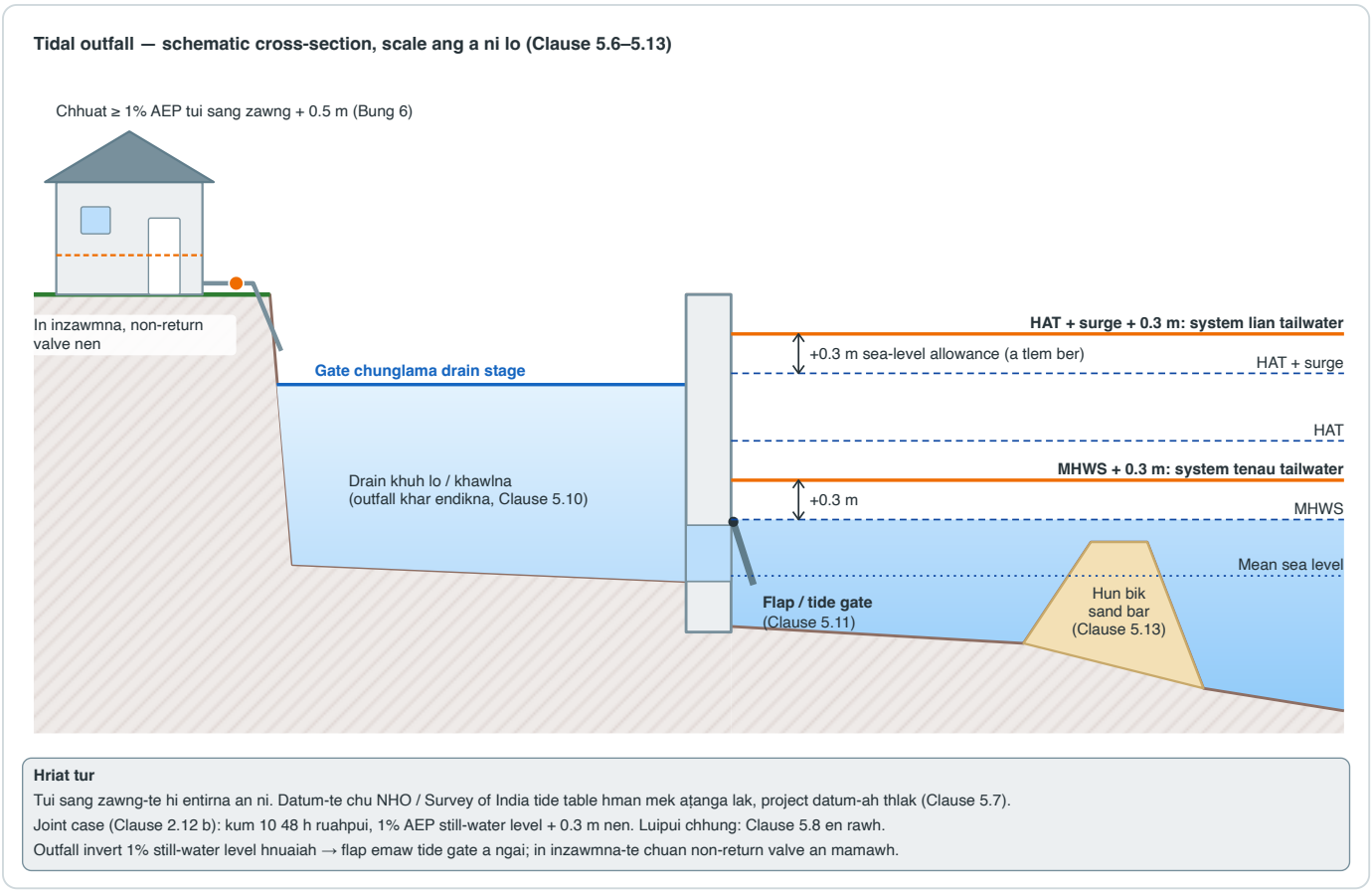
- (a) **Tidal level-te.** MHWS, HAT leh MSL chu National Hydrographic Office (NHO) emaw Survey of India-in a tlangzarh Indian tide table edition thar ber aṭanga, standard emaw secondary port hnai ber tan, emaw port authority-in a tlangzarh tidal level aṭanga lak tur a ni. Edition leh port chu tarlan tur a ni.
- (b) **Datum inthlakna.** Tide-table sang zawngte chu chart datum-ah a innghat. Chart datum, tide gauge zero leh Survey of India benchmark inzawmna chhinchhiah hmangin project datum-ah thlak tur a ni. Offset leh a thu hnar chu Form 5-1-ah tarlan tur a ni.
- (c) **Estuary, creek leh canal.** Estuary, creek, backwater emaw tidal canal chhunga outfall-te tan (entirnan coastal State-te estuary; Mizoram-ah a awm lo, Clause 5.1.4), tidal level chu tuifinriat kam hawng (open coast) nen a danglam thei. Spring–neap cycle pakhat tal chhunga tehna emaw calibrate hydrodynamic model-in value dang a finfiah loh chuan open-coast level hman tur a ni. Chutiang finfiahna tel lovin open-coast level aia hniam tihhniamna lak loh tur a ni.
- (d) **Interim.** Belhchian 5A a tlangzarh hma chu, design siamtu (designer) chuan value-te chu (a)-a thu hnar aṭangin a lak nghal tur a ni a, a chhinchhiah tur a ni.

5.7.3 **Storm surge.**

- (a) **Tui luanna system lian leh khawlna design.** "HAT + surge"-a surge term chu coastal segment tan **10% AEP (kum 10) storm surge** a ni, Belhchian 5A-a tarlan. 1% AEP surge chu Clause 2.12(b) joint case-ah chauh, kum 10 darkar 48 ruahpui nen hman a ni. Chu chuan case pahnih chu a inbangin a vawng a, a thlen vang ruahtui tlak chu a thlen vang surge nen engtikah mah kawp a ni lo.
- (b) **Joint case.** Clause 2.12(b) tana 1% AEP still-water level chu Belhchian 5A aṭanga lak a ni.
- (c) Belhchian 5A a tlangzarh hma chu, value pahnih chu INCOIS, IMD emaw NCCR surge hindcast emaw return-level analysis hmang site bik study aṭanga lak tur a ni. Study chuan a thu hnar, kalphung leh record rei zawng a tarlang tur a ni.
- (d) Outfall chu luhna venhim nei lovin tuifinriat hawng a hawi chuan wave set-up belh tur a ni.

5.7.4 **Tuifinriat sang lam pun allowance.** SLA chu:

- (a) element tin tan a tlem berah **+0.3 m**;
- (b) State, planning authority emaw Authority-in planning area tan projection sang zawk a hman chuan 0.3 m aia tam; leh
- (c) element design life tan chhut a ni tur a ni. Design life kum 50 aia rei element-te tan, design siamtu chuan SLA let hnih tuifinriat sang lam pun nghawng chu sensitivity run angin a tarlang tur a ni.



Milem 5.2 — Tidal outfall: flap gate, in non-return valve, leh design tailwater level-te (tui luanna system tenau tan MHWS + 0.3 m; system lian tan HAT + surge + 0.3 m), luipui kuama hun bik sand bar nen. Schematic, scale ang a ni lo. He Kaihhruaina Bu tana milem siam thar, MoHUA/CPHEEO Manual on Storm Water Drainage Systems (2019), Part A, Table 6.2-a tidal tailwater table aṭanga siam danglam.

Hrilhfiahna. CPHEEO (2019) Table 6.2 chuan coastal outfall-te design tailwater chu heti hian a ruat:

- ruahpui tê (kum 5-ah vawi 1 aia zing zawk) tan MHWN aṭanga MHWS thleng;
- ruahpui lian tan MHWS aṭanga HAT thleng; leh
- "Climate change nghawng: 0.3 m belh" ("Effect of climate change: additional 0.3 m").

CPHEEO chuan ruahpui, tide leh surge rual thlen theihna (joint probability) chu state maritime board rawn nen ngaihtuah "a ṭha" ("should") a ti bawk. He Kaihhruaina Bu hian CPHEEO range tin a sang ber lam a la a, system lian tan surge a belh a, joint case chu a tichiang (Clause 2.12). CPHEEO chuan surge belh a phut lo; he Kaihhruaina Bu hian a belh, coastal State-te surge record-in chutah a ṭul chhan a lantir avangin; Mizoram hian tuifinriat kam a nei lo a, surge term hi State-ah a lang lo, Remal ang cyclone-te ruah angin chauh a thleng a, a outfall-te chu tlang lui chhoh nasa-ah zalen takin an tla lut a, emaw phai luipui leh Tuirial leh Serlui B reservoir-ten an dang a, tuifinriat-in a dang lo (Clause 5.8.5).

Indian tide table hi kum zabi 19-na (nineteenth century) aṭangin Survey of India-in a tlangzarh ṭhin (Survey of India, Tidal Predictions). Tunlai Indian tidal prediction-te hi NHO tide table-ah pawh a lang. Port thuziak pakhat chuan edition thar ber hian Indian port 95 a huam a, NHO observation leh civil port, NIO leh INCOIS data a innghat a ti (Adani Ports, Dahej tide table 2025, NHO INP-12 a tarlan). INCOIS chuan coastal tide gauge a enkawl a, storm-surge leh swell-surge hriattirna (warning) a chhuah ṭhin. Heng zinga pakhat mah Mizoram-ah design atan hman a ni lo, tuifinriat kam a nei lo a, State tan Belhchian 5A buatsaih a ni lo (Clause 5.1.4).

5.8 Luipui backwater

5.8.1 **A hman theihna.** Ruahpui laia tui sang zawng outfall invert aia a san theih luipui leh canal-a outfall-te chu luipui backwater nen design tur a ni. Hei hian heng hi a huam:

- outfall invert chu lui design level aia a hniam tlang chhip khawpui luite, **Lunglei**, **Serchhip**, **Champhai**, **Kolasib**, **Siaha** leh **Lawngtlai**-a mite pawh telin (Clause 5.8.5(a));
- **Aizawl**-ah, **Tuirial**-a luang **Chite lui** leh a lui peng-te, Muthi leh Tuipawl lui nen, leh **Tlawng**-a luang **Ser lui** leh a lui tê-te (Clause 5.8.5(b));
- **Sairang** leh **Bairabi**-a leh Keitum CWC site-a **Tlawng**, **Champhai** leh **Zokhawthar**-a **Tiau**, **Chawngte**-a **Kau** (Tuichawng), CWC Bailley Bridge site-a Tuipui, leh an CWC site-a Tuichang leh Tuichawng, **Vairengte** phai leh lui kam zawl leh **Champhai** phai nen (Clause 5.8.5(c));
- **Tlabung**-a **Khawthlangtuipui** (Clause 5.8.5(d));
- **Tuirial** dam reservoir leh a hnuaia Tuirial, **Serlui B** dam reservoir leh a hnuaia Serlui, leh khawpui drain dawngtu dil zawng zawng, **Palak Dil** leh **Tam Dil** te pawh telin (Clause 5.8.3 leh 5.8.5(e));
- Bangladesh-a luang **Khawthlangtuipui** (Karnaphuli), CWC Sihthangpui site-a leh Myanmar-a luang **Chhimtuipui** (Kaladan), Myanmar ramri-a **Tiau**, leh hmar lam Barak phai pana an luanna hmuna **Tlawng**, **Tuirial** leh **Tuivai** (Clause 5.8.5(f));
- Aizawl Municipal Corporation, Lunglei Municipal Council, Village Council, PWD, PHED emaw national-highway agency drain emaw channel reng reng, leh District Council emaw a Village Council-te neih khaw drain emaw lui reng reng, ruahtui dawng (Clause 5.8.5(g)); leh
- hmun dangah: Belhchian 5B-a tarlan luipui emaw IWRD channel reng reng.

5.8.2 **Luipui sang zawng.** Luipui tui sang zawng chu heng aṭanga lak tur a ni:

- (a) IWRD design tuilian sang zawng emaw lui chhung (reach) tana tuilian sang ber chhinchhiah, a tlangzarh a nih chuan; emaw
- (b) luipui lui chhung hydraulic model (HEC-RAS emaw a tluk). Model chuan heng hi a hmang tur a ni:
  - hydrograph kalphung (Bung 3) aṭanga luipui design tuilian, Bung 3-in a phut apiangah continuous simulation nen;
  - luipui kuama Clause 5.7-a tidal boundary; leh
  - Clause 5.13-a sand-bar dinhmun.

5.8.3 **Reservoir leh dil (tank) tui thlah (release).** Chunglama reservoir emaw dil (tank) chuan luipuiah tui a thlah thei a nih chuan (entirnan Tuirial (Sonai)-a NEEPCO Tuirial dam leh Serlui-a Serlui B dam, Kolasib district-ah an pahnih hian), luipui sang zawng chuan ruahpui endik mek tana reservoir operating rule-in a pek tui thlah zat a telh tur a ni. Rule tlangzarh a awm loh chuan, tui thlah lian ber chhinchhiah a telh tur a ni.

5.8.4 **Site ruahpui leh luipui tuilian inrual.** Joint-probability study chu Authority-in a lo pawm loh chuan, heng zinga a nasa zawk hi hman tur a ni:

- (a) site design ruahpui (AEP phut ang), luipui chu a **10% AEP (kum 10)** level-a awm nen; leh
- (b) site **10% AEP** ruahpui, luipui chu a design-AEP level-a awm nen (system lian tan 1% AEP).

Inkawp tina ruahpui pahnih chu ruahtui tlak event pakhat aṭanga siam an nih chuan duration leh hun inang an nei tur a ni.

5.8.5 **Lui chhoh nasa-a free outfall, Aizawl-a Chite lui leh Ser lui, luipui tailwater nei phai, Tlabung, Tuirial leh Serlui B reservoir leh an release reach (dam hnuaia tui thlah luanna lui chhung), dil, ramri kal tlang outfall, leh remtihna leh ri (line)-te.**

- (a) **Lui chhoh nasa-a free outfall.** Tlang chhip emaw tlang pang aṭanga tlang lui (lui)-a outfall tan, a nghal emaw, lui-a tawp drain, down-drain (tlang pang zawh chhuk drain) emaw chute kal tlangin, Lunglei, Serchhip, Champhai, Kolasib, Siaha, Lawngtlai, Mamit, Khawzawl, Saitual, Hnahthial leh tlang chhip khawpui dangte ang, leh Aizawl-ah

item (b) hnuaiah:

- **Gauge a awm lo, level a awm lo.** State-a lui pakhat mahin gauge emaw tuilian sang zawng tlangzarh a nei lo [TBC]. An chhoh nasa a, an tawi a, ruah sur nasa a ṭan aṭanga minute engemaw zat chhungin an lian a, a tawp hnu darkar engemaw zat chhungin an kiam leh a, lung, gravel, leimin bal leh, khawpui hnuaiah, in chhunga tui bal (sullage) leh bawlhhlawh an phur ṭhin. State-a outfall tam zawk chu chung luite-ah chuan zalen takin an tla lut: tlang chhip-ah luipui tailwater a awm lo (NEER chhiar dan).
- **Free-outfall case.** Design case chu tui chakna tihnemna (energy dissipation) nei free outfall a ni. Outfall chu Bung 9 hnuaia design energy dissipator (tui chakna tihnemna)-ah a tawp tur a ni a, lui kam-ah siam lut tur a ni, leh khawpui drain aṭangin lined drain, chute, stepped channel emaw down-drain, SD&SM reg. 27-a "lei khawrh lo downdrain" ("non-erosive downdrains") hmanga thlen tur a ni, chutiang chuan tui luanna system tenau emaw lian tui luang reng reng venhim loh tlang pang, lei vur (fill), retaining wall emaw a hnuaia in ram chungah luan chhuah tir a ni lo ang (Clause 6.3.6(j)). Site chhung emaw a sira sawrkar ram chhungah lui thlen theih a nih loh chuan, tui chu closed conduit emaw lined drain-in "tui luanna kawng hnai ber thlen theih" ("the nearest practicable drainage way") (SD&SM reg. 27) thlengin phur tur a ni, AMCBR reg. 37(i) emaw easement-in a phal chuan mi dang ram kal tlangin, leh tlang pang ke-ah dah mai loh tur a ni (he Kaihhruaina Bu-in a ruat).
- **Design level.** System lian leh khawlna case-te tana tailwater chu heng zinga a sang zawk a ni tur a ni: (i) lui zirchianna aṭanga outfall-a 1% AEP level, outfall chunglam catchment pum tan Bung 3 hydrograph kalphung hmanga siam, Clause 2.3.6 hnuaia a sub-area ruahtui tlak, Clause 3.8.4-a AMC leh peak flow chunga Clause 6.3.6(g)-a bulking factor nen, leh survey anga channel, luah hneh (encroachment), leidip (silt), leimin bal leh bawlhhlawh paih hnua, hydraulic model (Clause 5.8.2(b)) kal tlanga route, Clause 6.3.6(h) leh 6.3.6(m)-in a phut angin luanna hnuailama kawng kal tlanna-te tihtawp (blocked) nen; leh (ii) June 2018, May 2024 emaw May–June 2025 ruahpui emaw a hnua ruahpui tuilian chhinchhiahna (bal ri, leidip leh scour chhinchhiahna, leh khawtlang mite thusawi ang) aṭanga, leh local body, Local Council emaw Village Council, DM&R emaw Deputy Commissioner record aṭanga outfall-a tuilian sang ber survey, a thu hnar tarlan nen. Lui-a outfall reng reng chu item pahnih tel lovin design loh tur a ni (he Kaihhruaina Bu-in a ruat).
- **Outfall hnuaia lui.** Design siamtu chuan outfall aṭanga catchment inang tal nei lui emaw luipui nena a lui inkawpna dawt thlengin lui dawngtu chu a endik bawk tur a ni: a catchment pum hmasawnna hnu lam 1% AEP tui luang, bulking factor nen, a kam chhungah leh a bed leh kam tan Bung 9 luan chakna tawp aia hniamin a phur theih em; chu lui chhung zawha kam emaw tlang pang reng reng chu leimin hlauhawmna map (landslide hazard map)-a High emaw Very High leimin hlauhawm zone-ah a awm em, emaw a hnuai lam tui-in a ei em (undercut), Clause 4.11 tlang rule-a geotechnical certificate tel lovin; leh tui luang pun chuan kawng, in, tuikhur (spring emaw tui chhuahna) emaw lung laihna (quarry) hmai a thleng loh em. Lui chuan heng endikna zinga pakhat emaw a tlin loh chuan, project chuan Bung 4 hnuaiah a peak leh tui zat a tihhniam tur a ni emaw, Bung 9 hnuaiah lui chhung chu a venhim tur a ni, item (g) hnuaia a neitu remtihna nen (he Kaihhruaina Bu-in a ruat). Outfall leh lui chhung leimin hlauhawmna map class chu Form 5-1-ah leh drain register (Clause 6.9)-ah tarlan tur a ni.
- **Bed level, scour leh lei kham (aggradation).** Design siamtu chuan outfall-ah leh a chunglam leh hnuailam 100 m tal chhungah lui bed a survey tur a ni a, survey hmasa, cross-section, lungphum leh pipe hmuh chhuah leh local body record aṭangin bed a inthlak chin a tarlang tur a ni. Outfall invert leh a chunga flap gate seat reng reng chu outfall luanna hnuailam 50 m chhunga chu chin chhunga hmuh **bed level sang ber aia 0.5 m tal a sang** tur a ni a, outfall structure leh a apron lungphum chu bulking factor nena 1% AEP tui luang tan Bung 9 (Clause 9.6) hnuaia scour thuk zawng chhut aia hnuaiah dah tur a ni (he Kaihhruaina Bu-in a ruat).
- **Siting.** Outfall chu kam-ah siam lut tur a ni a, bed emaw channel hman mek (active channel), he Kaihhruaina Bu tan kum 5-ah vawi khat tuilianin a chim ram anga ngaih, chhungah a chhuah lut loh tur a ni (he Kaihhruaina Bu-in a ruat). Lui luan dan lam hawiin a luan chhuak tur a ni a, Bung 9-in a phut kam venhimna nen, leh tui luanna system pipe, interceptor emaw chamber reng reng lui bed zawhin phah loh tur a ni. Hna aṭanga lei bal (muck), spoil emaw lei laih chhuah reng reng lui-ah emaw ruahpui-in lui-a a phur lut theihna hmunah dah loh tur a ni (SD&SM reg. 29; Clause 6.3.6(k)). Outfall reng reng chu tuikhur (spring

emaw tui chhuahna) chhungah emaw a chung hnai berah, a 15 m chhungah, emaw a chunga catchment venhim (Bung 8-a spring rule) chungah, emaw lung laihna hmai emaw spoil khawlna chungah emaw a hnuaiah (Clause 6.3.6(m)) a luan chhuah loh tur a ni (he Kaihhruaina Bu-in a ruat).
    - **Outfall khar.** Outfall invert chu he item design level aia a hniam chuan, Clause 5.10-a outfall khar endikna chu khar (lock) pakhat nen hman tur a ni a, chu khar chu design ruahpui duration leh lui kiam leh hun (recession), item (i) hnuaia Clause 5.8.4-a inrual case-te tan lui chu invert aia a san chhung chhut, a ni a, **darkar 24 aia tlem lo**; Clause 5.10.2-a darkar 48 leh 72 ruahpui tlan a nih chuan, khar chu ruahpui pum chhung a ni (he Kaihhruaina Bu-in a ruat).
- (b) **Aizawl: Chite lui leh Ser lui.** Aizawl-a outfall khawpui lui-a luang, emaw lui-a tawp drain-a luang tan:
    - **Lui-te.** Aizawl hi chhak lamah Chite lui kal tlangin Tuirial-ah a luang a, chu lui chuan khawpui "chhak lam ṭhena thum ṭhena hnih aia tam" ("more than two-third of eastern portion") a dawng a, a lui peng Chanmari, Ramthar, Mirawng, Tlak, Bangla, Taite, Bethlehem veng, Lawibual, Hmawngkawn, Zemabawktuikhur, Zuangtui leh Kawmthlang lui nen, leh Muthi leh Tuipawl lui kal tlangin; thlang lamah Ser lui leh a lui tê Ramri, Tuikal, Vai leh Zawngkawt lui kal tlangin Tlawng-ah a luang. Master plan chuan "Chite-lui, Chanmari-lui, Theihai-lui, Bethlehem-lui, Tuikhurhlu-lui, Mirawng-lui, and Bangla-lui" chu "fûr hun chhungin tui luan chak tak nen an luang buai" ("turbulent with high velocities of currents during the monsoon season") leh "a tichhe nasa hle" ("very destructive") a ti a, "Khatla-lui, Tuikual-lui, Vaivakawn-lui, Chanmari west-lui" chu "lui leh nullah tichhe nasa ber" ("the worst destructive streams and nullahs") a ti (Master Plan for Aizawl: Vision 2030, 8.3.1). Chungte zinga pakhat mahin gauge emaw tuilian sang zawng tlangzarh a nei lo [TBC], leh master plan-a drain siam tur rawt leh an catchment map (Map 8.3) chu he Kaihhruaina Bu tan lak chhuah a ni lo [TBC]. Khawpui hmun tam zawk tan luipui tailwater a awm lo: Tlawng leh Tuirial hi tlang chhip hnuai hla takah an awm (NEER chhiar dan).
    - **Design level leh khar.** Item (a) chu a kimin hman tur a ni, Clause 2.3.6(c)(i) hnuaia sub-area MZ-B ruahtui tlak nen. Item (a)(i) zirchianna chuan outfall aṭanga Chite lui emaw Ser lui nena a lui inkawpna thlengin, emaw 1 km, a tawi zawk zawk, lui chu a huam tur a ni (he Kaihhruaina Bu-in a ruat), leh a chunga kawng kal tlanna, culvert leh lui chhung khuh zawng zawng survey angin a telh tur a ni.
    - **Ek tui leh lui chhung bawlhhlawh-te.** "SIPMIU STP bul aṭanga Armed Veng thleng" ("near SIPMIU's STP to Armed Veng") Chite lui leh Tuikual lui chu CPCB polluted river stretch list-a Priority II-ah an awm a, Lawibual lui chu Priority III-ah (CPCB, 2025); CPCB-a Tuikual stream chu master plan-a Tuikual lui a ni em tih hi NEER chhiar dan, finfiah tur a ni [TBC]. Ek tui phur leh chungte zinga pakhatah luang lut sawrkar drain zawng zawng chu Clause 6.3.6(e) leh 8.9 hnuaiah sawi a ni a, lui emaw a drain-ah interception emaw screening hna reng reng chuan item (a) design level a tihsan loh tur a ni a, drain emaw lui phur theihna a tihniam loh tur a ni bawk; chu level chungah a din tur a ni emaw, chhiatna awm lova a chung tui a liam theih turin design tur a ni.
    - **Check dam-te.** Master plan chuan check dam riat "Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum leh Hlimen hnuaiah" ("below Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum and Hlimen") a rawt (4.9.12). Lui-a check dam, lung bund emaw bal emaw bawlhhlawh dawnna (trap) reng reng chuan chunglam outfall reng rengah a 1% AEP level a tihsan loh tur a ni a, chhiatna awm lova a chung tui a liam theih turin design tur a ni a, a bal dawn nen, item (a)(i) model-ah telh tur a ni (he Kaihhruaina Bu-in a ruat).
- (c) **Luipui tailwater nei phai leh lui kam zawl.** Phai emaw lui kam zawl-a outfall, a luipui chu outfall invert aia a san theih, Tlawng kama Sairang leh Bairabi, Vairengte, Champhai phai leh Tiau kama Zokhawthar, leh Kau (Tuichawng) kama Chawngte ang, leh luipui 1% AEP tuilian sang zawng hnuaia ram (phai ram, "valley-floor land", Belhchian 2A)-a outfall dang reng reng tan, a nghal emaw, flap gate kal tlangin emaw pumping station kal tlangin, emaw chung kawng pakhatin luang chhuak drain-ah:
    - **Flood plain zone a awm lo, tuilian erawh a awm.** MPCB chuan National Green Tribunal hnenah "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area") a ti a (OA 593/2017 leh OA 673/2018); chu chu heng phai-ah hian a dik lo, Sairang chhungkuate June 2018-ah tuilianin a khung a, Champhai chu June 2025-a hmun nasa ber zinga tel a ni (chanchin tlangzarh angin). Flood plain zoning dan, flood zone, leh SD&SM reg. 6-in site plan-in a lantir tura a phut "Aizawl Municipal Corporation-in a ruat leh a hrilhfiah tuilian hlauhawm

hmun" ("flood hazard areas as designated and defined by Aizawl Municipal Corporation") reng reng zirchianna hunah hmuh a ni lo (NEER chhiar dan), leh khawpui reng reng tan tuilian sang ber tlangzarh a awm lo (Bung 6, Clause 6.11) [TBC].

- **Gauge-te.** CWC hian Mizoram-ah tui sang zawng enna site pasarih a nei a, chung zinga panga chu hman a ni lo, forecasting site a nei lo: Tlawng kama Sairang (Dhaleswari anga tarlan; hydrograph hman mek, level sang ber tarlan a ni lo), Tuirial kama Turial (level sang ber **149.0 m**, June ni 17, 1995, tarlan awm chhun), Bailley Bridge Tuipui, Chhimtuipui (Kolodyne) kama Sihthangpui, Tlawng kama Keitum, leh Tuichang leh Tuichawng; June 2018 list pakhatin Pangkhuah a belh (SANDRP, 2018, CWC data copy, chanchin tlangzarh angin). Site reng rengah warning emaw danger level tarlan a ni lo, leh level reng reng tan datum sawi a ni lo [TBC]. CWC hian Bairabi leh Tlabung leh site dangah ruah tehna (rain gauge) a nei bawk (IMD Meteorological Centre Aizawl, ni tin list, 2026). Level hman apiang chuan a datum leh CWC gauge hming tarlan, emaw gauge dang hman, a enkawltu hming nen, gauge datum nena a inzawmna, leh Survey of India benchmark nena a inzawmna a tarlang tur a ni.
- **Design level.** Outfall-a Clause 5.8.2 luipui sang zawng chu, system lian case-te tan (Clause 5.8.4(b)), heng zinga a sang ber a ni tur a ni: (i) Clause 5.8.2(b) hnuaia hydraulic model aṭanga **outfall-a 1% AEP luipui sang zawng**, Bung 3 hnuaia site study aṭanga luipui design tuilian, CWC, NEEPCO emaw State gauge record a awm chuan chung nena calibrate, leh item (e) tui thlah nen; (ii) luipui inang-a CWC gauge hnai ber-a **level sang ber chhinchhiah**, a siamtu tuilian tui chung slope (water-surface slope) hmangin outfall-ah sawn, gauge record emaw model aṭanga, level chu tlangzarh a nih emaw CWC aṭanga lak a nih chuan (Sairang, Keitum, Bailley Bridge Tuipui, Tuichang emaw Tuichawng tan tarlan a ni lo [TBC]); leh (iii) June 2017, June 2018, July 2019, August 2023 leh June 2025 tuilian emaw a hnua tuilian chhinchhiahna aṭanga, leh local body, Village Council, DM&R emaw Deputy Commissioner record aṭanga outfall-a tuilian sang ber survey, a thu hnar tarlan nen. Phai ram-a outfall reng reng chu item (i) leh (iii) tel lovin design loh tur a ni. Luanna hnuailama gauge hnai ber level chu chunglamah lak chhoh loh tur a ni (he Kaihhruaina Bu-in a ruat).
- **10% AEP level.** Mizoram-a CWC site pakhat mahin warning emaw danger level a nei lo. Luipui chu a 10% AEP level-a a awm case-te tan (Clause 5.8.4(a)), level chu model inang aṭanga emaw gauge record frequency analysis aṭanga lak tur a ni; chutiang analysis chu lo pawm a nih hma chu, 10% AEP case chuan he item design luipui sang zawng a hmang tur a ni (he Kaihhruaina Bu-in a ruat).
- **Gate leh neitu-te.** Zirchian lai chhungin State-ah flap gate nei emaw pump hmang ruahtui outfall hmuh a ni lo [TBC]. Invert chu he item design level aia hniam outfall zawng zawngin a flap gate ngei (Clause 5.11) a nei tur a ni a, design siamtu chuan chu gate neitu, kalpuitu leh enkawltu tur pawl, drain register (Clause 6.9)-a drain neitu, hming a tarlang tur a ni a, a sill, a kal tlang kam emaw bang chhip reng reng leh a khar hun luipui sang zawng, he item datum-ah zawng zawng, a tarlang tur a ni.
- **Tailwater leh khar.** Outfall-a tailwater chu gate pawn lama luipui sang zawng leh a hnung lama drain tui sang ber, a sang zawk zawk a ni tur a ni, chu chu drain chu khawlna khar (closed storage) anga route-in chhut tur a ni, luipui chu a hnung lam level aia a san chhung, a lama luang catchment pum tui luang lut, phai chunglam tlang catchment-te telin, tunlai dinhmun survey anga a khawlna, leidip, lung, bal, luah hneh leh bawlhhlawh paih hnua, leh ruahpui laia pump theih tur kalpuitu-in ziak chunga a nemnghet pumping capacity aia tam lo luan chhuah nen, leh engtik lai mahin pump nghet (permanent) dah tawh capacity, pump lian ber paih, aia tam lo; event atana rawn hruai portable pump leh commission loh capacity chu chhiar tel loh tur a ni. Clause 5.10-a outfall khar endikna chu khar pakhat nen hman tur a ni a, chu khar chu Clause 5.10.2-a **darkar 72 design ruahpui pum chhung** a ni a, **darkar 72 aia tlem lo**, emaw luipui model emaw stage record-in luipui chu outfall invert aia a san rei zawk a lantir chuan a rei zawk (he Kaihhruaina Bu-in a ruat). Khar hian ruahpui tawi zawk zawng zawng a huam a, chutiang chuan khawlna leh pumping-in ruahpui tui zat pum a phur zawh ang (Clause 5.9.4). Pump-te (Clause 5.12) chuan he item design luipui sang zawng dodalin tui a pump chhuak tur a ni a, pump, panel leh control zawng zawng chu luipui chu chu level-a a awm laiin hman theih reng tur a ni (Clause 5.12.5). Khar tawi zawk chu outfall invert chu he item 1% AEP luipui sang zawng aia a san chauhvin, emaw Clause 5.10.6 hnuaia CWC gauge stage record analysis-in a lantir a, Authority-in phalna a pek chauhvin hman theih a ni.

    - **Barak khar a awm lo.** He series-a Barak-valley rule, a bula mi, Barak phai-a a ruat ni 7 khar chu hman a ni lo: Mizoram chhungah Barak phai a awm lo a, Bairabi leh Vairengte hi tlangin a hual lui kam zawl an ni, State ramri thlenga chhoh nasa taka luang luipui kamah (NEER chhiar dan).
    - **Gate chhiat.** Flap gate hnung lama in chhuat level (floor level) leh pump hmang outfall-te chu gravel, bal emaw bawlhhlawh-in gate a hawng tlat (jammed open) a, drain chu gate pawn lama luipui sang zawng thlenga a khat dinhmun tan pawh endik tur a ni.
- (d) **Khawthlangtuipui kama Tlabung.** Tlabung (sub-area MZ-D1)-a outfall, emaw Khawthlangtuipui (Karnaphuli) 1% AEP tuilian sang zawng hnuaia ram dang reng renga outfall tan:
    - **Luipui tuilian khawpui.** Tlabung hi a luipui aṭangin tuilian a tuar ṭhin: June 2017-ah sub-division-ah in 350 vel tuiin a chim tih report a ni a, district official-te chhiar danin 9 chu a pumin leh 60 aia tam chu a ṭhenkhatin a chim, mi 8 aṭanga 10 thi leh chhungkaw 1,500 aia tam tuar; June 2018-ah in 30; July 2019-ah in 400 vel, khawpui chhunga 150 telin, chhungkaw 350 aia tam sawn chhuah nen; leh August 2023-ah chhungkaw 40 sawn chhuah (zawng zawng chanchin tlangzarh angin). Tlabung-ah CWC level-monitoring site tarlan a ni lo (SANDRP, 2018, chanchin tlangzarh angin); CWC leh Agriculture Department-in chutah ruah tehna an nei (IMD Meteorological Centre Aizawl, ni tin list, 2026). Heng tuilian-ah hian luipui a san zawng leh a awm rei zawng hmuh a ni lo [TBC].
    - **Design level.** Tlabung drain-te chu luipui a tuilian sang zawnga awm tan design tur a ni a, invert chu chu level aia hniam outfall zawng zawngah flap gate nen. Design level chu heng zinga a sang zawk a ni: (i) Clause 5.8.2(b) hnuaia Khawthlangtuipui hydraulic model aṭanga outfall-a 1% AEP level, Bung 3 hnuaia site study aṭanga luipui design tuilian leh a catchment tan Clause 2.3.6 ruahtui tlak nen; leh (ii) June 2017, July 2019, August 2023 emaw a hnua tuilian chhinchhiahna aṭanga, leh local body, DM&R emaw Deputy Commissioner record leh khawtlang mite thusawi aṭanga outfall-a tuilian sang ber survey, a thu hnar tarlan nen, Survey of India benchmark nena inzawm. Tlabung-a outfall reng reng chu item (ii) tel lovin design loh tur a ni (he Kaihhruaina Bu-in a ruat).
    - **Luanna hnuailam boundary.** Khawthlangtuipui hi Bangladesh-ah Karnaphuli angin a luang zel a, luanna hnuailama Kaptai reservoir thlengin, chu chu zirchian a ni lo; ramri pawn lama luipui sang zawng reng reng India design siamtu-te tan hmuh theih a ni lo, leh a chungah luanna hnuailama India thununna a awm lo (NEER chhiar dan). Model chu a boundary-in Tlabung-a level a thunun loh theih khawpa luanna hnuailam hla taka ṭan tur a ni a, chu boundary chu normal depth leh level tihsan-ah tlan tur a ni, a chhuah sang zawk hman a, a danglamna Form 5-1-ah tarlan nen (he Kaihhruaina Bu-in a ruat).
    - **Khar.** Invert chu he item design level aia hniam outfall zawng zawng chu outfall khar case a ni a, khar pakhat **darkar 72 aia tlem lo**, Clause 5.10.2-a darkar 72 ruahpui pum chhung huam, leh **tuilian chhinchhiahna emaw khawtlang mite record-in luipui a sang reng rei zawk a lantir chuan a rei zawk**, emaw model emaw stage record-in a lantir chuan (he Kaihhruaina Bu-in a ruat). Item (c)-a tailwater, pumping leh gate chhiat rule-te hman tur a ni.
- (e) **Tuirial reservoir leh a release reach, Serlui B, leh dil-te.** Tuirial dam (Kolasib district-a Tuirial, Sonai tia koh bawk, kama NEEPCO Tuirial hydroelectric project) emaw Serlui-a Serlui B dam (Kolasib district) reservoir-a outfall, a nghal emaw a tawpna drain emaw lui kal tlangin, emaw dam pahnih zinga pakhat hnuaia luipui lui chhung-a, emaw dil (lake emaw pond)-a outfall tan:
    - **Remtihna.** Ruahtui chu reservoir, a drawdown zone emaw a release reach-ah, Tuirial dam tan NEEPCO, emaw Serlui B dam tan State power department ziak chunga remtihna tel lovin luan chhuah tir loh tur a ni (neitu NEER chhiar dan) [TBC] (he Kaihhruaina Bu-in a ruat).
    - **Design level.** System lian leh khawlna case-te tana tailwater chu reservoir **tui sang ber (maximum water level, MWL)** a kalpuitu-in a tlangzarh ang a ni tur a ni, emaw, full reservoir level (FRL) chauh tlangzarh a nih chuan, **FRL leh a design tuilian surcharge**, a spillway rating aṭanga chhut, gate reng reng chu kalpuitu ziak chunga rule-in a phal ang chauhva hawn. MWL emaw surcharge tlangzarh a nih loh chuan, emaw MWL tlangzarh chu FRL aia a san loh chuan, tailwater chu **FRL + 0.5 m** a ni (he Kaihhruaina Bu-in a ruat) [TBC]. Engtik lai pawhin reservoir-a level sang ber chhinchhiah aia a hniam loh tur a ni. Tui luanna system tenau tailwater chu FRL a ni. Project tui luan chhuah chu level-ah telh tur a ni (Clause 5.3.2 leh 5.12.3).
    - **Tuirial.** Project chungchanga CERC order chuan **FRL 90.5 m**, **minimum draw-down level (MDDL) 68.0 m** leh full load-a normal tailwater level 30.7 m a pe a, 75 m zoned earth-fill dam, open chute spillway leh 30 MW unit pahnih nei tan (CERC, Petition No. 125/MP/2021); MWL, spillway rating emaw datum hmuh a ni lo

[TBC]. NEEPCO-in ziak chungin a pek hma chu, reservoir tailwater chu **91.0 m** (FRL + 0.5 m) a ni, NEEPCO level-te datum-ah, chu chu final design hmain NEEPCO nen finfiah tur a ni (he Kaihhruaina Bu-in a ruat) [TBC]. CWC Turial gauge chuan June ni 17, 1995-ah level sang ber 149.0 m a chhinchhiah (SANDRP, 2018, chanchin tlangzarh angin); chu gauge leh a level chu reservoir level-te nen engtin nge an inzawm tih thu hnar hmuh reng rengin a sawi lo [TBC], leh CWC leh NEEPCO-in an datum leh hmun an sawi hma chu khaikhin, belh khawm emaw inthlak loh tur a ni. Normal tailwater 30.7 m hi power house hnuaia normal generation level a ni a, tuilian level a ni lo, leh release reach-a outfall design level atan hman loh tur a ni.

- **Serlui B.** Serlui B dam hi 51.3 m sang leh 293 m sei, 4 MW unit pathum nei a ni tih report a ni (chanchin tlangzarh angin); FRL, MWL, spillway rating emaw datum hmuh a ni lo [TBC]. Serlui B reservoir emaw a kam-a outfall reng reng chu kalpuitu FRL, MWL leh spillway rating ziak chunga tel lovin design loh tur a ni, emaw, a pek hma chu, kam-a tui ri sang ber survey leh dam-a spillway chhip survey, a sang zawk, Survey of India benchmark nena inzawm, 0.5 m belh (he Kaihhruaina Bu-in a ruat).
- **Tui thlah, hriattirna ni lovin.** Design reng reng chuan tui thlah hriattirna emaw warning, ruahpui hmaa reservoir tihhniam, emaw gate hawn hma, tlai emaw a ṭhenkhat a innghat loh tur a ni: he item tui thlah scenario-te hi hman tur a ni (he Kaihhruaina Bu-in a ruat). Dam pahnih operating rule emaw tui thlah record, leh an kalpui dan chu an chung emaw an hnuaia drain-te nena inzawmtir rule reng reng zirchianna hunah hmuh a ni lo [TBC].
- **Outfall khar.** Outfall invert chu he item design level aia a hniam chuan, outfall chu Clause 5.10.2-a **darkar 72 ruahpui pum chhung** leh ruahpui tawi zawk zawng zawng (Clause 5.9.4) tan khar angin ngaih tur a ni, khawlna leh pumping-in ruahpui tui zat pum phur zawh nen, kalpuitu stage record-in ruahpui inang ṭan laiin reservoir chu invert aia a hniam tih a lantir a, Authority-in a lo pawm loh chuan (he Kaihhruaina Bu-in a ruat). Reservoir zawng zawng chu design ruahpui tin ṭan laiin a FRL-ah a awm (Clause 7.7.3); FRL leh MDDL inkara drawdown zone chu reservoir ṭhenkhat a ni a, kalpuitu remtihna tel lovin outfall structure, pumping station emaw khawlna reng reng chutah siam loh tur a ni.
- **Release reach-te.** Dam hnuaia Tuirial, emaw Serlui B dam hnuaia Serlui-a outfall tan, Clause 5.8.4 case-te bakah, site design ruahpui (AEP phut tin) leh darkar 72 ruahpui chu dam tui thlah lian ber chhinchhiah, outfall thlenga route, aṭanga luipui sang zawng nen tlan tur a ni, dam hnuaia catchment tui luang a lo thlen dan ang nen, leh tui thlah chu site ruahpui hma, a lai leh a hnua dah nen, leh item (c) khar chu **darkar 72 aia tlem lo** hman tur a ni (he Kaihhruaina Bu-in a ruat). Dam pahnih tan tui thlah record lak a ni lo [TBC]. NEEPCO emaw State power department-in tui thlah lian ber chhinchhiah leh a rei zawng a sawi hma chu, tui thlah chu spillway design capacity a ni a, chu a pek hma chu, Bung 3 hnuaia site study aṭanga reservoir-a 1% AEP tui luang lut, reservoir-in tihhniam (attenuation) awm lova kal tlang (he Kaihhruaina Bu-in a ruat) [TBC]. Kalpuitu ziak chunga rule-in chu khawlna chu tuilian thununna atan a hman ngei loh chuan, reservoir pahnih khawlna tihhniamna reng reng chu a hnuaia luipui tan chhiar tel loh tur a ni. Tuirial dam dam-break study pakhat, PMF leh kum 100 tui luang lut case-te tan, chuan "lui inkawpna bulah" ("near the confluence") peak **3,035.34 m³/s** a route tih report a ni (IAHR, 2025 abstract, chanchin tlangzarh angin); chu chu dam-break case a ni a, design tui thlah a ni lo, leh design siamtu chuan Form 5-1-ah a chhinchhiah tur a ni a, NEEPCO-in a pek theih chuan, outfall chu chu study inundation extent chhungah a awm em tih a tarlang tur a ni [TBC]. Tuirial dam hnuaia release reach hi Clause 2.3.6(i) hnuaia hazard-first site a ni.
- **Dil-te.** Dil reng reng tan datum tarlan chunga level, leh outlet emaw tui liamna (overflow) level hmuh a ni lo, Palak Dil (Pala wetland, Siaha district-a Mara Autonomous District Council area-ah; Ramsar site no. 2484, a Ramsar Information Sheet angin August ni 31, 2021-a thlan leh July ni 26, 2022-a puangchhuah, chanchin tlangzarh angin) leh Saitual bula Tam Dil, Fisheries Department-in sangha vulhna reservoir (fishery reservoir) atana a siam ṭhat (chanchin tlangzarh angin) te pawh telin [TBC]. Ruahtui chu dil-ah a enkawltu (custodian) ziak chunga remtihna, leh Autonomous District Council area-ah chuan District Council remtihna tel lovin luan chhuah tir loh tur a ni [TBC]. Enkawltu-in level a pek hma chu, tailwater chu dil a liam chhuahna level, a outlet emaw tui liamna chhip survey, Survey of India benchmark nena inzawm, leh 1% AEP tui luang lut kal tlang tura chu chhip chunga head ngai belh, a ni a, chutah chhinchhiah level sang ber aia a hniam loh tur a ni; dil chu design ruahpui tin ṭan laiin a liam chhuahna level-ah a awm a, tailwater hnuaia outfall chu ruahpui pum chhung a khar (Clause 5.9.4) (he Kaihhruaina Bu-in a ruat). Dil-a luang lut drain zawng zawng chuan a thlen hmain bal leh bawlhhlawh dawnna (trap) leh sediment trap

(Clause 6.3.6(f) leh 6.3.6(m) leh Bung 8) a kal tlang tur a ni, ek tui phur drain reng reng dil-ah a luan lut loh tur a ni (Clause 6.3.6(e) leh 8.9), leh dil reng reng chu detention pond (ruahtui dah rihna dil siam) atan hman loh tur a ni (Bung 7).

- (f) **Ramri kal tlang outfall.** State chhuahsan luipui-a outfall, emaw a tawpna drain emaw lui-a outfall tan:
    - **Bangladesh leh Myanmar.** Khawthlangtuipui hi Bangladesh-ah Karnaphuli angin a luang lut a; Chhimtuipui hi Myanmar-ah Kaladan angin a luang lut a (Paletwa leh Sittwe lam panin); leh Tiau, chhak lama ramri luipui, chu Myanmar-ah a luang zel (NEER chhiar dan, finfiah tur). Heng luipui-te zinga pakhatah mah luanna hnuailam gauge emaw level India design siamtu-te tan hmuh theih a ni lo, leh luanna hnuailama India thununna a awm lo (NEER chhiar dan). Chhimtuipui kama CWC Sihthangpui site hian level tlangzarh a nei lo [TBC]. Heng luipui-a outfall model chu a boundary-in outfall-a level a thunun loh theih khawpa luanna hnuailam hla taka ṭan tur a ni, item (d) sensitivity run nen (he Kaihhruaina Bu-in a ruat).
    - **Barak phai.** Tlawng, Tuirial leh Tuivai hi hmar lam Barak phai panin an luang a, chu lui chhung-te chu he Kaihhruaina Bu Assam edition hnuaiah a awm. Heng luipui-a Mizoram outfall tan, chu edition aṭanga State ramri-a level, emaw luanna hnuailam CWC site aṭanga chunglama sawn, chu model luanna hnuailam boundary tan a hniam ber (lower bound) a ni a, outfall-a level a ni lo.
- (g) **Remtihna leh ri (line)-te.** Outfall structure, gate, pumping station emaw drain reng reng chu lui emaw luipui bed emaw kam-ah, emaw tuilian venhimna hna (flood-protection work)-ah, drain register (Clause 6.9) hnuaia a neitu remtihna tel lovin, emaw reservoir, a drawdown zone emaw release reach-ah, item (e) hnuaia NEEPCO emaw State power department remtihna tel lovin siam loh tur a ni. Mizoram Water Resources (Management and Regulation) Act, 2024 chuan WARDMA chu Autonomous District Council-te pawn lama tui hnar (water resources) tan "Competent Authority" a siam a, IWRD Chief Engineer chu a member secretary atan, leh "ruahtui khawl khawm telin tui humhalh leh leihnuai tui recharge" ("water conservation and groundwater recharge, including rain water harvesting") a thupek theihna a pe (s.16(2)(ix)), mahse chu Act hnuaia ruahtui outfall remtihna kalphung reng reng zirchianna hunah hmuh a ni lo [TBC]; WARDMA, District Water Resources Committee emaw Village emaw Local Water Resources Committee-in humhalh tur tui hnar an thlan (identify) tawh chuan, outfall chuan chutah a luan chhuah loh tur a ni (he Kaihhruaina Bu-in a ruat). Ruahtui chu pawl dang drain-ah chu pawl ziak chunga remtihna tel lovin luan chhuah tir loh tur a ni: municipality chhungah, municipal drain-a drain zawm tan Chairman ziak chunga phalna (Mizoram Municipalities Act, 2007, s.295), leh municipal drain emaw "tui luan kawng reng reng" ("any water-course")-a drain zawm tan municipality ziak chunga remtihna (s.296); municipal drain, culvert emaw ruahtui channel chungah structure reng reng sak phal a ni lo (s.300); kawng drain emaw culvert-ah, PWD emaw national-highway agency remtihna, leh Corporation area chhunga State kawngah Clause 6.9-a inkhuhkhawm (overlap) a chinfel hma chu PWD leh Corporation pahnih remtihna; municipality pawn lama khaw drain-ah, Village Council remtihna; leh Lai, Mara emaw Chakma Autonomous District Council area-ah, District Council emaw a ruat pawl remtihna, chu tan ziak chunga kalphung hmuh a ni lo [TBC] (he Kaihhruaina Bu-in a ruat). Remtihna pek a nih chuan, tui luan chhuah zat chu remtihna-in a phal zat aia a tam loh tur a ni; tailwater chu channel neitu-in ziak chunga a sawi channel design tui sang zawng leh Clause 5.8.4 inrual case-a a level, a dawn ruahtui zawng zawng aṭanga chhut leh a luanna hnuailam boundary chu item (a) aṭanga (f) thleng level-ah dah, a sang zawk zawk a ni; channel chu a tunlai dinhmunin ngaih tur a ni, leidip, lung, bal, luah hneh leh bawlhhlawh paih hnua leh a cross-section zim ber survey angin, leh tihzauh, lining emaw check dam rawt tawh mahse zawh loh chu chhiar tel loh tur a ni; leh design tui sang zawng emaw level chhut chu outfall invert aia a san chuan outfall chuan flap gate (Clause 5.11) a nei tur a ni. Design siamtu chuan design hun laia hman mek ri (line)-te nen (Bung 7) outfall chu a endik bawk tur a ni: SD&SM reg. 28-in pianphung lui bula plot-te tan vawng turin a phut riverine reserve, rule hmuh reng rengin a hrilhfiah loh; Mizo District (Forest) Act, 1955 hnuaia riverine reserve-te, EF&CC-in a neih, January ni 27, 2021-a High Court rorelna hnua a zau zawng chu EF&CC nen finfiah tur, General Administration Department notification (Gazette-a tarlan) April 2021-a mi, luipui laili aṭanga 800 m restricted zone, phalna hmasa nena hmasawnna, a ruat tih report leh chhiar a ni lo, chu chuan drain outfall a thleng em tih pawh telin (chanchin tlangzarh angin) [TBC]; master plan-in a rawt, tui luanna channel lian kam lehlam zawnga 15 m green buffer; Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, hnuaia River Conservation Zone, dan chu hman mek a nih a, zone notify a nih chauhvin, a pahnih hi hmuh a ni lo, chu zone chhungah State Authority phalna hmasa tel lovin sakna emaw "tui luan kawng emaw channel dal emaw her" ("obstruction or diversion of the water course or channel") tih theih a ni lo, leh a exemption tarlante ("bridges and culverts, check dams, waterholes") chuan drain outfall an tarlang lo; leh

AMCBR reg. 33-in septic tank emaw soak pit chu "tui hnar" ("a water source") aṭanga a hlat tir 15 m. Master plan-a Tlawng zawha 800 m green belt chu notification paih (quashed) tawh a innghat a, he clause hian dan ri (statutory line) angin a hmang lo.

Kalpuitu ziak chunga record-in a lantir loh chuan, tui luanna ṭanpuitu pump, gate emaw dam kalpui dan, ruahpui hmaa drain pump tihhniam, ruahpui hmaa reservoir tihhniam, gate khar tlai emaw dam gate hawn hma ang chu ngaih loh tur a ni. Outfall invert chu he clause tailwater aia a hniam chuan, outfall chuan a flap gate ngei (Clause 5.11) a nei tur a ni a, outfall khar endikna-in a phut chuan pumping (Clause 5.12), pump tui zat chu drain, reservoir emaw luipui routing-ah telh nen (Clause 5.12.3). Pumping chu a enkawltu remtihna tel lovin dil, reservoir emaw catchment dang-ah tui sawn nan, emaw tlang pang chungah, hman loh tur a ni.

Hrilhfiahna. Continental luipui basin lian takah chuan, site ruahpui leh luipui tuilian hi a tlangpuiin inzawm lo (independent) angin ngaih a ni ṭhin. Chu chu FHWA HEC-22 Table 7.3 ang inrual frequency (coincident frequencies) table-te innghahna a ni. Mizoram luite leh luipui-te hian chu ngaihdan chu an tichhia, an catchment-te an tê a, an chhoh nasa a, a tikhattu ruahpui-te chu khawpui-ah hun inangah leh ni tam tak chhung an sur ṭhin avangin. June 2018-ah Aizawl-in ni khatah 148 mm a chhinchhiah a, chu ni-a "India-a sang ber" ("the highest in India") tih report a ni (chanchin tlangzarh angin; June ni 12, 2018 a ni maithei, NEER chhiar dan), chutih lai chuan Serchhip district-in June ni 1–13 chhungin 677 mm a dawng a (SANDRP, chanchin tlangzarh angin), Tiperabagh, Serhuan leh Tlabung-ah in-te tuiin a chim a, Sairang-ah chhungkuate an khung (chanchin tlangzarh angin). May ni 24, 2025 aṭanga June ni 3, 2025 thleng chhungin ruahpui inang chuan State pumah leimin 598 leh phai-ah tuilian a thlen (DM&R figure, chanchin tlangzarh angin). A pahnih hi inzawm lo angin ngaih theih a ni lo, leh khawtlang ruahpui chu luipui peak hma, a lai emaw a hnuah a sur thei. Chuvangin Clause 5.8.4 chuan lehlam design event chu lehlam kum 10 event nen a kawp a, Clause 2.12(b) ang bawkin. He inkawp dan hi a entirna hmasa chiang a awm lo. Inzawm lo ngaihdan aia a nasa zawk a ni.

Clause 5.8.3 hian hmar lam tlang luipui-a dam pahnih, Kolasib district-ah an pahnih hian, a ngaihtuah. NEEPCO Tuirial hydroelectric project, Tuirial (Sonai, "Barak luipui lui peng" ["a tributary of river Barak"]) kamah, hian 75 m zoned earth-fill dam, open chute spillway leh 30 MW unit pahnih, full reservoir level 90.5 m, minimum draw-down level 68.0 m leh full load-a normal tailwater level 30.7 m a nei (CERC, Petition No. 125/MP/2021-a order); PMF leh kum 100 tui luang lut case-te tana dam-break study pakhatin "lui inkawpna bulah" ("near the confluence") peak 3,035.34 m³/s a route tih report a ni (IAHR, 2025 abstract, chanchin tlangzarh angin). Serlui-a Serlui B dam hi 51.3 m sang leh 293 m sei, 4 MW unit pathum nei a ni tih report a ni (chanchin tlangzarh angin); a FRL leh MWL hmuh a ni lo. Tuirial-a CWC Turial gauge chuan June ni 17, 1995-ah level sang ber 149.0 m a chhinchhiah a, chu chu State-a site reng renga level sang ber tarlan awm chhun a ni (SANDRP, 2018, CWC data copy, chanchin tlangzarh angin); thu hnar hmuh reng rengin chu gauge chu dam nen khawiah nge a awm, emaw a datum chu NEEPCO level-te nen engtin nge an inzawm tih a sawi lo, leh he Kaihhruaina Bu hian pakhat mah a chhut chhuak (infer) lo [TBC]. Dam pahnih tan MWL, spillway rating, operating rule, tui thlah record emaw datum lak a ni lo, leh an kalpui dan chu an chung emaw an hnuaia drain-te nena inzawmtir rule reng reng zirchianna hunah hmuh a ni lo [TBC]. An awm hma chu, spillway design capacity, emaw chu a awm loh chuan tihhniam loh 1% AEP tui luang lut, chu tui thlah atan hman a ni, event inanga dam hnuaia catchment tui luang a lo thlen dan ang nen (Clause 5.8.5(e)). He Kaihhruaina Bu-a luipui sang zawng hmante hi SANDRP-a CWC data copy aṭanga lak a ni; an datum leh gauge zero chu CWC nen finfiah tur a ni [TBC].

Clause 5.8.5 hi he Kaihhruaina Bu-in a ruat a ni. Mizoram-ah khawpui outfall-a tailwater hi tide-in a ruat lo va, tumahin gauge an neih loh leh a bed inthlak ṭhin lui, ni tam tak chhung sur ruahpui-in a tisang phai luipui, Tlabung-a Khawthlangtuipui, emaw a level khat-a awm reservoir leh a dam hnuaia tui thlah-in a ruat a ni, leh zirchian lai chhunga thuziak hmuh reng rengin chungte zinga pakhat tan mah design level a pe lo. State-a khawpui drain reng reng tan design standard hmuh a ni lo: Corporation regulation-te chuan drainage geometry a ruat a, design ruahpui, return period (kum engzat zelah nge a lo thlen ṭhin) emaw runoff coefficient erawh a ruat lo (Bung 4), master plan-a drainage bung chu thil awm dan sawina chauh a ni, leh Aizawl tana Smart City emaw ADB programme-ah storm-drainage component hmuh a ni lo (Bung 6). State hian floodplain zoning dan a nei lo, leh lui chhung reng reng tan tuilian sang zawng tlangzarh a awm lo (Bung 7).

Case hmasa ber chu free outfall a ni. State-a outfall tam zawk chu tlang chhip emaw tlang pang aṭanga lui-ah an tla lut a, chuvangin item (a) hi dan pangngai a ni a, a dangte chu exception an ni. A design case chu free outfall a ni, tlang chhip-ah luipui tailwater a awm loh avangin, mahse outfall-ah a tawp lo: energy dissipator, lui thlenga kawng lined leh lui inkawpna dawt thlenga lui endikna te hian tui chu tlang pang aṭangin an veng. Master plan chuan Aizawl drain-te chu "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") leh a luite chu fûr hunah "a tichhe nasa hle" ("very destructive") a ti a (Master Plan for Aizawl: Vision 2030), leh tlang pang-a emaw a dawng zo lo lui-a luang chhuak drain chuan 2022-23-a leimin lian zirchian ṭhena thum ṭhena hnih chhan anga sawi leimin a ṭan tir ṭhin (chanchin tlangzarh angin). Endikna lui chhung chu lui inkawpna dawtah a tawp, catchment inang tal nei lui emaw luipui hi project tui luang chu a pum zinga ṭhen tê a nihna hmun hmasa ber a nih avangin; phur theihna leh nghet zawng endikna a ni a, level endikna a ni lo. Design level, lui chu invert aia a san theihna hmunah, study leh tuilian chhinchhiahna aṭanga lak a ni, he series-a tlangram (mountain) edition-te gauge nei lo tlang lui-te ang bawkin, Clause 6.3.6-a bulking leh tihtawp (blockage) nen; leh invert chu luanna hnuailama bed level sang ber survey aia 0.5 m a sang, lung bed nei chuan tuilian vawi khatah a lantir theih lei kham (aggradation) tana he Kaihhruaina Bu-in a ruat margin a ni. Khar chu ruahpui leh lui kiam leh hun a ni a, darkar 24 aia tlem lo, luite an tê a, ruah a tawp hnu darkar engemaw zat chhungin an kiam a, mahse State-a leimin ruahpui chu ni tam tak a sur ṭhin avangin (Bung 2), leh Clause 5.10.2-a ruahpui rei zawk tlan a nih chuan khar chu a zawng zawng chhung a ni. Item (a) hian outfall-te chu tuikhur (spring)-te, "mipuiin in chhung mamawh atan an hmang nasa" ("are widely utilized by people for domestic needs") (CGWB), leh lung laihna hmai, South Hlimen-ah August ni 9, 1992-ah leh Melthum–Hlimen-ah Cyclone Remal laiin May ni 28, 2024-ah a chim (Bung 1), aṭangin a hlat tir bawk.

A pahnihna chu Aizawl a ni. Item (b) hian Chite lui leh Ser lui a tarlang, khawpui ber chu chungah a luan avangin, master plan-in an lui peng-te a tarlang a, a chhiatna thlen nasa berte a thlan chhuah avangin, leh Chite leh Tuikual lui-in khawpui ek tui chu CPCB-a lui bawlhhlawh list-ah an phur luh avangin (CPCB, 2025). Rule chu item (a) ang a ni, lui lian thlen theih khawp study rei nen; master plan-a check dam riat rawtte chu an venhim tur outfall-ah lui an tisang loh chuan chauh phal a ni.

A pathumna chu phai a ni. Item (c) hian tlangram edition-te interim luipui rule a zui: design level chu 1% AEP level a ni a, CWC gauge-a level chhinchhiah, tlangzarh a awm chuan, aia hniam ngai lo, leh tuilian chhinchhiahna survey aia hniam ngai lo, State pum tan level sang ber pakhat chauh tarlan a nih avangin, Turial-ah 149.0 m (SANDRP, 2018, chanchin tlangzarh angin), leh site reng reng tan warning emaw danger level a awm loh avangin; chuvangin frequency analysis a awm hma chu 10% AEP case chuan design level a hmang. Khar chu darkar 72 ruahpui pum a ni a, darkar 72 aia tlem lo, phai tikhattu luipui-te hi leimin thlentu ni tam sur ruahpui-te bawkin an chawm avangin: June ni 1–13, 2018-ah Serchhip district-ah 677 mm a sur a, May ni 24, 2025 aṭanga June ni 3, 2025 thleng chhungin leimin 598 a thleng (a pahnih chanchin tlangzarh angin). He series-a Barak-valley rule, a bula mi, chuan Barak phai-a outfall-te chu ni 7 tal a khar; Mizoram chhungah Barak phai a awm lo a, a phai-te chu chhoh nasa taka luang luipui kama tlang inkara lui kam zawl an ni a, chuvangin ni 7 khar chu lak a ni lo va, a aiah darkar 72 khar hman a ni. Luipui-in outfall a khar theihna apiangah flap gate a ngai a, gate neitu hming tarlan a ni, State-ah gate nei ruahtui outfall hmuh a ni lo va, tumahin an neih loh avangin. State-in National Green Tribunal hnena flood plain zone a nei lo tih a sawi chu Sairang, Champhai leh Tlabung tuilian bulah chhinchhiah a ni, tlang chhip-ah a dik a, chutah erawh a dik loh avangin.

A palina chu Tlabung a ni. Item (d) hian khawpui chu a bik takin a ngaihtuah, Mizoram khawpui kum engemaw zat danah a luipui aṭanga tuilian tuar chhun a nih avangin, 2017, 2018, 2019 leh 2023-ah (chanchin tlangzarh angin), leh a luipui chu ramri pawn lama level hmuh theih lovin Bangladesh-ah a luan zel avangin. A drain-te chu luipui tuilian level-a awm tan flap gate nen design a ni a, khar chu darkar 72 aia tlem lo, leh tuilian chhinchhiahna emaw khawtlang mite-in luipui a sang reng rei zawk an lantir chuan a rei zawk, tuilian a rei zawng gauge record hmuh a nih loh avangin [TBC].

A pangana chu reservoir leh a release reach a ni. Reservoir a level khat-a awm chuan season dang zawng chhungin a kiam lo va, a tui luang lut chu a spillway chungah a kal tlang tir a, a level chu tuilian-in a mamawh head zat FRL aia a sang. Chuvangin item (e) hian MWL, emaw FRL leh design-flood surcharge, a la a, a hnuaia outfall chu darkar 72 ruahpui pum chhung khar angin a ngai. Tuirial MWL hmuh a ni lo, chuvangin FRL + 0.5 m, 91.0 m,

interim value atan ruat a ni: he Kaihhruaina Bu-in floor level tan a hman freeboard a ni a (Clause 6.11.1), a hniam ber (floor) a ni a, surcharge chhut lawkna a ni lo [TBC]. Turial gauge level sang ber 149.0 m leh reservoir FRL 90.5 m chu khaikhin a ni lo, gauge leh a datum chu NEEPCO level-te nen engtin nge an inzawm tih thu hnar reng rengin a sawi loh avangin, leh an inkara inzawmna chhut chhuah chuan design level a tisual nasa thei. Dam pahnih tan tui thlah record lak a ni lo, chuvangin spillway capacity, emaw chu a awm loh chuan tihhniam loh 1% AEP tui luang lut, chu tui thlah lian ber aiah a ding; chu chu design dan anga fimkhur (conservative) a ni: tailwater hniam lutuk chuan lui chhung a tichim a, sang lutuk chuan khawlna man chauh a tipung. Tuirial tana dam-break peak report chu Form 5-1-ah chhinchhiah a ni a, design tui thlah atan erawh hman a ni lo, kalpui dan ni lovin chhiatna aṭanga chhuak a nih avangin. Dil-te hian level tlangzarh an nei lo, chuvangin item (e) hian an liam chhuahna level survey a hmang, tlangram edition-te-in an dil-te tan an tih ang bawkin, ek tui chu a luh tir lo va, detention pond atan hman a phal lo.

A parukna chu State chhuahsan luipui a ni a, a pasarihna chu remtihna leh ri (line)-te a ni. Item (f) hian model chu tumahin an teh theih loh boundary, Bangladesh emaw Myanmar-ah, chuan chhanna a ruat loh theih khawpa luanna hnuailam hla taka a ṭan tir a, Barak phai chu a enkawltu edition hnenah a hlan. Item (g) hian neitu remtihna leh design level a phut, channel emaw reservoir-a luang chhuak design chu chung tel lovin endik theih a nih loh avangin, leh drain-te hi pawl hrang hrang ta an nih avangin, chung zingah PWD leh Corporation hi State kawng drain inang tan (Bung 6, Clause 6.9). Item (g) ri-te hian outfall siam theihna hmun a ruat a, a level erawh a ruat lo: master plan-a 15 m buffer hi rawtna (recommendation) a ni a, 800 m Tlawng belt hi notification paih tawh a innghat a, SD&SM reg. 28-a riverine reserve hrilhfiah a ni lo, leh River Conservation Zone chu Rivers dan hman mek a nih a, zone notify a nih chauhvin a awm, leh hengte zinga pakhat mah finfiah a ni lo; he Kaihhruaina Bu corridor (hydraulic corridor) ngei (Clause 7.4) hi hman mek ri reng reng aia a zau zawk.

5.9 Joint-probability case-te

5.9.1 Tidal emaw backwater nghawng outfall-a luang element zawng zawng chu a hnuaia case-te tan endik tur a ni. A nasa ber chuan design zat tin a ruat: khawlna, tui sang zawng, pipe lian zawng leh pump capacity.

Table 5.2 — Tidal leh luipui outfall-te tana joint-probability case-te

Case	Ruahtui tlak	Tailwater	A huam	Innghahna
J1	Tui luanna system tenau design AEP, Tc aṭanga darkar 24 thleng	MHWS + SLA (tidal curve)	System tenau	Clause 2.12(a); Clause 5.7.1
J2	1% AEP, Clause 2.5.2 duration zawng zawng	HAT + surge + SLA	System lian, detention, dil (tank), pump hmang system	Clause 5.7.1
J3	10% AEP, **darkar 48**	1% AEP still-water level + SLA	System lian, detention, dil (tank), pump hmang system	Clause 2.12(b)
J4	Design AEP, **darkar 48** (darkar 72 tarlan)	J1 ang tidal curve, **darkar 6 khar hun** pahnih nen (Clause 5.10)	Khawlna zawng zawng leh gate nei emaw tide nghawng outfall zawng zawng	Clause 5.10
R1	Site design AEP	Luipui 10% AEP level-ah	Luipui outfall	Clause 5.8.4(a)
R2	Site 10% AEP	Luipui design-AEP level-ah	Luipui outfall	Clause 5.8.4(b)

5.9.2 Khawlna element-te tan, darkar 48 leh 72 ruahpui chu J2 leh J3 tailwater nen tlan tur a ni (Clause 2.5.3).

5.9.3 Tide nghawng luipui outfall-te tan, R1 leh R2 chu luipui model luanna hnuailam boundary J1 tidal curve-a dah nen tlan tur a ni. Authority-in J2-ah pawh a phut thei.

5.9.4 Tailwater chu ruahpui pum chhung outfall invert aia sang level-ah a danglam lo a nih chuan, case chu outfall khar vek angin ngaih a ni. Chutichuan khawlna leh pump-te chuan ruahpui tui zat pum an phur zawh tur a ni.

> Hrilhfiahna. Clause 2.12 hian joint case pahnih a ruat. Case (a) chu design ruahtui tlak, MHWS leh tuifinriat sang lam pun allowance nen a ni. Case (b) chu kum 10, darkar 48 ruahpui, 1% still-water level nen a ni. He Kaihhruaina Bu hian system lian design tan HAT leh surge a belh (Clause 5.7.1). Case J2 hian heng hi a belh khawm. J4 chu outfall khar endikna a ni a, level pakhat ni lovin ruahpui laka tide hun a endik. Ruahtui tlak leh surge hian cyclone chhan inang an nei a, chuvangin inzawm lo angin ngaih theih an ni lo (Clause 2.12 hrilhfiahna). Heng case-te hi aiawhtu (surrogate) awlsam an ni a, IMD ruahtui tlak leh tide-gauge record statistical joint analysis hman a nih hunah thlak tur an ni.

5.10 Outfall khar (tide-locked) khawlna endikna

5.10.1 **A hman theihna.** Endikna hi heng hnenah hman a ni:

- khawlna facility zawng zawng;
- tui luanna system tenau leh lian element zawng zawng; leh
- pump hmang system zawng zawng

a outfall invert chu HAT + surge + SLA aia a hniam, emaw tide-lock emaw sand-bar khar (Clause 5.13) tuar lui chhung-a luang.

5.10.2 **Ruahpui.** Clause 2.9.2 anga siam darkar 48 design ruahpui (peak ni hnuhnung ber) hmang rawh, heng hmangin:

- element AEP: detention, dil (tank) leh system lian tan 1% AEP; drain tenau tan system tenau AEP; leh
- AMC III.

Darkar 72 ruahpui pawh tlan leh tarlan tur a ni.

5.10.3 **Khar hun-te.** 5.10.6 hnuaia site study-in a dang a sawi loh chuan:

- (a) outfall chu **darkar 6 theuh khar hun inzawm pahnih** chhung a khar, local tidal curve tui sang (high tide) inzawm pahnih laili-ah. Semi-diurnal tide tan, window ṭan hun chu darkar 12.4 vel a inhla.
- (b) Khar hun tin chhungin, gravity luan chhuah chu **zero** a ni.
- (c) Khar hun inkarah, gravity luan chhuah chu J1 tidal curve dodalin chhut a ni, flap gate leh non-return valve reng reng head loss telin.
- (d) Khar hun hmasa ber chu ruahpui darkar 24 hnuhnung ber peak darkar 1 block laili-ah dah tur a ni. Window hmasa ber chu chu peak block-ah **a ṭan** nen tlan dawt pakhat siam bawk tur a ni. A nasa zawk hman tur a ni.

5.10.4 **Phut dan.** Khawlna leh pumping (a awm chuan) chuan endikna chhung zawng zawngin tui luang lut chu heti hian a dawn tur a ni:

- (a) detention facility reng renga stage sang ber chu a emergency spillway chhip aia a hniam, chutiang chuan spillway a hna a thawk lo. Outfall khar stage chu free-outfall design 1% AEP tui sang ber aia a san chuan, chu chu Clause 4.9.3 tana facility 1% AEP tui sang ber a ni a, spillway chhip, freeboard leh bang sang zawng chu chu aṭanga ruat a ni;
- (b) system tenau leh lian-a stage sang ber chuan Bung 6 tawp-te a tlin: in chhuat level, leh kawng tui thuk zawng chu crown-ah 150 mm aia tam lo leh a thuk berah 350 mm aia tam lo; leh
- (c) in connection reng reng chu a rawngbawl kawngka hniam ber chungah a surcharge lo, emaw Clause 5.11 hnuaiah non-return valve dah a ni.

Tui zat (volume) lamah, khar hun tin leh ruahpui pum chhungah:

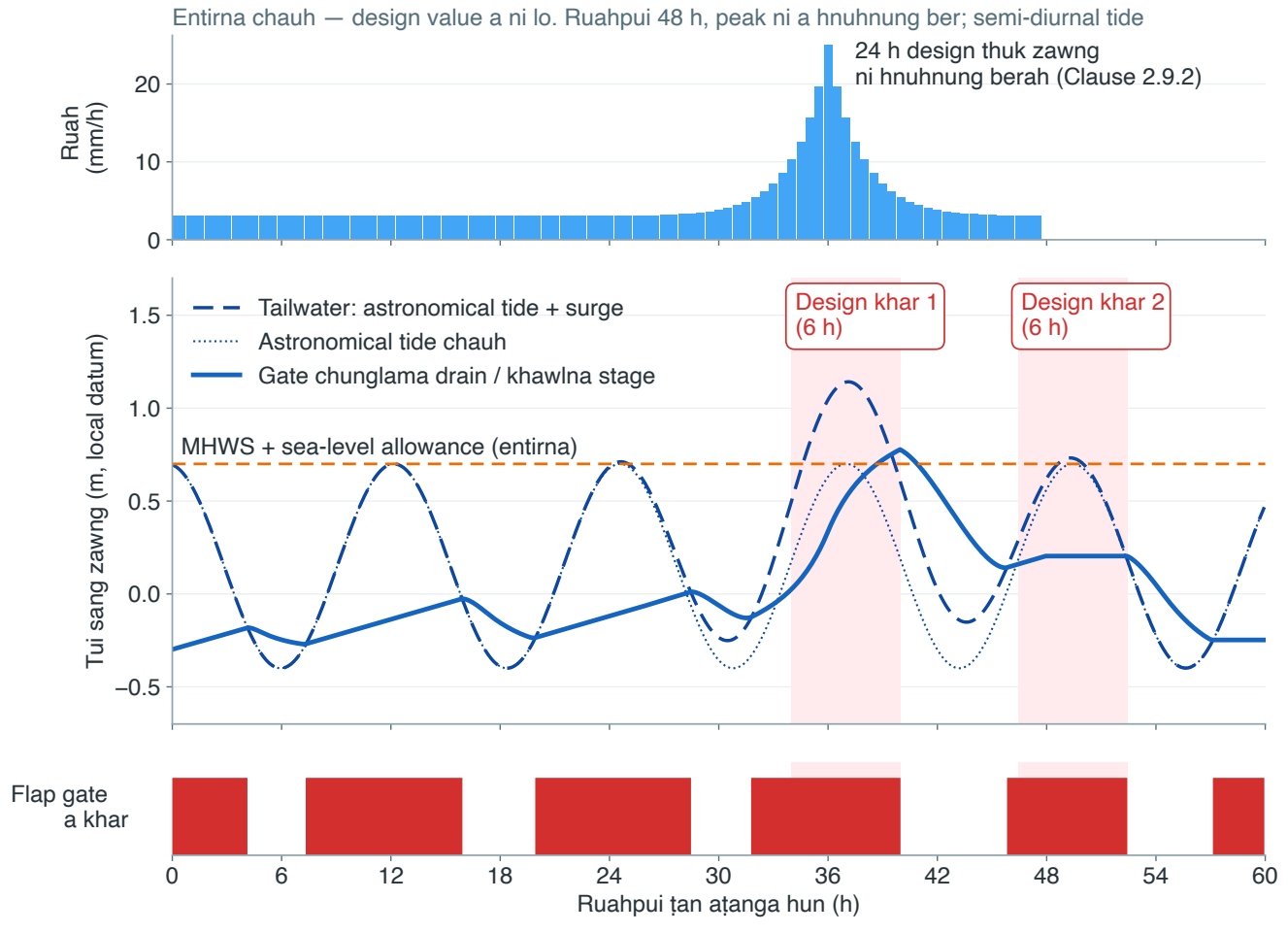
> V_inflow ≤ V_storage available + V_pumped + V_gravity (khar hun inkarah)

Hei hi routing hmangin lantir tur a ni, tui zat inbuktawhna (volume balance) pakhat hmangin ni lovin. Khar hun a tawp hnua facility tin aṭanga luan chhuah tir chu Bung 4 luan chhuah tir tawp (release cap) aia a tam thei, facility chu drain hawn thar-ah a ruak mek avangin. Chu luan chhuah tir chu luanna hnuailam zirchianna-ah telh tur a ni (Clause 5.4 leh 5.9).

5.10.5 **Ruahpui hnua tui tihhniam (drawdown).** Khar hun pahnihna hnuah, khawlna chu J1 tidal curve hnuaiah a ruak tur a ni. Clause 4.7 drawdown phut dan chu tlin tur a ni, gravity-in a tlin theih loh chuan pumping nen (Clause 5.12).

5.10.6 **Site study.** Design case tana still-water level time series site study-in a pek chuan khar rei zawk emaw tawi zawk hman theih a ni. Study chuan calibrate hydrodynamic model, hmalam event gauge record, emaw surge hindcast a hmang thei. Default aia khar tawi zawk chuan Authority phalna a mamawh. Heng apiangah khar rei zawk hman tur a ni:

- sand-bar khar (Clause 5.13) emaw luipui backwater (Clause 5.8) chuan outfall chu a rei zawkin a khar; emaw
- gauge record-in hmalam event inangah tide tin-ah darkar 6 aia rei tailwater chu outfall invert chungah a awm tih a lantir.



Milem 5.3 — Outfall khar endikna: peak ni hnuhnung ber darkar 48 ruahpui (Clause 2.9.2), astronomical tide leh surge tailwater, darkar 6 design khar hun pahnih, leh flap gate chunglama stage a chhuak. Entirna chauh — design value a ni lo. He Kaihhruaina Bu tana milem siam thar, MoHUA/CPHEEO Manual on Storm Water Drainage Systems (2019), Part A, §6.3.6-a tidal tailwater leh joint-probability ngaihdan aṭanga siam danglam.

Hrilhfiahna. Outfall khar endikna hi he Kaihhruaina Bu-a Mizoram phut dan bik a ni. Mizoram-ah hei hi outfall chu tide-in ni lovin, outlet chunga lian emaw lung, leimin bal leh bawlhhlawh-in a phum lui, ni tam sur ruahpui-in a tisang phai luipui, Tlabung-a Khawthlangtuipui, emaw a level khat-a awm Tuirial emaw Serlui B reservoir emaw dam pahnih hnuaia tui thlah-in a khar apiangah hman a ni. Luipui tisangtu ruahpui-te hi ni tam tak chhung an sur ṭhin: Serchhip district-in June ni 1–13, 2018 chhungin 677 mm a dawng a (SANDRP, chanchin tlangzarh angin), May ni 24, 2025 aṭanga June ni 3, 2025 thleng leimin ruahpui chuan leimin 598 a thlen (DM&R figure, chanchin tlangzarh angin); leh Tlabung in-te June 2017 leh July 2019-ah tuiin a chim tih report a ni a, August 2023-ah chhungkuate sawn chhuah leh an ni (chanchin tlangzarh angin), tui a awm rei zawng erawh hmuh a ni lo [TBC]. Tlang chhip khawpui luite hi minute engemaw zat chhungin an lian a, darkar engemaw zat chhungin an kiam a, mahse ruahpui vawi khatah outlet chu lung leh bawlhhlawh-in an dang thei. Chuvang chuan Clause 5.8.5 hian a hnuaia sawi darkar 6 window pahnih aiah, tlang outfall a design level hnuaia awmah ruahpui leh lui kiam leh hun khar, darkar 24 aia tlem lo; phai-ah darkar 72 ruahpui pum, darkar 72 aia tlem lo; Tlabung-ah darkar 72 aia tlem lo, leh tuilian chhinchhiahna-in a lantir chuan a rei zawk; leh release reach-ah darkar 72 aia tlem lo, reservoir design level hnuaiah ruahpui pum chhung khar nen, a thlak. Outlet a awm loh chuan rate rule-in a ṭanpui thei lo: gate khar hnung lama orifice nei basin chu a khat mai ang.

Darkar 6 khar inzawm pahnih default hi a entirna hmasa chiang a awm lo. Ruahpui peak hnai ber tui sang (high tide) pahnih vela tidal cycle tin chanve vel chhung gravity outfall-in tui a luan chhuah theih lohna a entir. Milem 5.3-in window pahnih an pawimawh chhan a lantir. Khar hmasa ber chuan ruahpui peak a man. A pahnihna chu khawlna a ruak hmain a lo thleng a, chuvangin stage a sang leh.

Window hmasa ber ruahtui tlak peak-a dah hi tumruh taka ṭhat lohna lam (unfavourable) a ni. Cyclone ruahtui tlak leh surge hian chhan inang an nei a, Clause 2.12 hian inzawm (dependent) angin a ngai tawh. Endikna hian J2 leh J3 level endikna emaw luanna hnuailam zirchianna a thlak lo; hun leh tui zat enchhinna a belh a ni.

5.11 Flap gate, tide gate leh non-return valve

5.11.1 **A ngaihna hmun.** Invert chu **1% AEP still-water level** (Clause 5.7.3) aia hniam outfall zawng zawngah flap gate, tide gate emaw a tluk non-return device a ngai. Clause 5.8.5 hnuaia irrigation channel-a outfall-ah pawh a ngai bawk.

5.11.2 **Hydraulics.** Design chuan heng hi a telh tur a ni:

- gate head loss leh a hawn theihna head, siamtu (manufacturer) certify head–discharge curve aṭanga; leh
- gate a ṭhenkhata a hawn laia outfall phur theihna tak tlahniam zat.

Enchhin an nih loh chuan, outfall khar endiknaah gate-te chu ṭha taka an khar (seal) angin ngaih loh tur a ni.

5.11.3 **Siamna.**

- (a) Gate, hinge leh seat-te chu tuifinriat tui (seawater) tana remchang thir ei theih loh (corrosion-resistant) thil hmanga siam tur a ni (Clause 4.12.5).
- (b) Gate chu luanna hnuailam lama chiahhlei, leidip emaw bal-in a khar tlat emaw a hawn tlat theih loh turin dah tur a ni. Bed a inthlak ṭhin chuan, gate invert chu bed chungah tihsan tur a ni, emaw a luhna venhim tur a ni.
- (c) Gate chu bal-in a dang tlat thei a nih chuan chunglamah trash screen dah tur a ni.
- (d) 600 mm aia lian outfall-ah enkawl laia tihhran (isolation) nan chunglamah stop-log slot emaw penstock dah tur a ni.
- (e) Gate chamber chu tide zawng zawngah thlen theih tur a ni a, a luhna chu HAT + surge + SLA chungah a awm tur a ni.

5.11.4 **In connection-a non-return valve.** In drainage connection zawng zawngah, a rawngbawl kawngka hniam ber chu heng aia a hniam chuan, non-return valve, emaw tihfai theihna (cleaning eye) thlen theih nei backwater valve, a ngai:

- connection hmuna system lian tailwater (J2); emaw
- outfall khar endikna-a stage sang ber (Clause 5.10).

Basement drainage chu a pahnih aia sang level-ah pump chhoh bawk tur a ni, a non-return valve ngei nen.

5.11.5 **Endikna.** Gate leh valve-te chu heng hunah endik leh kalpui tur a ni:

- kum tin **March ni 31** hmain;
- ruahpui tui luang laka an khar event tin hnuah; leh
- enkawlna plan-a ruat angin (Bung 10).

> Hrilhfiahna. 1% still-water level hnuaia gate phut dan hi he Kaihhruaina Bu-in a ruat a ni. Siamna chipchiar-te hi coastal-drainage hmanna pangngai a zui. Bal-in a hawn tlat gate chuan tide chu drain-ah a luh tir. Chiahhlei kham-in a khar tlat gate chuan gravity outfall chu kawng tawpna (dead end)-ah a chantir. Mizoram-ah outfall-te hian tuifinriat kam (beach) an kal tlang lo. A tam zawk chu lui-ah zalen takin an tla lut a, zirchianna hunah State-ah flap gate nei emaw pump hmang ruahtui outfall hmuh a ni lo [TBC]; mahse Sairang, Bairabi, Vairengte, Chawngte, Champhai phai leh Tlabung phai outfall-te hian Clause 5.8.5(c) leh (d) hnuaiah flap gate an mamawh a, chutah chuan gravel, leimin bal emaw bawlhhlawh-in a hawn tlat gate chuan luipui chu khawpui drain-ah a luh tir a, bed sang lam-in a phum gate chuan outfall chu kawng tawpna-ah a chantir. Outfall lui chhung pahnih chu dam hnuaiah an awm: NEEPCO dam hnuaia Tuirial, chumi tan dam-break study pakhatin "lui inkawpna bulah" ("near the confluence") peak 3,035.34 m³/s a route tih report a ni (chanchin tlangzarh angin), leh Serlui B dam hnuaia Serlui; a pahnih operating rule emaw tui thlah record hmuh a ni lo, leh dam reng reng kalpui dan chu a chung emaw a hnuaia drain level-te nena inzawmtir rule pawh hmuh a ni lo [TBC]. Dam-te hi NEEPCO leh State power department-in an nei a, an hnuaia luipui thleng drain-te erawh Aizawl Municipal Corporation, PWD, national-highway agency-te, Village Council-te leh, chhim lamah, District Council-te ta an ni a, notification reng rengin a ṭhen lo (Clause 6.9). Chuvangin gate leh a hnung lama drain-te hi pawl hrang hrang ta an ni thei a, Clause 6.9 drain register chuan gate tin neitu hming a tarlang. March ni 31 endikna ni hi fûr hma lamah ruat a ni.

5.12 Pump hmang outfall

5.12.1 **A ngaih hun.** Gravity luan chhuah-in heng hi a tlin theih loh chuan pumping siam tur a ni:

- Clause 5.10-a outfall khar endikna;
- Clause 4.7-a drawdown phut dan; emaw
- J2 leh J3 case-te.

Gravity solution-in heng phut dan-te a tlin chuan pumping hman loh tur a ni.

5.12.2 **Capacity.**

- (a) Duty pump-te belh khawm, khawlna siam nen, chuan Clause 5.9 case tin (J4 telin) an tlin tur a ni, routing hmanga lantir.
- (b) Duty pump lian ber tluk tal **standby** capacity dah tur a ni (a tlem berah duty + standby 1).
- (c) Pump capacity chu **J2** tailwater static head-ah tarlan tur a ni, tide chawhrual (mean tide)-ah ni lovin.

5.12.3 **Tui dawngtu chunga nghawng.** Luipui, canal emaw creek-a pump tui luan chhuah chu Clause 5.8 luipui emaw creek level analysis-ah telh tur a ni. Hmun dangah tui dawngtu level chu Clause 5.5 lo pawm theihna tehna aia tisang pumping chu phal a ni lo.

5.12.4 **Kawlphetha pekna (power supply).** Pumping station-te chuan heng zinga pakhat an nei tur a ni:

- kawlphetha pekna inzawm lo (independent) pahnih; emaw
- duty capacity 100% tan standby generation, duty kalpui darkar **72** tal tan site-a fuel nen.

Inthlakna (changeover) chu automatic a ni tur a ni.

5.12.5 **Tuilian venhimna (flood immunity).** Electrical panel, control equipment, generator leh fuel khawlna-te chu heng zinga a sang zawk aia sangah dah tur a ni:

- 1% AEP tuilian sang zawng + 0.5 m; leh
- HAT + surge + SLA + 0.5 m.

Station luhna kawng chu 1% AEP event-ah hman theih reng tur a ni.

5.12.6 **Luan chhuah tir dan.** Rising main-te chuan heti hian tui an luan chhuah tir tur a ni:

- J2 tailwater aia sang level chung kal tlangin; emaw
- non-return valve leh flap gate kal tlangin.

Chu dan chuan back-siphoning a veng tur a ni.

5.12.7 **Thununna leh enna (monitoring).** Station tin chuan heng hi a nei tur a ni:

- automatic level control;
- level sang, pump chhiat leh kawlphetha tawp tan remote alarm, kalpuitu hnena thawn; leh
- kum 5 tal chhung vawn tur level leh run-time log.

Wet well-te chu pump ṭan zat chu siamtu tawp chhungah a awm theih turin a lian zawng ruat tur a ni.

5.12.8 **Screen-te.** Inlet screen-te chu ruahpui laia hna thawk thei tihfai dan (mechanical rake, emaw screen kawp) nen dah tur a ni.

5.12.9 **Enchhinna.** Pump hmang outfall zawng zawng chu kum tin **March ni 31** hmain duty kim-ah, standby power telin, tlan enchhin tur a ni. Mimal pump hmang system-te chu registered maintenance declaration (Bung 10)-in huam tur a ni.

> Hrilhfiahna. Duty + standby, darkar 72 fuel leh tuilian venhim electrics hian a entirna hmasa chiang pakhat a awm lo va, he Kaihhruaina Bu-in a ruat a ni. Darkar 72 fuel zat hi design ruahpui tih ngei ngei tur rei ber (Clause 2.5.2) nen a inmil. Grid kawlphetha chauh innghat pump station chu a ngaih lai takah a tawp thei, tuilian hmun-a kawlphetha chu himna avangin titawp a ni fo avangin. Singapore-a April 2025 amendment-te chuan pump hmang detention tank-te tan kumtin maintenance declaration a belh (PUB Addendum No. 3). Clause 5.12.9 leh Bung 10 hian kawng inang an zawh. Clause 5.12.3 hian tide-locked drain pakhat aṭanga tide-locked luipui-a tui sawn mai pumping a veng.

5.13 Luipui kuam sand-bar khar

5.13.1 **A hman theihna.** He clause hi a kuam chu hun bik (seasonal) sand-bar khar tuar luipui emaw creek reng reng-a outfall-te tan a ni. Hei hian coastal State-te luipui kuam (Mizoram-ah a awm lo: Clause 5.1.4), leh Belhchian 5B-a tarlan luipui kuam dang reng reng a huam.

5.13.2 **Fûr ṭan laia ngaihdan.** April–October season ṭan laiin, kuam chu fûr hma survey thar ber crest level-ah bar-in **a khar** angin ngaih tur a ni. IWRD-in heng hi a certify loh chuan hei hi hman a ni:

- kuam enkawlna programme (dredging, bar cutting emaw training wall) chuan fûr hun hmasa pathum ṭan tinah kuam chu a hawng reng; leh
- programme chu tun season tan sum ruat a ni.

5.13.3 **Kuam khar laia tailwater.** Kuam a khar laiin, outfall-a tailwater chu heng zinga a sang zawk a ni tur a ni:

- (a) Clause 5.7-a tidal tailwater; leh
- (b) bar hnung lama luipui lui chhung level, bar chu a crest level survey-ah weir angin chhut. Chu level chuan Clause 5.8-a luipui tui luang leh bar chung emaw a kal tlanga tui luang kal tlang tura head ngai a telh tur a ni.

5.13.4 **Emergency cutting tan chhiar tel loh.** IWRD-in kalphung chhinchhiah (documented operating procedure), chu tana hmanrua dah reng nen, a neih loh chuan, ruahpui laia bar cutting emaw tihchhiat (breaching) chu design-ah ngaih loh tur a ni. A neih chuan, kalphung-in a sawi hun hnu chauhvin bar chu kalphung target level thlenga tihhniam angin ngaih theih a ni.

5.13.5 **Outfall khar endikna.** 5.13.3(b) kuam khar level chu default khar hun aia rei zawkin outfall invert aia a san chuan, Clause 5.10 khar rei zawng chu chu hun thlengin tihpun tur a ni.

> Hrilhfiahna. Mizoram hian tuifinriat kam leh luipui kuam a nei lo, chuvangin Clause 5.13 hi State-ah hman a ni lo (Clause 5.1.4). A tluk hnai ber ram chhung lam thil chu luite-in outfall emaw gate-a an dah lung, leimin bal, leidip leh bawlhhlawh a ni. Master plan chuan Aizawl drain-te "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") a ti a, Aizawl W-I area ṭhena thum ṭhena khat chu bawlhhlawh-in a kawng sir drain-te a dan avangin "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") tui a lian (Master Plan for Aizawl: Vision 2030); khawpui hnuaia luite hian chunglama leimin tin bal an phur. Gravel, bal emaw bawlhhlawh-in a hawn tlat emaw a khar tlat flap gate, bed sang lam-in a phum emaw scour-in a tihkhai (left hanging) outlet, emaw tihchet theih loh gate chuan design outfall chu kawng tawpna emaw tui let luhna kawng (back-flow path)-ah a chantir. State-a gate emaw dam reng reng kalpui dan chu a chung emaw a hnuaia drain level-te nena inzawmtir rule reng reng zirchianna hunah hmuh a ni lo [TBC]. Clause 5.8.5 hian a pahnih hi a chingfel, outfall-te chu bed inthlak chin chungah dahin leh kalpuitu record-in a lantir loh gate kalpui dan emaw khawlna reng reng chhiar tel lovin. Clause 5.13.2 hian a entirna hmasa chiang a awm lo. Kuam a khar ngaih ni lovin, a hawng tih lantir chungah finfiahna mawh (burden of proof) a nghat.

5.14 Thuziak chhinchhiahna (documentation)

He bung huam project zawng zawng chuan **Luanna Hnuailam leh Tailwater Report** (Form 5-1) a thehluh tur a ni. A chhungah heng hi a awm tur a ni:

1. zirchianna huam chin plan, heng lantir:
    - site;
    - zirchianna hmun tin, a contributing catchment area leh chu chhunga site percentage nen; leh
    - tawpna hmun leh a thlan chhan (Clause 5.3);
2. model sawifiahna:
    - software leh version;
    - network schematic, drain leh kawng kal tlanna-te survey hnar nen;
    - site pawn area-te tan ram hman dan leh CN;
    - chunglam detention telh reng reng; leh
    - calibration emaw validation finfiahna, a awm chuan;

3. zirchianna hmun, AEP leh duration tin tan, tunah awm leh project nen:
    - peak flow;
    - peak thlen hun (time to peak);
    - tui sang ber leh luan chakna; leh
    - tui chim rei zawng (Clause 5.4);
4. Clause 5.5 nena khaikhinna, tlin lohna tin leh a tihdamna (remedy) hman nen;
5. tailwater chhut chhuah dan:
    - tide-table edition leh port;
    - chart datum nena MHWS, HAT leh MSL;
    - Survey of India benchmark leh project datum nena datum inzawmna;
    - surge hnar leh value;
    - SLA; leh
    - luipui sang zawng leh an thu hnar (Clause 5.6 aṭanga 5.8 thleng);
6. Clause 5.9 joint-case table, a chhuah nen;
7. outfall khar endikna (Clause 5.10):
    - ruahpui leh khar hun inmilna (alignment);
    - stage hydrograph-te; leh
    - khar hun tin tana tui zat inbuktawhna (volume balance);
8. flap gate, tide gate leh non-return valve tarlanna (schedule), certify head–discharge data nen (Clause 5.11);
9. pump hmang outfall design, kawlphetha pekna, tuilian venhimna leh control-te, a awm chuan (Clause 5.12);
10. sand-bar ngaihdan leh a ṭanpuitu IWRD certification, a ngai chuan (Clause 5.13); leh
11. Bung 10 tana endikna leh enkawlna phut dan-te.

Clause 5.3.4 hnuaia site tê-te chuan a aiah Form 5-2 (Luanna Hnuailam Thusawi Tawi) an thehluh tur a ni.

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Belhchian leh Form

Belhchian / Form	A chhunga thu
5A	Tidal datum (MSL, MHWS, HAT, CD leh Survey of India datum nena khaikhin), surge allowance leh coastal segment zela 1% still-water level
5B	Major drain, luipui outfall lui chhung, leh sand-bar khar tuar luipui kuam-te; map
5C	Entirna chhut: Lunglei khawpui-a tlang pang colony, tlang lui (lui)-a luang, tana outfall khar endikna
Form 5-1	Luanna Hnuailam leh Tailwater Report
Form 5-2	Luanna Hnuailam Thusawi Tawi (site tê tan)

BUNG 6

Tui Luanna System Tenau leh Lian

6.1 Tum leh a huam chin

6.1.1 He bung hian development (hmasawnna hna), kawng emaw public drainage scheme aṭanga ruahtui luang (runoff) chu tui dawngtu waterway (tui luanna lian), dil (tank) emaw outfall (drain tui luan chhuahna) thlenga luang tirtu conveyance system (tui luan tirna system) tan level of service leh hydraulic criteria a ruat. A huamte chu:

- (a) dual drainage concept (tui luanna system pahnih inṭanpui): tui luanna system tenau (minor system) leh tui luanna system lian (major system) (Clause 6.3);
- (b) ram hman dan (land use) leh kawng class zela design return period (kum engzat zelah nge a lo thlen ṭhin) (Clause 6.4);
- (c) kawngpui hydraulics: kawng chunga tui zau zawng (spread), a thuk zawng leh tui luan hlauhawmna (Clause 6.5);
- (d) inlet (luan lutna) hrang hrang, clogging (bal avanga tihtawp) tiamin (Clause 6.6);
- (e) pipe leh drain (tui luanna) khuh lo leh drain khuh (Clause 6.7);
- (f) hydraulic grade line zirchianna (Clause 6.8);
- (g) overland flow path (lei chunga tui luan kawng), sag (kawng hniam lai) hmuna tui tlin leh building floor level (Clause 6.9 aṭanga 6.11 thleng);
- (h) culvert (kawng hnuaia tui kalna) leh kawng kal tlanna (road crossing) (Clause 6.12); leh
- (i) drain khuh, leidip (silt), bawlhhlawh (solid waste), utility leh leidip laih chhuahna (desilting) kawng chungchanga Mizoram sakna hna (construction practice) mamawhte (Clause 6.13).

6.1.2 Structure mal tin (culvert, channel, energy dissipator (tui chakna tihnemna), screen, pump, gate, manhole) hydraulic design kimchang chu Bung 9-ah a awm. Ruahtui tlak chu Bung 2-ah, ruahtui luang chhut dan Bung 3-ah, site chhunga khawlna Bung 4-ah, tailwater (outfall hnuailama tui sang zawng) Bung 5-ah, tui awmna (waterbody) Bung 7-ah leh tui ṭhatna Bung 8-ah a awm.

6.1.3 He bung hian public drain zawng zawng, kerb (kawng kam dai) emaw kawng sir drain nei kawng zawng zawng, leh Bung 1-a applicability threshold (a huam chin tehna) thleng development-a private drainage system zawng zawng a huam. Tier B local body-ah chuan, Bung 1-a sawi simplified procedure leh design aid-te chu ≤ 16 ha rawngbawltu element-te tan hman phal a ni a, mahse he bung criteria chu a huam tho.

> **Hrilhfiahna.** Mizoram drain-te hi State emaw municipal standard reng reng hmanga design a ni lo: zirchianna hunah pakhat mah hmuh a ni lo, leh khawpui reng reng tan design return period, runoff coefficient emaw drain size sawina thuziak hmuh a awm lo. Corporation building regulation-te chuan National Building Code ("hun hun-a siam ṭhat angin" ("as amended from time to time"), 2019 amendment aṭang khan) leh, leimin hlauhawmna tan, IS 14458 leh IS 14496 (Part 2) an kawhhmuh (AMCBR reg. 33 leh Annexure F); a slope regulation chuan terrace swale (tlang panga hmun zawl siam chunga tui luanna), interceptor drain (cut chung lama ruahtui dangtu drain) leh down-drain (tlang pang zawh chhuk drain) geometry a ruat a, mahse "hydrology leh hydraulic chhutna" ("hydrology and hydraulic calculations") chu licence nei civil engineer-te kutah a dah (SD&SM reg. 27 leh Schedule I). Master plan chuan "Aizawl Urban Area 67% hi kutcha drain a ni a, 18% hi tui luanna system reng reng a nei lo. Hmun 15% chauhin pucca drain a nei" ("67% of Aizawl Urban Area is having kutcha drains and 18% are without any drainage system at all. Only 15% of the area is provided with pucca drains") tih te, drain-te chu "hydraulic

design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") tih te, leh khaw 8% chauhin drain khuh lo enkawl fel taka an nei a, 40%-in a hun hunin an enkawl a, 52%-in enkawlna an nei lo tih te a hmu (Master Plan for Aizawl: Vision 2030, 8.3.1–8.3.4). Aizawl Smart City tum sawi chhuahte zingah "tui pek leh tui luanna system tihṭhat" ("refining water supply and drainage systems") a tel (chanchin tlangzarh angin), mahse a storm-drain project reng hmuh a ni lo, leh North Eastern Region capital khawpuite tana ADB programme chuan Aizawl-ah tui pek leh sewerage a sum a pe a, drainage component hmuh a ni lo (ADB thuziak, search summary aṭanga hmuh) [TBC]. Drain-te hi he Kaihhruaina Bu phai ram edition-te-in an tawh loh dinhmunah hna an thawk bawk. Ruahpui tinah gravel, lung leh leimin bal rawn thlentu 30° aṭanga 45° thleng tlang pang aṭangin tui an khawn khawm a, tlang pang chu tui a luh chuan a chim ṭhin: 2022-23-a leimin lian zirchian zinga ṭhena thum ṭhena hnih chu "tui luanna ṭha lo" ("improper drainage") avanga thleng nia sawi a ni (Directorate of Geology and Mineral Resources, chanchin tlangzarh angin), leh Roadmap to Stability (2014) chuan PHED chu "ruahtui leh tui bal chu tlang pang inhawng aṭanga khawm a, hla takah luan tir a, tlang pang nghet lo thei a tihhnawng loh tur hmunah paih" ("capture and transport rain and waste water away from exposed hillslopes and ejected at locations that will not saturate potentially unstable slopes") turin a ngen. Aizawl-a catchment (ruahtui luan khawmna hmun) pakhat chauhah sewer a awm avangin, drain-te hian khawpuite in chhunga tui bal (sullage) leh septic tank aṭanga tui an phur (Clause 8.9). Tlang ram kawng drain-te hi an chung lama ram drain an ni. Tin, drain-te hi neitu hrang hrang inṭhen an ni: Aizawl Municipal Corporation leh a Local Council-te, Lunglei Municipal Council, PWD, national-highway agency-te, PHED leh SIPMIU, EF&CC leh Land Revenue & Settlement Department, NEEPCO leh State power department, Village Council-te leh, chhim lamah, District Council-te zawng zawngin drain leh tui dawngtu an siam emaw an nei emaw a, notification (Gazette-a tarlan) reng rengin an inṭhen lo (Clause 6.9 Hrilhfiahna en rawh). Ruahtui tlak tihfel (Bung 2) hi chhanna chanve chauh a ni. A chanve dang chu pipe-in an phur theih loh tui chu building-ah tuilian thlen lovin phurtu, lei chung lam system pahnihna hi a ni. Chu chu he bung dual drainage concept, Kansas City Metro APWA Section 5600 (5601.8, Levels of Service) aṭanga lak, element tin-in 1% AEP tui luan chhuahna kawng an neih ngei ngei a phut kha a ni.

6.2 Thumal awmzia

Thumal	He Kaihhruaina Bu-a a awmzia
Tui luanna system tenau (minor system)	Table 6.1-a minor design AEP thleng ruahtui luang chu Clause 6.8 limit aia sang surcharge (tui khat luat a nek chhuahna) awm lova phurtu inlet, pipe, drain khuh leh drain khuh lo.
Tui luanna system lian (major system)	Tui luanna system tenau theihna aia tam tui chu 1% AEP (kum 100) ruahpui thleng phurtu lei chunga tui luan kawngte (kawngpui, overland flow path, channel khuh lo, floodway (tuilian luan kawng) leh khawlna).
Overland flow path	Public ram emaw easement (mi ram kal tlanga hman phalna) record-a dah chhunga, tui luanna system lian tui chu tui dawngtu waterway thlenga phurtu lei chunga kawng ruat.
Spread (T)	Gutter (kawng sir tui luanna) leh carriageway (motor kalna kawng)-a tui luang zau zawng, kerb hmai aṭanga teh.
Sag	Kawng emaw tui luan kawng chunga hmun hniam, inlet kal tlang emaw overflow level thlenga tui tlin chauhin tui a chhuahna. Trapped sag chuan lei chunga overflow kawng a nei lo.
Clogging factor	Inlet tihfai lai hydraulic theihna, bal avanga hloh nia ngaih zat (Clause 6.6.3).
Hydraulic grade line (HGL)	Conduit system-a tui chung lam level, emaw system chu pressure hnuaia a awm chuan piezometric level, inzawmtu ri.
Drain khuh (covered drain)	Drain pali kil, kawng sirah a tam ber, cast-in-situ emaw precast cover slab-in khuh, chung lam chu kekawng (footpath) a ni.
Sediment allowance	Drain emaw pipe design theihna chhut hunah leidipin a khat nia ngaih a thuk zawng emaw area (Clause 6.7.8).
Check event	Design AEP aia thleng tlem zawk AEP, chu ruahpuiah pawh tui luanna system tenau leh lian inzawm chuan Table 6.2 limit a zawm ngei ngei tur a ni.

Thumal	He Kaihhruaina Bu-a a awmzia
High-density area	Approving authority (phalna petu authority)-in Clause 6.4.4 hnuaia chutiang anga notify a area.
Class I area	Mi nuai 1 emaw aia tam awmna urban local body (CPHEEO awmzia sawi).

6.3 Dual drainage concept

6.3.1 Tui luanna system tin hi system pahnih ṭangkawp angin design tur a ni:

- (a) Table 6.1-a minor design flow chu lei hnuaiah emaw drain-ah phurtu, kawngpui hman theih tura vawngtu leh spread chu Table 6.2 chhunga dahtu **tui luanna system tenau**; leh
- (b) tui luanna system tenau theihna aia tam tui zawng zawng, 1% AEP (kum 100) tui luang thleng, building-a lut lovin leh Clause 6.5-a a thuk zawng leh hlauhawmna limit chhungin lei chungah phurtu **tui luanna system lian**.

6.3.2 **Element tinin 1% kawng an nei.** Inlet, sag, pipe, drain, culvert leh khawlna element tin hian tui dawngtu waterway, dil emaw outfall thlenga 1% AEP overland flow path hriat chian an nei tur a ni. Chu kawng chu drainage plan-ah (Clause 6.15) tarlan tur a ni.

6.3.3 **Tui luanna system lian design flow.** Hmun tinah tui luanna system lian hian chu hmuna 1% AEP tui luang zat sang ber, chu hmuna tui luanna system tenau theihna paihin, a phur tur a ni. He paihnaa tui luanna system tenau theihna hman chu Clause 6.6.3-a clogging factor hman hnua inlet theihna emaw pipe theihna emaw, a tlem zawk zawk a ni. Sag-ah leh building floor level ruatna hmun tinah, tui luanna system lian chu tui luanna system tenau **a tawp vek** (Clause 6.10.3) angin endik bawk tur a ni.

6.3.4 **Ruahtui tlak leh kalphung.** Design flow-ah Bung 2-a ruahtui tlak (Clause 2.8-a climate factor tiamin) leh Bung 3-a kalphungte hman tur a ni:

- (a) Rational Method chu catchment ≤ 16 ha leh conveyance element pakhat chauh tan; catchment zawng zawng 16 ha aia lian network-ah tui luang belh khawmna atan hman loh tur a ni;
- (b) network 16 ha aia lian leh khawlna, pump emaw tidal outfall (tuifinriat thlen theih loh, Mizoram-ah a awm lo) nei network tan hydraulic routing nei hydrograph (hun hrang hranga tui luang zat) kalphung (entirnan SWMM, hydraulic model nen HEC-HMS, emaw a tluk 1D/2D model);
- (c) time of concentration a tlem ber minute 10.

6.3.5 **Catchment inkar tui sawn loh.** Approving authority-in catchment pum zirchianna, chhiatna awm lo tih lantirtu, a lo pawm loh chuan tui luanna system tenau emaw lian emaw hian catchment pianphung pakhat aṭanga dang lamah tui a sawn tur a ni lo.

6.3.6 **Ek tui phurtu drain-te, leh tlang drain-te.** Aizawl-a sewer nei catchment pakhat pawn lamah, Mizoram-a site emaw public drainage project aṭanga ruahtui dawngtu public drain hian septic tank, soak pit leh connection hawng aṭangin ek tui leh in chhunga tui bal a phur ve tlangpui (Clause 8.9); tin, State-a khawpui deuhthaw zawng zawng awmna tlang pangah, drain-te hian leidip, gravel, lung, leimin bal leh bawlhhlawh an phur bawk a, an tui luang chhuak emaw zuang chhuak chuan tlang pang a tichhe ṭhin. He bung hi connection hmun thlenga ruahtui system leh public drain tin-ah, a hnuaia belhte nen (a zavaia he Kaihhruaina Bu-in a ruat) hman tur a ni.

Item (a) aṭanga (e) thleng hi drain dawngtu chuan ek tui emaw in chhunga tui bal ruah sur lohna hun tui luang (dry-weather flow) a phur apiangah, a neitu-in eng hmingin pawh koh se, hman tur a ni:

- (a) **Site chhunga inṭhen.** Ruahtui leh ek tui, in chhunga tui bal tiamin, chu site chhungah system hrang hranga khawn khawm tur a ni a, site ramri-ah mahni inspection chamber hnuhnung ber theuh nei turin, chutiang chuan public storm drain hran a siam hunah emaw area sewer-te hman ṭan a nih hunah, site-a hna thawh nawn ngai lovin ruahtui system chu public storm drain hran-ah zawm theih a nih nan. Authority-in drain dawngtu-ah connection pakhat chauh a phal chuan, system pahnih chu inspection chamber pahnih hnua chamber hnuhnung

berah chauh an inzawm tur a ni. Dan awm mekte hian he item tan kawng an nei a, mahse tui an inṭhen lo: site plan chuan "sewerage leh leilung chung drain, septic tank leh soak pit awmna leh a lian zawng" ("sewerage and surface drains, position and sizes of septic tank and soak pit") a lantir tur a ni (AMCBR reg. 5(5)(v)); "lei chung tui leh tui bal paih fel nan public drain hnai ber thlengin theihna tawk nei surface drain/closed conduit siam tur a ni" ("surface drain/closed conduit of adequate capacity to the nearest public drain shall be provided for proper disposal of surface and waste water") (AMCBR reg. 37(ii)); SD&SM reg. 27 chuan "lei chunga ruahtui luang, ek tui, in chhunga tui bal leh septic system aṭanga tui zuang thunun theihna" ("that provide for control of surface runoff, sewage, sullage and seepage from septic systems") drainage plan a phut kawp a, chu chu he item hian a ṭhen; leh municipality chuan "ruahtui leh lei hnuaia tui bawlhhlawh lo dang aṭanga hran takin drainage emaw ek tui leh thil bawlhhlawh dang tan ruahmanna hran siam" ("require separate provisions to be made for drainage or sewage and other offensive matters as distinct from rain-water and other unpolluted sub-soil water") turin a phut thei (Mizoram Municipalities Act, 2007, s.298). Chite sewage treatment plant (ek tui tihfaina plant) sewer nei catchment chhungah, site ek tui chu sewer-ah, a ruahtui chu storm drain-ah a kal a, an pahnih chu zawm loh tur a ni. Clause 6.13.7 hi site chhunga storm drain tin-ah a huam. Clause 4.11-a tlang dan (hill rule)-in infiltration (lei-a tui luh) a khap hmunah chuan in chhunga tui bal leh in chung emaw hmun lai (paved area) tui reng reng soak pit emaw infiltration device dang-ah luan tir loh tur a ni; he item hian AMCBR reg. 33-in water closet tin tan a phut septic tank "soak pit nen" ("with soak pit") chu a thlak lo, chu chu Clause 8.9 hnuaiah sawi a ni.

- (b) **Tui luang lut zat sang ber tihpun loh.** Bung 4 huam development chuan ek tui phurtu drain-a connection tinah, site outfall dang angin, Bung 4 chu a zawm tur a ni (Clause 4.5.1.3). Clause 1.5.2 threshold hnuaia development chuan development hma site tui luang lut zat sang ber aia sang a tihpun tur a ni lo: tui luh theih lohna hmun (impervious) a belh chuan, area belh in chung tui chu AMCBR reg. 33-in a phut tawh ruahtui khawl khawm (RWH) emaw ruahtui khawlna tank ("in zawng zawngah ruahtui khawl khawmna facility ṭha tak siam bawk tur a ni" ("A suitable rain water harvesting facility shall also be provided in all buildings")), Bung 4-a credit dan anga a lenzawng ruat, kal tlang tur a ni a, connection a thlen hmaa overflow thunun nen.
- (c) **Tailwater leh tui kir leh (backflow).** Clause 6.8-a HGL chu coincident event-a connection hmuna drain dawngtu tui level aṭangin ṭan tur a ni, neitu model a awm chuan chu aṭanga la, a awm loh chuan drain obvert emaw kam chhip (top of bank)-ah (Clause 5.6.2). Drain dawngtu chu lui, luipui emaw reservoir (tui khuah)-in a khar thei outfall-a a tawp chuan, Clause 5.10-a outfall khar endikna chu Clause 5.8.5-a khar (lock) nen a huam. Ek tui phurtu drain-a connection tin, storm emaw foul emaw, a rawngbawl drainage fitting emaw kawngka hniam ber chu connection hmuna drain dawngtu cover emaw kam level aia a hniam apiangah, non-return valve (tui kir leh dangtu valve) (Clause 6.8.8) bun tur a ni. Site hnuai lam chuan SD&SM reg. 27 hnuaiah "a bula site chung lam aṭanga drainage, ek tui emaw tui zuang" ("drainage, sewage or seepage from the adjacent site uphill") a phur chuan, site chung lam ruahtui chu a ruahtui system-ah, chu site ek tui leh in chhunga tui bal chu a foul system emaw closed conduit hran-ah a phur tur a ni a, channel pakhatah engtikah mah phur loh tur a ni.
- (d) **Theihna, velocity, luh theihna leh rimchhia.** Ek tui phurtu public drain chu a area sewer-te an zawm hma chu combined channel angin design tur a ni: Clause 6.3.3-a a storm theihna hman chu a ruah sur lohna hun tui luang, mi a rawngbawl zat aṭanga teh emaw chhut emaw, paih hnua theihna la awm a ni tur a ni; a ruah sur lohna hun tui luang-ah Clause 6.7.3(a)-a velocity tlem ber a thleng tur a ni, emaw a invert (tui luanna hniam ber)-ah chutiang thleng low-flow channel a nei tur a ni, ruahpui inkarah ek tui bal a thlah loh nan; a khuh chuan, Clause 6.13.2-a luhna kawngka a nei tur a ni, cover leh vent chu rimchhia in, kailawn leh kekawng a thlen loh nan dah; tin, chung kawngka aṭang chuan tumah a chhunga lut lovin machine-in tihfai theih a ni tur a ni. A storm theihna aia tam tui, emaw inlet-in an luh tir theih aia tam tui chu tui luanna system lian-in lei chungah a phur tur a ni (Clause 6.3.2 leh 6.9), tlang pang humhim loh chungah engtikah mah ni lovin, tin floor level chu drain surcharge angin Clause 6.11 hnuaiah ruat tur a ni.
- (e) **Outfall hmaa interception leh screen; Authority ruahman inṭhenna.** Ek tui phurtu public drain tin chuan CPCB-in a tarlan luipui tihbawlhhlawh chhung (polluted river stretches)-a lui, chung zingah Chite lui leh Tuikual lui (Priority II), Lawibual lui (Priority III) leh Tuipui (Priority V) (CPCB, 2025), dil, emaw tuikhur (spring) catchment chhunga a outfall hmaah ruah sur lohna hun tui luang interception leh screen a nei tur a ni, Clause 8.9 hnuaiah drain storm theihna tihtlem lo tura design; tin, chu tihfaina nei lovin storm drain thar reng reng dil-ah thlen tir loh tur a ni. Ek tui phurtu drain reng reng leh storm outfall reng reng chu tuikhur chungah emaw a chung hnaiah emaw, emaw a 15 m chhungah luan tir loh tur a ni (Bung 8-a tuikhur dan). Chutiang screen tin chuan drain-in an phur bawlhhlawh pawh a dang tur a ni, machine luh theihna leh a man khawlna hmun, lui, tlang pang emaw dil

kam ni lo nen. Master plan chuan "ruahtui chhunga in tui bal awm avanga bawlhhlawhna tihhniam nan outfall hmunah tihfaina hmanrua" ("treatment facilities at the outfall points to reduce the pollution from storm water which is found containing domestic effluents") a ngen tawh (Master Plan for Aizawl: Vision 2030, 8.3.4). Authority chuan a master plan (Bung 11)-ah public storm drain hran siam theihna area-te a tarlang tur a ni, chung zingah Chite plant catchment, a connection an siam zel angin; khawpui tinah, khaw hnuaia public drain tin chu sewer a awm hma chu ek tui phurtu angin ngaih tur a ni; tin, site ramri-ah public storm drain hran a awm chuan site ruahtui system chu chutah zawm tur a ni a, ek tui phurtu drain-ah zawm loh tur a ni. Tui Luan Tirna Design Report (Form 6-1) chuan drain dawngtu tin-in ek tui a phur em tih, chu thu hnar, leh item (a) aṭanga (e) thleng a zawm dan a sawi tur a ni.

Item (f) aṭanga (m) thleng hi tlang catchment aṭanga ruahtui luang dawngtu tui luanna system tenau leh lian element tin-ah hman tur a ni; he Kaihhruaina Bu-ah tlang catchment chu Belhchian 2A-a sub-area MZ-A, MZ-B, MZ-C leh MZ-D chhunga ram, phai (valley floor) sub-area MZ-A1, MZ-C1 leh MZ-D1 chhunga tlang pangte, lei pianphung tlang pang average-in 10% aia nasa catchment reng reng, leh tlang aṭanga lo luang chhuk lui emaw tui luanna pianphung dang tin, phai ram a kal tlanna hmun tiamin, a ni; Mizoram-ah chuan chu chu catchment deuhthaw zawng zawng a ni (NEER chhiar dan). Item (f) aṭanga (m) thleng zawng zawngah, SD&SM reg. 27-a drainage geometry chu conveyance layer tlem ber a ni a, he Kaihhruaina Bu hian regulation-in designer kutah a dah hydrology chu a belh:

- (f) **Debris rack leh trap.** Tlang ram sak loh (ramngaw, mau ram, ram hnim, lo neihna ram emaw thlai chinna tlang pang dang, tlang pang ruak, lei laih pang emaw lei vur pang, lung laihna (quarry) emaw a lei paih, emaw leimin hma) **1 ha emaw aia tam** aṭanga tui, emaw lui emaw tlang lui dang aṭanga tui, a catchment eng zat pawh ni se, dawngtu inlet, drain emaw pipe luhna leh culvert tin chuan a chung lamah debris rack (bal dangna) emaw debris trap (bal khawlna) a nei tur a ni, Bung 9 (Clause 9.8) hnuaia design, machine luh theihna leh a man khawlna hmun nghet nen, chu chu tlang pang, lui, dil kam emaw tuikhur catchment a ni tur a ni lo. Rack 50% a tawp pawhin, a humhim element chuan a design flow a luan tir thei tur a ni, tin overflow kawng chuan tui chu building emaw tlang pang humhim loh chungah a thawn tur a ni lo. Rack leh trap-te chu March ni 31-ah, April ruahpui hnu leh May ruahpui hmaa April ni 30-ah, leh fûr hun tawp hnuah November ni 15-ah tihfai tur a ni (Bung 10). Debris basin tui zat (volume) chu Bung 9-ah ruat tur a ni [TBC].
- (g) **Bulking factor.** Tlang catchment aṭanga tui dawngtu channel, drain, pipe, culvert leh kawng kal tlanna tin design flow chu Bung 3-a tui thianghlim tui luang zat sang ber, **1.25** bulking factor (leidip avanga tui pun factor)-a puntir a ni tur a ni, minor design flow, check event (endikna atana ruahpui) leh 1% AEP tui luang tan; hmun dangah factor chu 1.0 a ni. Factor hi theihna, freeboard (tui sang ber chunga zau dah) leh velocity-ah a huam; khawlna atana ruahtui luang tui zat (Bung 4)-ah a huam lo. Catchment leidip zirchianna-in factor lian zawk a pek chuan chu hman tur a ni. Clause 2.3.6(i) screening-in debris flow emaw leimin thleng thei nia a lantir catchment, emaw leimin hma, lei laih pang hnuaia bal kawng, lei vur emaw retaining wall, emaw quarry hmai emaw a lei paih aṭanga tui luanna catchment chu bulking factor hmanga design a ni lo: chu kawngah building, outfall, pumping station emaw khawlna reng reng dah loh tur a ni, tin drain-te chu bulked flow tan chauh design a ni [TBC].
- (h) **Tihtawp (blockage).** Clause 6.12.4-a tihtawp endikna chuan span emaw diameter **3.0 m** hnuai culvert leh pipe luhna tin tan inlet area 50% tawp angin, a lian zawk tan 20% tawp angin a ngai tur a ni, debris rack siam emaw siam loh emaw pawh ni se. Grate inlet-te chuan Table 6.5-a clogging factor an vawng a, grade chunga kerb opening-te chuan sag value 20% an la.
- (i) **Leidip leh velocity tlem ber.** Tlang catchment aṭanga tui dawngtu, emaw MZ-A1, MZ-C1 leh MZ-D1 phai leh lui kam zawl (river terrace) kal tlang drain leh pipe-te chuan minor design flow-ah Clause 6.7.3(a)-a tlem ber aiah velocity **1.0 m/s** tal an thleng tur a ni. Gradient-in a phal loh chuan, chung lamah sediment trap siam tur a ni a, Clause 6.7.8-a sediment allowance chu let hnih a ni tur a ni (Clause 6.7.4).
- (j) **Drain nasa, kawngpui nasa leh tlang panga outfall.** Drain gradient-in design flow-ah Clause 6.7.3(b) limit aia sang velocity, emaw Froude number 0.8 aia sang a pek chuan, drain chu lined chute, stepped emaw baffled channel emaw Bung 9 hnuaia item (g)-a bulked flow tana design drop structure series a ni tur a ni, tlang nasa channel tana Table 6.7-a freeboard nen, leh gradient phei zawka a inthlakna tinah leh outlet (luan chhuahna)-ah energy dissipator nen. **Tlang pang chunga emaw tlang pang zawh chhuk outfall tin**, public drain, kawng drain emaw site ta ni se, energy dissipator-ah a tawp tur a ni a, lined chute, stepped channel emaw closed pipe kal tlangin, SD&SM reg. 27-a "lei khawrh lo downdrain" ("non-erosive downdrains"), channel pianphung nghet a thleng tur a ni, tin tlang pang humhim loh, lei vur emaw retaining wall chungah a luan tir tur a ni lo. Lei pianphung 10° aia

nasa, Surma-group shale, siltstone emaw mudstone, emaw colluvium, lei vur emaw leimin bal chungah drain lined lo reng reng awm tur a ni lo, chutah chuan drain lined lo chu Clause 4.11-a tlang dan-in a phal loh infiltration kawng a ni si avangin. Kawngpui 5% aia nasaah grate chauh inlet hman loh tur a ni a, inlet-te chu Clause 6.6.4-a chhutna, gutter nasa bypass flow (inlet kal pelh tui) nen, hmangin dah tur a ni; kawngpui 10% aia nasaah, tui chu transverse grated channel emaw kerb inlet hmangin dan tur a ni, check leh 1% AEP event-ah kawngpui tui luang chu Table 6.3 limit chhunga a awm theih nan inkar dahin, tin 1% AEP tui luang chu chung limit chhunga vawn theih a nih loh chuan a tam zawk chu lined side channel emaw stepped drain-ah phur tur a ni a, kawngpui chu, notify a nih evacuation route (hlauhawm laia mipui sawn chhuahna kawng) a nih loh chuan, chu event-ah kal theih loh angin ngaih tur a ni. Tui luanna kailawn leh kekawng chuan lined side channel an nei tur a ni.

- (k) **Tlang kawngte chu tui luanna system tenau angin.** He clause-in a sawi ang tlang catchment-a kawng leh kawngpui tinah, chung zingah Aizawl kal tlang NH-6 Hunthar-ah, ruahpui tam berah a kal theih loh ṭhin nia sawi (2018 leh 2024, chanchin tlangzarh angin), kawng drainage chu kawng tan chauh ni lovin a chung lama ram tan pawh tui luanna system tenau a ni. Chutiang kawng leh kawngpui tin chuan, kawng neitu, PWD, national-highway agency, Aizawl Municipal Corporation, Lunglei Municipal Council, Village Council emaw District Council hnathawh angin, heng hi an nei tur a ni: (i) a chung lama ram chu kawng lam pana a luan apiangah lei laih pang tin chungah lined catch-water drain, channel pianphung emaw cross-drainage work-ah luang chhuak, lei laih pang chungah ni lovin; (ii) tlang lam sirah lined side drain (IRC:SP:42-2014, cl. 8.5.1); (iii) lui leh tlang lui tinah cross-drainage work, leh side drain reng reng chuan Table 6.1-a design AEP-ah item (g) leh (h) factor nen a theihna a khum loh nan inkar dahin culvert emaw scupper; (iv) phai lam sira scupper, culvert leh side drain outlet tinah, tui chu channel pianphung nghet emaw public drain thlenga phurtu lined chute, cascade emaw pipe, energy dissipator nen, chutiang chuan kawng ruahtui luang chu PWD, national-highway agency emaw kawng neitu dang reng rengin **tlang pang humhim loh**, lei vur, retaining wall emaw a hnuaia building ram chungah **engtikah mah luan tir loh** turin; (v) Clause 6.12.5-a size tal culvert, Clause 6.12 hnuaia design leh IRC:SP:42-2014 cl. 7.1.4-in kawng tan a phut aia tlem lo; IRC:SP:48-1998, Hill Road Manual drainage ruahmanna, he Kaihhruaina Bu tan chhiar a nih loh [TBC], chu he item aia a khauh zawk chuan, chung chu hman tur a ni; leh (vi) kawng siamna, tihzauna emaw enkawlna aṭanga, emaw a bula tlang laihna aṭanga lei bal (muck), lei paih emaw lei laih chhuah reng reng lui emaw tui luanna pianphung dang chhungah emaw a bulah emaw, emaw ruahpuiin chutah a phur lut thei tlang pangah dah loh, leh chutiang thilin a tihtawp tui luanna pianphung emaw lui tin chu March ni 31-ah tihfai. Item ang bawk hi tlang catchment-a railway formation drainage-ah, chung zingah Bairabi–Sairang line, a huam.
- (l) **Tlang pang site: SD&SM layer leh a hydrology dah loh.** Site-a a chung lama ram chu building, a lei laih pang emaw a retaining wall lam pana a luan apiangah, chu ram ruahtui luang chu an chungah lined diversion drain, a chung lama ram aṭanga Table 6.1-a minor design flow tana a lenzawng ruat, item (g) leh (h) factor nen, hmangin dan tur a ni a, building kal tlang lo emaw a bul hnai lo 1% AEP tui luan kawng nen. Building leh a chung lama lei laih pang emaw retaining wall inkar hmun chu tui building bulah a dinh lo nan emaw lei laih pang ke-ah a chiah lo nan paved emaw lined leh drain nei a ni tur a ni, tin an pahnih hian item (j)-in a phut ang angin public drain emaw channel pianphung nghet-ah an luan chhuak tur a ni, a hnuaia tlang pangah ni lovin. Tlang pang chelhtu retaining wall tin chuan weep hole emaw weep pipe leh subsurface drain, a ke-a lined drain-ah luang chhuak, a hnuaia tlang pangah emaw a hnuaia bang backfill-ah ni lovin, a nei tur a ni. Aizawl Municipal Corporation area-ah regulation-te chuan geometry tlem ber an ruat tawh a, he Kaihhruaina Bu hman a nihna hmun dangah chu geometry chu tlem ber hman tlak a ni: terrace "lei laih pang emaw lei vur pang zawng zawngah meter 10 aia hla lo inkarah" ("not more than 10 meter intervals on all cut or fill slopes"), "a zau zawng meter 2 tal" ("at least 2 meters in width"), tlang pang m 20 aṭanga 40 thleng sang-ah a laiah terrace 4 m zau nen; terrace swale "gradient tlem ber vertical 1, horizontal 20" ("a minimum gradient of 1 vertical to 20 horizontal"), "reinforced concrete thickness 75 mm aia tlem lo hmanga paved" ("paved with reinforced concrete not less than 75 mm in thickness"), 300 mm tal thuk leh paved area 0.7 m² tal, chu-ah "run pakhat … chuan down drain-ah luang chhuak lovin square meter 400 (horizontal-a teh) aia lian tributary area aṭanga ruahtui luang a khawn khawm tur a ni lo" ("A single run … shall not collect runoff from a tributary area exceeding 400 square meters (projected horizontally) without discharging into a down drain"); paved interceptor drain "lei laih pang zawng zawng chhip zawhin" ("along the top of all cut slopes"), a chung lam drainage kawng "horizontal-a teh meter 10 aia sei" ("greater than 10 meters measured horizontally") a nih chuan, 300 mm tal thuk leh paved zau zawng 800 mm, reinforced concrete emaw gunite, thickness "75m" (75 mm tia chhiar) anga chhut; building pad "approved

drainage facility lam panin gradient tlem ber vertical 1, horizontal 50" ("a minimum drainage gradient of 1 vertical to 50 horizontal toward approved drainage facilities") nen (lei vur leh lei laih leh lei vur hmai 3 m emaw a hnuai a nih chuan 1:100); "lei khawrh lo downdrain" ("non-erosive downdrains"); subsurface drainage "nghetna atana a ngai angin" ("as necessary for stability"); "site awm mek hnuai lama site siamte" ("Sites developed downhill of existing sites") chu "a bula site chung lam aṭanga, leh site siam mek aṭanga drainage, ek tui emaw tui zuang chu drainage kawng hnai ber thlengin him takin phur" ("convey drainage, sewage or seepage from the adjacent site uphill, as well as from the site being developed, in a safe manner to the nearest practicable drainage way") tur mawhphurhna; leh permit-in a siam enkawl tur neitu mawhphurhna (SD&SM reg. 27); lei vur ke chu "tui zau taka luan liam nan emaw paved drain atan emaw pang siam" ("sloped for sheet overflow or a paved drain") "energy dissipater (tui chakna tihnemna) nen" ("with energy dissipaters") siam (reg. 25), lei laih pang aṭanga setback (tui kam aṭanga hmun kalhlen tur) "interceptor drain ngai reng reng atan tihpun a ngai thei" ("may need to be increased for any required interceptor drains"), leh "leihnuai tui, tuikhur ang chi" ("subsurface water, such as springs") thunun (reg. 26). He Kaihhruaina Bu hian reg. 27-in licence nei civil engineer, a thiamnaah "hydrology leh hydraulic chhutna tiamin, drainage structure design" ("Design of drainage structures, including hydrology and hydraulic calculations") (Schedule I) a tel, kutah a dah chu a belh: site emaw a chung lam site tui phurtu terrace swale, interceptor drain, down-drain leh conduit tin chu a tributary area zawng zawng aṭanga Table 6.1-a minor design flow tan, Bung 2-a ruahtui tlak, item (g) leh (h) factor leh Table 6.7-a freeboard nen, a lenzawng ruat tur a ni a, building emaw tlang pang humhim loh chunga kal lo 1% AEP tui luan kawng nen endik tur a ni; reg. 27 cross-section a lian zawk chuan, chu chu hman tur a ni; reg. 27 zawm a design flow zawm lo cross-section chu tihlian tur a ni; tin reg. 27-a 400 m² hian run pakhat area a khaikhawm a, a theihna a khaikhawm lo. Site hook-te chu AMCBR reg. 26(2)(b), chu hnuaiah in chung tui chu "ruahtui gutter leh closed conduit hmangin … pipe-in lei chungah luan chhuah tir" ("by means of rain gutters and closed conduits … discharged at ground level by pipe") a ni a, "spout reng reng kawng emaw public area emaw a bula compound emaw building-ah luan tir phal a ni lo" ("no spout should be allowed to drain into the road or public area or within the adjacent compound or building"), chu chu he Kaihhruaina Bu hian site khawlna tank emaw lei chunga lined drain-a luan chhuah tir angin a chhiar a, tlang pang lei chungah engtikah mah ni lovin; leh AMCBR reg. 37, chu hnuaiah neitu chuan "vantlang himna avangin" ("in the interest of public safety") a vengte ruahtui leh tui bal a ram a kal tlang ngei a ngaih chuan a ram kal tlangin "closed conduit" ("a closed conduit") a phal tur a ni, leh "public drain hnai ber thlengin theihna tawk nei surface drain/closed conduit siam tur a ni" ("surface drain/closed conduit of adequate capacity to the nearest public drain shall be provided") (37(i) leh (ii)). Chutiang site-a in chung leh hmun lai (paved area) ruahtui luang chuan Clause 4.11-a tlang dan a zawm. Corporation area pawn lamah building emaw site-development regulation reng reng huam hmuh a ni lo: he item hian public works a huam a, pawl reng rengin he Kaihhruaina Bu hi a pawm chuan chu pawl chu a huam ang a, hmun danga chhungkua tan chuan kaihhruaina a ni (Bung 1).

- (m) **Quarry hmai, lei paih leh bawlhhlawh nei tui luang.** Khawpui drain, kawng emaw lui-a luang catchment-a quarry tin, hnathawh mek emaw hnathawh tawh loh, leh lei paih khawl tin chuan a hmai chungah lined cut-off drain, a chung lama ram aṭanga Table 6.1-a minor design flow tana item (g) leh (h) factor nen a lenzawng ruat, down-drain leh energy dissipator kal tlangin channel pianphung nghet-ah luang chhuak, a hmai chungah emaw lei paih chungah emaw ni lovin, a nei tur a ni; tui luanna system tenau emaw lian drain emaw tui luan kawng reng reng quarry hmai emaw lei paih khawl chungah, a kal tlangin emaw a hnuaiah emaw luan tir loh tur a ni; tin lei paih leh construction leh demolition bawlhhlawh reng reng ruahpuiin drain emaw lui-ah a phur lut theihna hmunah, emaw drainage course emaw riverine reserve chungah dah loh tur a ni (SD&SM reg. 29). Chite lui, Ser lui emaw CPCB list-a lui-a drain outfall tin, leh khaw hnuaia lui a luhna public drain emaw culvert tin chuan Bung 9 (Clause 9.8) hnuaia design solid-waste trap emaw screen a nei tur a ni, kut emaw machine-a tihfai theihna kawng leh a man khawlna hmun, lui, tlang pang emaw dil kam ni lo nen, item (f)-a ni-ah leh ruahpui nasa ni tin hnuah tihfai (Bung 10). Item (h)-a tihtawp hian trap siam emaw siam loh emaw pawh ni se bawlhhlawh a tel nia ngaih tur a ni, tin drain emaw channel awm mek theihna chu a chhunga leidip leh bawlhhlawh survey-a hmuh paih hnua theihna angin ngaih tur a ni (Clause 6.7.8). Lui-a trap, screen emaw check dam dah, chung zingah Aizawl-ah master plan-in a rawt check dam pariat, chuan outfall reng rengah a 1% AEP level a tihsan tur a ni lo (Clause 5.8.5(a) leh (b)) a, chhiat lova a chung tui luan kai theih tura design tur a ni. Trap hi tihfaina hna (treatment work) a ni lo: ruah sur lohna hun tui luang chu item (e) leh Clause 8.9 hnuaiah interception a ni.

Hrilhfiahna. CPHEEO (2019) manual chuan a glossary-ah major leh minor system awmzia a sawi a, mahse major system tan return period a pe lo. APWA 5600 (2006, 5601.8) chuan system hian 1% tui luang zat sang ber a phur tur a ni a, system chhunga theihna a tlem zawk chuan a la bang phur turin overflow system a phut. Clause 6.3.3 hian pipe theihna zawng zawng ni lovin, inlet theihna *tawp* (clogged) chauh a paih, a takah chuan inlet-in an luh tir aia tam tui pipe-in an la thei lo a ni si avangin. Sag-a tawp vek endikna hi a entirna hmasa chiang a awm lo; he Kaihhruaina Bu hian Aizawl tawnhriat, ruah nasa ber a sur laia kekawng hnuaia drain-te leidipin emaw bawlhhlawhin emaw a khat fo ṭhin avangin a ruat a ni (CPHEEO 2019 Part A, Ch 1 leh 2, drain-a bawlhhlawh paih chungchang Figure 1.2 leh 2.1). Catchment inkar tui sawn khapna hi DID Malaysia 2008 submission checklist, catchment inkar tui sawn khaptu, a zawm a ni. Clause 6.3.6 hi he Kaihhruaina Bu-in Mizoram tan a ruat a ni a, State drain-te hi kawng pahnihin an chhe ṭhin a, he bung criteria-te, ruahtui thianghlim lei phei chunga luang a ngaitu, chuan an hmu lo avangin, he clause hian ṭhen pahnih a nei. A hmasa chu ek tui a ni. "Sewerage system a awm loh avangin, mipuiin septic tank leh soak pit an hmang. Hmun tam takah ek tui chu tihfai lovin drain khuh lo-ah luan tir a ni a, a tawpah luipui-ah a luang lut" ("In absence of sewerage system, people are using septic tanks and soak pits. In most of the places sewage is discharged into open drains without any treatment, which ultimately gets discharged to rivers"), leh "in chhunga tui bal [chaw siamna leh inbualna tui bal] chu drain-ah luan tir a ni a, a tawpah tui thianghlim hnar a tibawlhhlawh" ("the sullage [i.e. kitchen and bathroom waste] is discharged into drains which ultimately pollutes the fresh water sources") (Master Plan for Aizawl: Vision 2030). State chuan ek tui 51.81 MLD, chu zinga 31.37 MLD khawpui ta, a chhut a, "Tihfaina hmanrua awm mek … 10 [MLD] Aizawl khawpui tan chauh" ("Existing Treatment Facilities … 10 [MLD] only for Aizawl city") a ni, Chite-a plant pakhat aṭangin, leh "tlang ram topography danglam avangin, Grey Water tihfai hi harsatna lian tak a la ni" ("Due to peculiar topography of the hilly regions, treatment of Grey Water remains a huge challenge") tih a hmu (O.A. 606/2018-a National Green Tribunal hnena State report, August ni 31, 2025 dinhmun); tin CPCB chuan Chite lui leh Tuikual lui chu Priority II-ah, BOD 29 leh 29.1 mg/L-ah a tarlang (CPCB, 2025). Storm drain-te hi sewer an ni. Regulation-te hian a phut lo chungin inṭhenna lam an pan tawh: site plan-in sewerage leh surface drain a lantir (AMCBR reg. 5(5)(v)), municipality-in foul tui leh ruahtui hran taka luan tir a phut thei (Municipalities Act s.298), leh SD&SM reg. 27 chuan "lei chunga ruahtui luang, ek tui, in chhunga tui bal leh septic system aṭanga tui zuang" ("surface runoff, sewage, sullage and seepage from septic systems") chu drainage plan pakhatah a dah, chu chu tlang pangah channel pakhat tihna a ni. Item (a) aṭanga (e) thleng hi he series phai ram edition-te combined-sewer dan an zawm a ni: site chuan a ruahtui chu a ramri thleng hran takin a vawng a, chutiang chuan khawpui chuan sewer a lo awm zel angin kawngpui khat hnu khatin a system a ṭhen thei a, ram tin-ah a kir leh ngai lo; development chuan ek tui phurtu drain tui luang zat sang ber a belh lo; non-return valve hian connection tin a veng, surcharge drain-a lo kir leh chu ek tui a ni si avangin; drain chu a nihna ang combined channel angin design a ni a, a theihna chu ruah sur lohna hun tui luang paih hnu angin la a, ruahpui inkarah ek tui bal a thlah loh nan low-flow channel nen; tin lui tihbawlhhlawh, dil emaw tuikhur catchment-a outfall chu interception leh screen a ni. Item (a) hian tlang pangah in chhunga tui bal leh in chung tui chu soak pit-ah a luh tir lo, Roadmap to Stability (2014) chuan "Aizawl City chhunga septic tank, leach field leh soak pit zawng zawng" ("all septic tanks, leach fields and soak pits within Aizawl City") paih bo turin a ngen a, AMCBR reg. 33 erawh chuan water closet tin tan septic tank "soak pit nen" ("with soak pit") a phut reng si avangin; he Kaihhruaina Bu hian chu inkalh chu a sawi a, a tifel lo (Clause 4.11 leh 8.9). Item (e) hian tuikhur-te a humhalh, "Mizoram hi tuikhur awmna a ni. Heng tuikhur-te hi mipuiin in chhunga mamawh atan an hmang nasa hle" ("Mizoram is an abode of springs. These springs are widely utilized by people for domestic needs") (CGWB) a ni si avangin, leh a 15 m hi AMCBR reg. 33-in soak pit leh "tui hnar" ("a water source") inkara a vawn tawh hla zawng a ni. Inṭhenna ngei hi site tin tan ni lovin Authority ruahman tur a ni.

A pahnihna chu tlangte an ni. Aizawl tlang pangte hi "300 aṭanga 450 thleng" ("300 to 450") (30° aṭanga 45° thleng, chhut ang ngeiin) an nasa a, a lei hi "a la naupang a, a nghet lo" ("is young and in a loose state") (master plan), leh Serchhip khawpui 89% vel hi 30° aia nasa a ni (MIRSAC; NEER chhutna); tlang chhipte hi Surma-group shale, siltstone leh sandstone an ni a, CGWB chuan "tui luh theihna leh infiltration hniam lutuk" ("very low permeability and infiltration") nei leh "ruahtui luang zone angin" ("as run off zone") thawk angin a sawi (CGWB, Lunglei booklet). Tlang pangte hi tui an chhunga a luh chuan an chim ṭhin: Corporation regulation ngei hian "tlang panga leihnuai tui lut zat tihpun, leh sewerage leh tui luanna chu thunun ṭha lova tlang pangah paih" ("increasing the amount of groundwater penetrating into slopes, and disposing of sewerage and drainage onto slopes in a

poorly controlled manner") chu "tlang pang nghet lohna a tipung nasa thei" ("can greatly increase slope instability") hnathawh zingah a tarlang (SD&SM, reg. 1); Directorate of Geology and Mineral Resources chuan 2022-23-a leimin lian a zirchian zinga ṭhena thum ṭhena hnih chu "tui luanna ṭha lo" ("improper drainage") avangin a ti (chanchin tlangzarh angin); May ni 11, 2013-a Laipuitlang lungpui tlak (paper pakhatah May ni 15) chuan chhiar dan pakhatin mi 17, a dangin mi 8 a thah (Science Vision; chanchin tlangzarh angin); South Hlimen-ah August ni 9, 1992-ah lung laihna (quarry) a chim a, Melthum leh Hlimen inkara quarry hnathawh tawh loh chu May ni 28, 2024-ah Cyclone Remal-ah a chim, chu ruahpuiah Aizawl district-a thi leh hliam chu May ni 29, 2024-ah mi 29 thi leh 7 hloh angin tarlan a ni (PTI, chanchin tlangzarh angin; chhiar dan dangte a inang lo, chung zingah quarry-ah mi 15 thi leh a hnuah Aizawl area pasarihah mi 34, chanchin tlangzarh angin); tin July ni 2, 2019-ah Durtlang-a BSUP in block sawmhnih zinga pathum a chim a, mi pathum a thi a, 2020-a rock bolt, wire net leh buttressed toe wall rawtnate zingah "rawtna pakhat mah hlen chhuah a ni lo" ("none of the suggestions were carried out") (CAG, 2025). Kawngte hi tui a khawm khawmna hmun an ni: Hunthar-a NH-6 hi ruahpui tam berah a kal theih loh ṭhin nia sawi a ni (chanchin tlangzarh angin), leh 2017-18 aṭanga 2021-22 thleng leimin hian kawng km 219 a tichhe (CAG, 2025). Zirchianna hunah bal, bulking emaw tihtawp tan Mizoram allowance reng reng hmuh a ni lo [TBC], leh bulking factor, debris rack emaw debris basin chungchang India kaihhruaina reng reng hmuh a ni lo [TBC], chuvangin item (f) aṭanga (m) thleng number tin hi he series tlang leh tlangsang edition-te interim value, chhan ang chiah nen, a ni. Debris rack tana 1 ha trigger hian tlang panga time of concentration minute tlem tê a ngaihtuah. Bulking factor 1.25 hi a tui zat panga ṭhena pakhat leidip anga phurtu tui luang tan factor a ni (bulking factor = 1 / (1 − leidip zat volume-a)), drain-in a phur theih a, tuilian anga a la awm theih zat sang ber deuh a ni; chu aia tam phurtu tui luang chu debris flow angin a awm a, drain reng rengin a tan a lenzawng ruat theih loh a ni, chuvangin item (g) hian building leh outfall-te chu a kawng aṭangin a hlat tir. Item (h)-a 3.0 m limit hian core-a 1.5 m chu a let hnih, lung, thing leh bawlhhlawh hian hnah chauhin a tihtawp loh kawngka an tihtawp avangin. Item (i)-a 1.0 m/s tlem ber hian CPHEEO 0.6 m/s, 0.09 mm sand tê phur tura innghat, chu a thlak, tlang drain-in gravel an phur si avangin. Item (f)-a fûr hun laia tihfai hi April ni 30-ah tih tur a ni, he series North-East edition dangte anga May ni 31 emaw May ni 15 ni lovin, State-a May thla ruahpui thihna thlen ni chiang hmasa ber chu May ni 11 a ni si avangin (Bung 10). IRC:SP:42-2014 (cl. 8.5.1) hian tlang kawngte chu hrang takin a ngai tawh a, lined side drain leh "phai ram aia inkar hnai zawkin" ("at closer intervals compared to those in plain areas") culvert nen, tin item (k) hian kawng ruahtui luang chu tlang pang humhim loh aṭangin a hlat tir, tlang panga tui luan tir hian a pore pressure a tisang si avangin (Clause 4.11). Item (j) hian tlang nasa, shale leh lei vur chungah drain lined lo a khap, chutah drain lined lo chu tlang dan-in a khap infiltration a ni si avangin. Item (l) hian SD&SM 2017 drainage dan, State tana dan dang hmuh zawng zawng aia drainage geometry kimchang zawka ruattu, chu conveyance layer tlem ber angin a la a, regulation-in licence nei civil engineer kutah a dah design ruahpui, theihna leh freeboard a belh; regulation-a swale run-a 400 m² limit hi geometry a ni a, hydraulic endikna a ni lo, tin chu zawmtu run pawh Bung 2-a darkar 1 ruahtui tlak zatin a khum thei. Item (m) hi Mizoram tan belh a ni, a leimin thihna tam ber pahnih chu quarry chim an ni a, master plan-in Aizawl W-I ṭhena thum ṭhena khat chu kawng sir drain-a bawlhhlawh avangin "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") tui a tlin tih a hmu bawk si avangin. He clause hian drain-a ek tui, bal, quarry leh bawlhhlawh a sawi a; lui concrete-a channelisation a phut lo, lui harsatna chu an chhunga tui leh bal luh tir a ni a, an ṭhetrual (roughness) a ni lo.

6.4 Design return period

6.4.1 Tui luanna system tenau, kawng leh kawng kal tlannate chu Table 6.1-a AEP-te tan design tur a ni. Element pakhatah ram hman dan row leh kawng class row pahnih a huam chuan, AEP **thleng tlem zawk** (return period sei zawk) chu hman tur a ni.

Table 6.1 — Conveyance tana design AEP (Clause 2.4 nen a inmil)

Element	Design AEP (return period)	Check event	Innghahna
Tui luanna system tenau: Aizawl leh Lunglei laipui leh high-density area dangte	10% (kum 10)	1% (kum 100) overland path	He Kaihhruaina Bu (Hrilhfiahna en rawh)
Tui luanna system tenau: Class I area dangte	20% (kum 5)	1% overland path	He Kaihhruaina Bu; CPHEEO Table 4.1
Tui luanna system tenau: area dangte	50% (kum 2)	1% overland path	He Kaihhruaina Bu; CPHEEO Table 4.1
Arterial kawng drainage leh kawng kal tlanna	Notify a nih evacuation emaw emergency route arterial tan 2% (kum 50); arterial dang tan 4% (kum 25)	AEP sang zawk dawt: 2% design tan 1%; 4% design tan 2%	He Kaihhruaina Bu (kum 25–50); ṭhen dan he Kaihhruaina Bu-in a ruat
Collector kawng drainage leh kawng kal tlanna	4% (kum 25)	2% (kum 50)	He Kaihhruaina Bu
Local kawng drainage leh kawng kal tlanna	10% (kum 10)	4% (kum 25)	He Kaihhruaina Bu
Kawng underpass (kawng hnuai kal tlang) leh public kawng chunga trapped sag dangte	2% (kum 50)	1% (kum 100)	He Kaihhruaina Bu (Clause 6.10.5)
Thlawhna tumhmun, railway station, power station leh critical infrastructure dangte	Class I area-ah 1% (kum 100); hmun dangah 2% (kum 50)	—	CPHEEO 2019 Table 4.1
Tui luanna system lian (overland), element tin	1% (kum 100)	—	He Kaihhruaina Bu
Building floor level	1% level + 0.5 m freeboard	—	He Kaihhruaina Bu (Clause 6.11)

6.4.2 **Check event.** Table 6.1-a check event-ah, tui luanna system tenau leh lian inzawm chuan check-event tui luang chu Table 6.2-a 1% AEP limit chhungin, building reng rengah tui lut lovin, a phur tur a ni. Clause 6.3.2-a 1% overland path phut hi check event bakah a huam bawk.

6.4.3 **Standard sang zawk.** Approving authority chuan element reng reng tan AEP thleng tlem zawk a hmang thei, CPHEEO Table 4.1 Note 2-a high-powered committee kawng hmangin pawh. Table 6.1 aia thleng fo zawk AEP a hmang tur a ni lo.

6.4.4 **High-density area.** Approving authority chuan 10% AEP minor-system standard huam high-density area-te chu map hmangin a notify tur a ni. A notify hma chu, 10% AEP standard hi heng hmunah hian a huam:

- (a) Aizawl-ah, thu hnarte-in lui tichhe thei, tui tlin emaw tlang pang chim avanga an tarlan hmunte: thlang lama lui "tichhe nasa ber" ("worst destructive") kama Chanmari, Khatla, Tuikual leh Vaivakawn, Chite sewage treatment plant awmna Bethlehem Vengthlang, leh Chite lui system kama Zemabawk, Laipuitlang hnuaia Ramhlun Venglai, Hunthar Veng leh a hmun lut zawlh, Bawngkawn–Durtlang kawng kama Durtlang leh Bawngkawn, leh khawpui chhim lam kama Melthum leh Hlimen (Master Plan for Aizawl: Vision 2030; CAG, 2025; chanchin tlangzarh angin), leh Aizawl W-I, master plan-in a area ṭhena thum ṭhena khat tui tling a hmuh; a ramri tin, leh in a khat em tih, Aizawl Municipal Corporation leh UD&PA-in finfiah tur [TBC]; leh Lunglei-ah, khawpui laipui hlui in khat tak, Lunglei Municipal Council-in tarlan tur [TBC];
- (b) municipal area leh notify a nih khawpui dang tinah, master plan hman tlak-in core area, khawpui hlui emaw central business district anga a tarlan area, leh tlang khawpui bazar lian ber; leh
- (c) Tier A body-a master plan-in zone tan base value aia sang floor space index a phalna area reng reng.

6.4.5 **Retrofit.** Drain awm mek chu Table 6.1 AEP thlenga tihlian theih a nih loh chuan, a tlachham chu chung lam khawlna (Bung 4), regional khawlna (Bung 7) emaw tui luanna system lian kawng tihṭhat hmangin siam that tur a ni. Approving authority chuan level of service la bang chu a record tur a ni.

> **Hrilhfiahna.** Table 6.1-a value-te hi Clause 2.4 tlangpui nen an inmil a, underpass leh critical infrastructure tan row an belh. Class I khawpui tan kum 5 leh hmun dang tan kum 2, CPHEEO (2019) ram pum advisory tlem ber aia an sang zawk (CPHEEO Part A, Table 4.1). Chu table Note 2 hian State committee-in value sang zawk hman a phal. High-density area tana kum 10 tier hi Gupta (IIT Bombay), "residential-high density tan kum 10-ah 1" ("1 in 10 year for residential-high density") rawttu, leh Malaysia MSMA 2, link house, apartment, sumdawnna leh industry ram tan kum 10 minor leh kum 100 major system hmangtu, a zawm a ni. Kawng value-te hian India code-te inkalhna a tifel. IRC:SP:50-2013 chuan khawpui kawng drain tan kum 1–2 a rawt. IRC:SP:42-2014 chuan khawpui kawng sir drain tan kum 25 leh return period sang zawk dawtah check flood a rawt. APWA 5600 (2006) chuan arterial tan kum 50, collector tan kum 25 leh residential kawngpui kal tlanna tan kum 10 a hmang. Table 6.1 hian APWA tier-te leh IRC:SP:42 check-flood concept a hmang. Arterial-te chu kum 50 evacuation route leh kum 25 dangah ṭhen hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Underpass tana kum 50 standard pawh he Kaihhruaina Bu-in a ruat bawk a ni, underpass hi trapped sag, motor kal mek kawng chunga tui thuk a chhiatna kawng a nih avangin. Clause 6.4.4-a high-density area default-te hi he Kaihhruaina Bu-in a ruat a ni a, approving authority-in map a notify hma chu a huam.

6.5 Kawngpui hydraulics: spread, a thuk zawng leh tui luan hlauhawmna

6.5.1 **Gutter tui luang.** Kerb-and-gutter cross-section kil thum chhunga tui luang chu modified Manning (Izzard) equation hmangin chhut tur a ni:

> Q = (Ku / n) · Sx^(5/3) · SL^(1/2) · T^(8/3)

heta Q chu gutter tui luang (m³/s), Ku = 0.376 (SI), n chu gutter Manning roughness (Table 6.6), Sx chu kawng kal tlang lam tlang pang (cross slope) (m/m), SL chu a sei zawng lam tlang pang (longitudinal slope) (m/m) leh T chu spread (m) a ni. Composite leh depressed gutter cross-section chu FHWA HEC-22 (4th edition, 2024) kalphungte hmangin zirchian tur a ni.

6.5.2 **Spread leh a thuk zawng limit.** Kawngpui tui luang chuan Table 6.2 limit a khum tur a ni lo.

Table 6.2 — Kawngpui tui luang limit

Kawng class	Minor design event (Table 6.1)	Check event leh 1% AEP event
Arterial	Spread chuan lam tin-ah through lane pakhat tal tui awm lovin a hawn tur a ni. Crown (kawng laili sang ber) kal tlangin tui a luang tur a ni lo.	Crown-ah a thuk zawng ≤ 150 mm leh a thuk berah ≤ 350 mm; Clause 6.5.3-a hlauhawmna limit
Collector	Spread T ≤ 3 m. Sag intersection-ah lo chuan crown kal tlangin tui a luang tur a ni lo.	A chunga ang khan
Local	Spread T ≤ 3 m. Tui chuan kerb a khum tur a ni lo.	A chunga ang khan
Class zawng zawng, intersection-ah	Sag intersection leh superelevation transition-ah crown kal tlang tui luang ≤ 0.03 m³/s; mid-block sag-ah a awm tur a ni lo.	A chunga ang khan

6.5.3 **Tui luan hlauhawmna limit.** Check event leh 1% AEP event-ah, kawngpui leh overland tui luang thuk zawng (D, m) leh velocity (V, m/s) puntir (product) chuan Table 6.3 limit a khum tur a ni lo.

Table 6.3 — Kawngpui leh overland flow path tana tui luan hlauhawmna limit

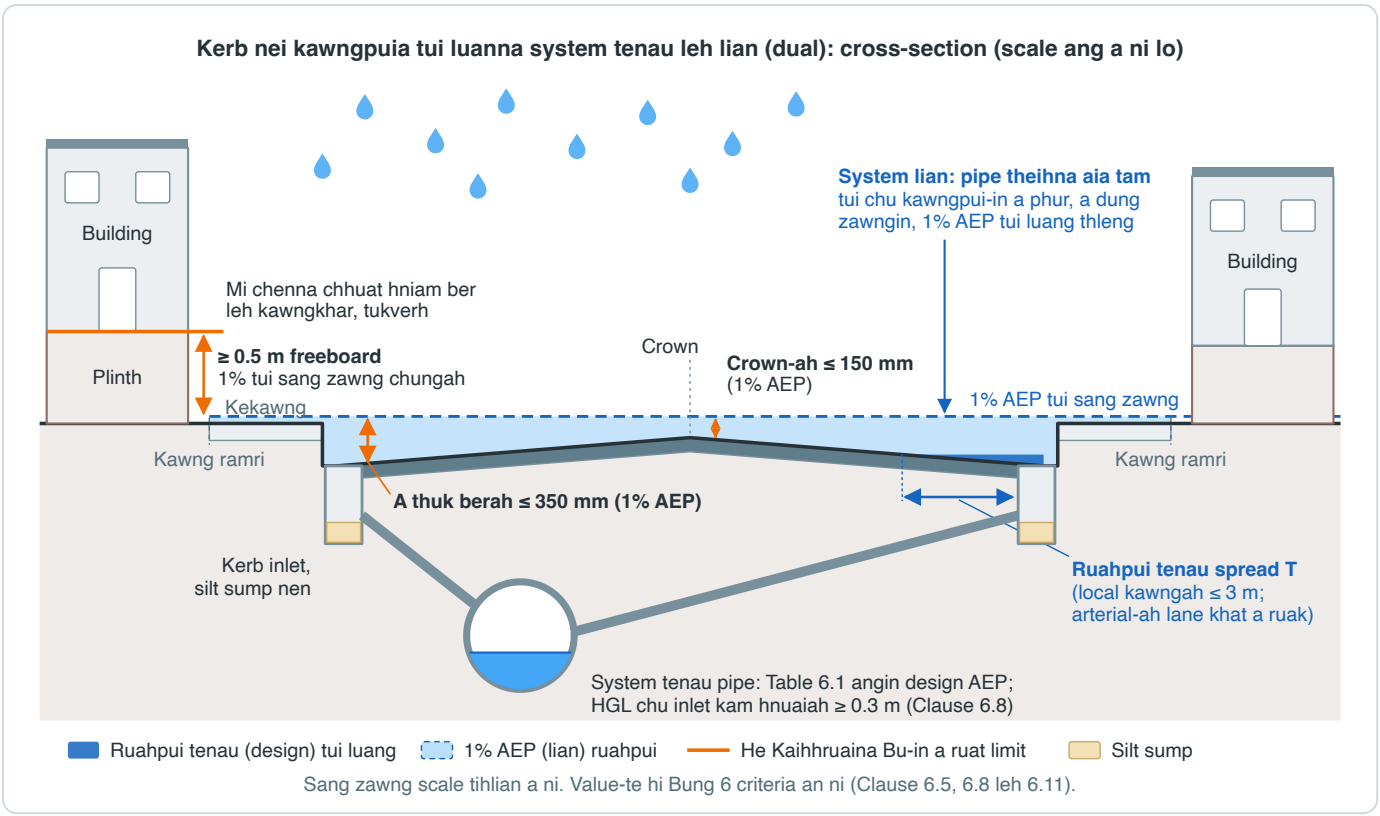
Hmun	Hlauhawmna class mamawh (Table 6.4)	Limit
Kawng zawng zawng carriageway	H2 emaw a ṭha zawk	D·V ≤ 0.6 m²/s; D ≤ 0.35 m (Table 6.2); V ≤ 2.0 m/s
Kekawng, mi kal tlanna (pedestrian crossing), school, damdawi in leh transit-stop hmai	H1	D·V ≤ 0.3 m²/s; D ≤ 0.3 m; V ≤ 2.0 m/s
Notify a nih evacuation leh emergency route	H1	D·V ≤ 0.3 m²/s; D ≤ 0.3 m; V ≤ 2.0 m/s
Public open space emaw easement chhunga overland flow path, kawng aṭanga hla	H3 emaw a ṭha zawk, vaukhanna chhinchhiahna nen	D·V ≤ 0.6 m²/s; D ≤ 1.2 m; V ≤ 2.0 m/s

Table 6.4 — Tuilian hlauhawmna class inzawm (entawn tur atana tarlan)

Class	Sawifiahna	D·V limit (m²/s)	A thuk zawng limit D (m)	Velocity limit V (m/s)
H1	Motor, mihring leh building tan a him tlangpui	≤ 0.3	0.3	2.0
H2	Motor tê tan a him lo	≤ 0.6	0.5	2.0
H3	Motor, naupang leh upa tan a him lo	≤ 0.6	1.2	2.0
H4	Motor leh mihring tan a him lo	≤ 1.0	2.0	2.0
H5	Motor leh mihring tan a him lo; building structure chhiat theihna a awm	≤ 4.0	4.0	4.0
H6	Motor leh mihring tan a him lo; building zawng zawng chim theihna a awm	> 4.0	—	—

Thu lakna: AIDR Guideline 7-3, *Technical flood risk management guideline: Flood hazard* (2014), Table 1 leh 2, Smith leh Wasko (2012) entawn.

6.5.4 Clause 6.5.3 tana a thuk zawng leh velocity chu cross-section awlsam tan gutter-flow chhutna aṭangin, emaw tui chu kerb-and-gutter cross-section a chhuahsan chuan 1D emaw 2D hydraulic model aṭangin lak tur a ni.



Milem 6.1 — Kerb nei kawngpuia tui luanna system tenau leh lian. He Kaihhruaina Bu tana milem siam thar, Kansas City Metro APWA, Section 5600 (2006, 5601.8) leh FHWA, HEC-22 Urban Drainage Design Manual (4th ed., 2024) aṭanga siam danglam.

Hrilhfiahna. Ku = 0.376 nei Manning equation Izzard form hi FHWA HEC-22 leh CPHEEO (2019) manual (Part A, Example 5.5, constant chu Kc = 0.376 tia ziahna) pahnihah hman a ni. Arterial spread dan (lane pakhat hawng) leh local leh collector kawngpui tana 3 m spread hi APWA 5600 (2006, 5604.2) limit, lam tin outside lane-ah kerb hnung aṭanga 12 ft (3.66 m), nen an hnai. Crown kal tlang tui luang limit 0.03 m³/s hi intersection sump leh superelevation transition-a APWA limit 1.0 cfs SI tluk a ni, mid-block sump-ah crown kal tlang tui luang awm lovin. A thuk zawng limit 150 mm leh 350 mm hi kawng kal tlannaa 1% overflow tana APWA 5600 limit (crown-ah 7 in, 180 mm vel; a thuk berah 14 in, 360 mm vel) nen an hnai. Mumbai criterion, 15 cm chunga tuilian awm lo tur (IRC:SP:50-2013, §6.4.1) hi crown value 150 mm tana local entirna hmasa a ni.

Table 6.4-a hlauhawmna class-te hi Australian Institute for Disaster Resilience-in a tlangzarh hlauhawmna curve inzawm (AIDR Guideline 7-3, 2014), Smith leh Wasko (2012) entawn, an ni. Carriageway-ah H2 emaw a ṭha zawk phut hian 1% a thuk zawng limit 350 mm (Table 6.2) chuan a thuk zawng a thunun tihna a ni a, D·V product chuan kawngpui nasa chunga tui luang chak leh thuk lo a thunun. H2 hi "motor tê tan a him lo" ("unsafe for small vehicles") tiin sawi a ni. Mizoram kawngpuiah two-wheeler hi motor tam ber an ni a, chuvangin 1% event hi notify a nih evacuation route, H1 zawm ngei ngei tur, bak kawng zawng zawngah kawng kal theih loh event angin ngaih ngei ngei tur a ni. Table 6.3-a hmun tin hlauhawmna class pek hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni.

6.6 Inlet

6.6.1 **Inlet chi.** Inlet-te chu kerb-opening inlet, grate inlet, combination inlet (kerb opening nei grate) emaw slotted leh trench drain an ni thei. Public kawngpuiah:

- (a) approving authority-in hmun bik tan grate chauh inlet a lo pawm loh chuan, kerb-opening emaw combination inlet hman tur a ni;
- (b) inlet kawngka chu kawng level-ah dah tur a ni, theih chinah gutter depression nen, kerb emaw kekawng sang avanga tui carriageway chungah a dinh loh nan;
- (c) carriageway, cycle lane leh kekawng-a grate-te chu cycle leh kea kal tan him pattern a ni tur a ni (Bung 9, Clause 9.11).

6.6.2 **Inlet theihna.** Grade chunga leh sag-a inlet tihfai lai theihna chu FHWA HEC-22 (4th edition, 2024) kalphungte hmangin, emaw grate leh kerb-opening geometry chiah tana manufacturer-in a tlangzarh test rating aṭangin chhut tur a ni. CPHEEO (2019) Part A §5.6.2-a empirical kerb-inlet equation-te chu cross-check atan chauh hman phal a ni.

6.6.3 **Clogging factor.** Inlet tin design theihna chu Table 6.5-a clogging factor hmanga tihtlem a tihfai lai theihna a ni tur a ni:

Table 6.5 — Inlet clogging factor (tihfai lai theihna hloh nia ngaih zat)

Inlet chi	Grade chungah	Sag-ah
Grate	50%	50%
Kerb opening	10%	20%
Combination	Grate leh kerb factor chu ṭhen tin-ah hran takin hmang	Grate leh kerb factor chu ṭhen tin-ah hran takin hmang

Design theihna = (1 − clogging factor) × tihfai lai theihna.

6.6.4 **Inlet inkar.** Inlet-te chu gutter run tin chhip aṭanga ṭan chhutna inzui hmangin dah tur a ni. Inlet tinah, a man tui luang chhut a ni a, bypass flow chu inlet dawt thleng gutter tui luang-ah belh a ni. Inkar chu minor design event-ah hmun tinah Table 6.2-a spread limit a zawm theih tur a ni tur a ni. Chu bakah:

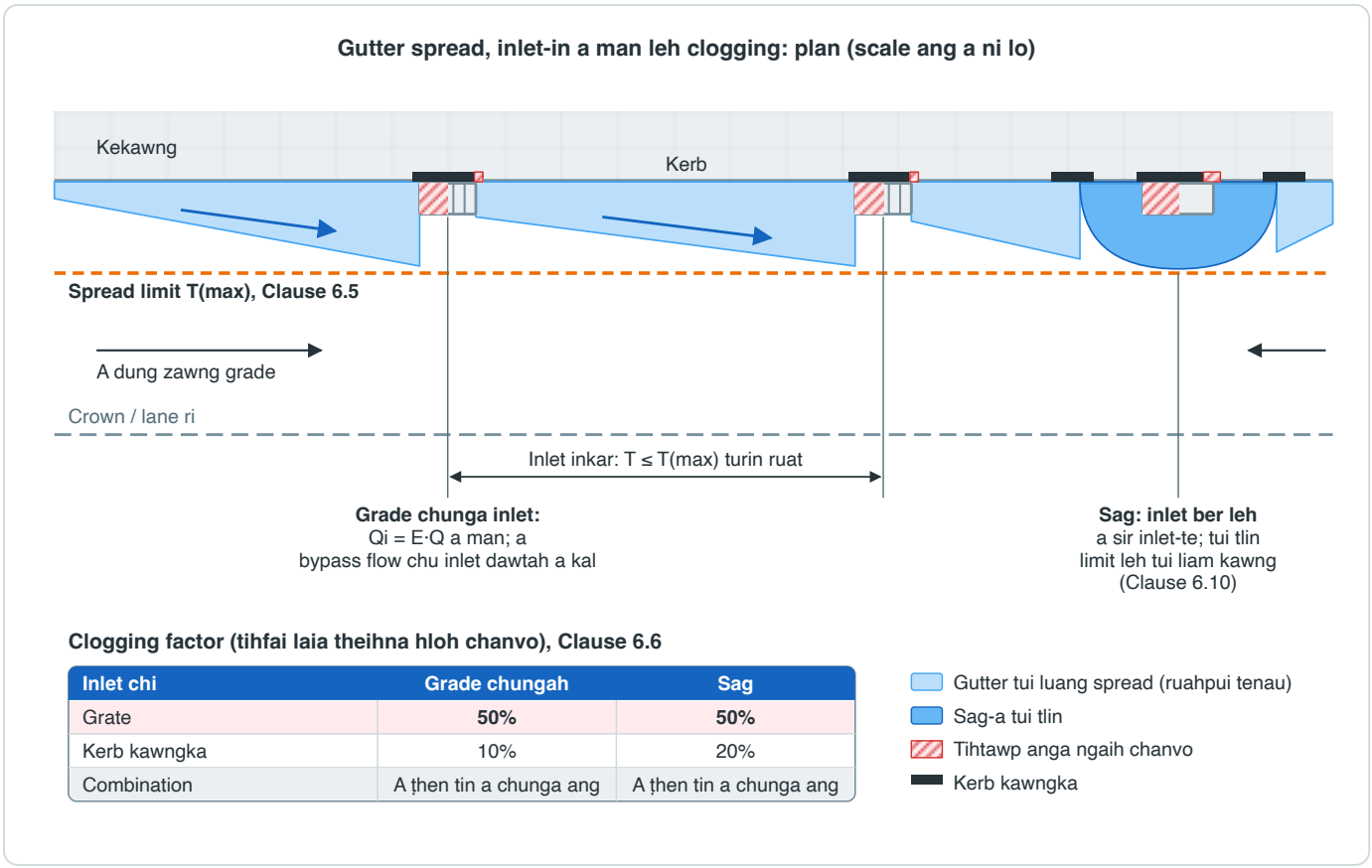
- (a) kerb nei kawngah inlet inkar chu, chhutnain eng pawh pe se, 30 m a khum tur a ni lo;
- (b) sag tinah, pedestrian crossing leh intersection chung lam hnai berah, bridge deck leh superelevation transition chung lamah, leh gutter run tin tawpah inlet siam tur a ni;
- (c) run pakhat inlet hnuhnung ber aṭanga bypass flow chu class sang zawk kawng emaw private ram-ah luan tir loh tur a ni.

6.6.5 **Sag inlet.** Kerb nei kawng chunga sag-ah:

- (a) sag inlet design theihna (clogging hnu) chu sag thleng minor design flow zawng zawng aia tlem a ni tur a ni lo;
- (b) tui tlin chu Table 6.2 limit pela a zau theihna kawng reng renga sag sir tinah, leh underpass tinah, flanking inlet dah tur a ni;
- (c) sag-a tui tlin chuan Clause 6.10 a zawm tur a ni.

6.6.6 **Inlet connection.** Inlet leh drain lian inzawmtu pipe chu diameter 300 mm tal a ni tur a ni a, inlet design flow-ah 0.9 m/s tal petu gradient-ah dah tur a ni.

6.6.7 **Silt sump.** Public kawng chunga inlet chamber tin chuan a outlet pipe invert hnuaiah 300 mm tal thuk silt sump (leidip dawnna khur), lei chung aṭanga tihfai theih, a nei tur a ni.



Milem 6.2 — Gutter spread, inlet-in a man leh clogging. He Kaihhruaina Bu tana milem siam thar, FHWA, HEC-22 Urban Drainage Design Manual (3rd ed., 2009; 4th ed., 2024) leh CPHEEO, Manual on Storm Water Drainage Systems (2019) aṭanga siam danglam.

Hrilhfiahna. Clogging factor-te hi APWA 5600 (2006, 5604.2) rating, sump inlet chu theoretical theihna 80% (20% tihtlem) anga a ngaihna aia an khauh zawk, Mizoram kawngpui grate-te hi plastic leh hnah-in an khuh fo ṭhin avangin. CPHEEO (2019) Part A chuan drain-a bawlhhlawh paih hi drain chhiatna chhan pui ber angin a lantir (Figure 1.2 leh 2.1). APWA 5600 (2006) chuan public kawngpuiah kerb-opening inlet chauh a phal; Clause 6.6.1(a) hi a khauh lo zawk, combination inlet hi kawng phei chungah a ṭangkai avangin. PWD, Aizawl Municipal Corporation emaw Lunglei Municipal Council-a standard inlet, kerb-channel emaw drain khuh detail reng reng zirchianna hunah hmuh a ni lo [TBC]; Corporation building regulation-te chuan plan-in "site development leh structure nghet, retaining wall, leilung chung drain ang chi" ("site development and permanent structures like retaining wall, surface drain") a lantir chauh an phut (AMCBR reg. 5(6)(viii)), leh a slope regulation chuan terrace swale leh interceptor drain cross-section a ruat a, inlet erawh a ruat lo (SD&SM reg. 27). Inkar sei ber 30 m leh Table 6.5-a combination inlet ngaihdan hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Tlabung, Bairabi, Sairang leh Champhai phai kawngte hi an phei a, chu chuan chhut inkar a titawi tawh; Aizawl, Lunglei leh tlang chhip khawpui dangte kawngpui nasa-ah gutter tui luang a chak a, inlet a kal pelh ṭhin, chu chu Clause 6.3.6(j)-in a sawi. Cap nghet hian inlet pakhat tawp avanga gutter run sei tak tui awm lo a awm a veng. 300 mm silt sump hi he Kaihhruaina Bu-in a ruat a ni. CPHEEO catch-basin detail-a 0.3 m sump lantir (CPHEEO 2019, Figure 5.9) nen a inmil.

6.7 Pipe leh drain khuh lo leh drain khuh

6.7.1 **Uniform flow.** Pipe leh drain theihna chu Manning equation hmangin chhut tur a ni:

> V = (1/n) · R^(2/3) · S^(1/2); Q = A · V

heta V chu velocity average (m/s), n chu Manning roughness (Table 6.6), R chu hydraulic radius (m), S chu friction slope (m/m), A chu tui luanna area (m²) leh Q chu tui luang zat (m³/s) a ni. Tailwater, junction emaw structure aṭanga backwater-in tui level a nghawng chuan, gradually varied flow (standard step) emaw hydraulic network model hman tur a ni a, Clause 6.8-a HGL phutte a huam.

6.7.2 **Manning roughness.** Design value n chu Table 6.6 aṭanga lak tur a ni. Concrete pipe leh masonry emaw concrete drain tan, design value chu leidip, biofilm leh a lo upat zel ngaihtuahin, tarlan "fair" emaw "rough" dinhmun value aia tlem a ni tur a ni lo.

Table 6.6 — Design tana Manning's n (CPHEEO 2019 aṭanga lak)

Hmanrua	Dinhmun	n (CPHEEO)	He Kaihhruaina Bu-a design n tlem ber
Cement concrete pipe (collar joint)	Ṭha / fair	0.013 / 0.015	0.015
Spun concrete pipe (RCC, PSC) S/S joint nen	Manufacturer design value	0.011	0.013
HDPE / uPVC pipe	—	0.010	0.011
Plastic (nal), asbestos cement	—	0.011	0.011
Concrete drain, steel trowel / thing trowel	—	0.014 / 0.015	0.015
Sand leh cement plaster	—	0.015	0.015
Brick masonry	Ṭha / rough	0.015 / 0.017	0.017
Masonry	Dinhmun ṭha lo	0.020	0.020
Lung cement-a phun (rubble set in cement)	—	0.017	0.017
Lei channel	Inang, ṭha / pangngai	0.020 / 0.025	0.025
Lei channel	Lung leh hlo nen / ṭha lo	0.030 / 0.035	0.035
Lei channel	Bal emaw hlo-in a then dang	0.050	0.050
Gutter: concrete	—	0.013	0.013
Gutter: hot-mix asphalt	—	0.015	0.015
Gutter: sprayed seal	—	0.018	0.018

CPHEEO column thu lakna: CPHEEO (2019) Part A, Table 5.1 (amah ngei pawh CPHEEO Manual on Sewerage and Sewage Treatment Systems, 2013 aṭanga lak) leh Table 5.8 (gutter).

6.7.3 **Velocity limit.** Minor design flow-ah:

- (a) velocity tlem ber (amah ngeia infai): drain khuh lo leh drain khuh-ah **0.6 m/s** leh pipe-ah **0.9 m/s**;
- (b) velocity sang ber: drain lined leh pipe-ah **3.0 m/s**, drain emaw pipe chu Bung 9 hnuaia chute anga design a nih loh chuan. CPHEEO chuan tlang ramah plastic emaw plastic-lined pipe-ah 6.0 m/s thleng a phal; hei hi approving authority remtihna nen Aizawl, Lunglei, Serchhip, Champhai, Kolasib, Siaha, Lawngtlai, Mamit, Khawzawl, Saitual, Hnahthial leh tlang khawpui dangah hman phal a ni;
- (c) channel lined lo leh hlo nei-a velocity sang ber: Bung 9, Table 9.2;
- (d) drain khuh lo leh drain khuh-a tui luang Froude number chuan design flow-ah 0.8 a khum tur a ni lo, drain chu Bung 9 hnuaia supercritical flow tana design a nih loh chuan.

6.7.4 **Gradient.** Pipe leh drain tin chu Clause 6.7.3(a) thleng theitu gradient-ah dah tur a ni. Ram phei emaw outfall level nghet avanga hei hi theih loh a nih chuan, designer chuan:

- (a) velocity a thlen chu a report tur a ni;
- (b) Clause 6.7.8-a sediment allowance chu a let hnih tur a ni; leh
- (c) Clause 6.13.2-a inkarah machine-a leidip laih chhuahna kawng a siam tur a ni.

6.7.5 **Pipe tui luan dinhmun.** Pipe-te chu minor design flow-in pipe khat theihna a khum loh nan a lenzawng ruat tur a ni. Pipe kual chuan a thuk zawng 0.95 vela a phur tui luang tam zawk chu innghahna atan hman loh tur a ni.

6.7.6 **Size tlem ber.**

- (a) Pipe: chhung lam diameter 300 mm; public main tan **450 mm**.
- (b) Drain khuh lo: a hnuai zau zawng (bed width) 0.3 m.
- (c) Public drain khuh (cover slab-a khuh drain): chhung lam zau zawng **0.6 m** leh chhung lam thuk zawng **0.6 m**.

6.7.7 **Pipe chunga lei khuh (cover).** Pipe-te chuan finished level thlengin 0.6 m tal cover an nei tur a ni a, carriageway hnuaiah chuan, motor rihna tana structural design thehluh a nih loh chuan, 0.9 m tal. Hun bik-a leihnuai tui sang ber chu pipe crown aṭanga 1 m chhunga a awm chuan, pipe chu a ruak lai angin flotation tan endik tur a ni (CPHEEO 2019, Table 11.2) a, a ngaih chuan anchor tur a ni.

6.7.8 **Sediment allowance.** Drain khuh lo, drain khuh leh diameter 600 mm emaw aia lian pipe-te design theihna chu invert-ah leidip thuk zawng hetiang hi telin chhut tur a ni:

- (a) drain khuh lo leh drain khuh: **75 mm** leh chhung lam thuk zawng **10%** zinga a lian zawk;
- (b) diameter 600 mm emaw aia lian pipe: chhung lam diameter **5%**;
- (c) 600 mm hnuai pipe: allowance a awm lo, mahse Clause 6.7.3(a) zawm tur a ni.

Cross-section tihtlem tana Manning n chu Table 6.6-a drain hmanrua n a ni tur a ni.

6.7.9 **Drain khuh lo leh drain khuh-a freeboard.** Minor design flow-ah, tui chung lam (sediment allowance nen chhut) chu drain bang chhip hnuaiah, emaw drain khuh-ah cover slab soffit hnuaiah, Table 6.7-a freeboard tal a hniam zawk tur a ni.

Table 6.7 — Drain khuh lo leh drain khuh-a freeboard tlem ber

Drain	Freeboard tlem ber	Hnar
Bed width 300 mm thleng	100 mm	CPHEEO 2019 Table 5.3 (IRC:SP:50-2013 aṭanga lak)
Bed width 300–900 mm	150 mm	CPHEEO 2019 Table 5.3
Bed width 900–1,500 mm	300 mm	CPHEEO 2019 Table 5.3
Drain zau zawk leh engineered channel, Q < 3 m³/s	450 mm	CPHEEO 2019 Table 5.12 (IS 7784 (Part 1): 1993 aṭanga lak)
Q 3 aṭanga < 30 m³/s	600 mm	A chunga ang khan
Q 30 aṭanga < 300 m³/s	900 mm	A chunga ang khan
Q 300 aṭanga < 3,000 m³/s	1,200 mm	A chunga ang khan
Q ≥ 3,000 m³/s	1,500 mm	A chunga ang khan
Kawng sir drain reng reng	150 mm aia tlem lo	IRC:SP:42-2014
Channel nasa (supercritical)	Tui luang thuk zawng nen a inang	CPHEEO 2019 §5.3.2

Kawng kawi-ah, freeboard chu kawi pawn lam tui level aṭangin teh tur a ni, superelevation Δy = V²T / (2 g rc) telin, heta T chu a chung lam zau zawng leh rc chu centreline radius a ni (CPHEEO 2019, Eq. 5.29).

6.7.10 **Kawi leh junction.**

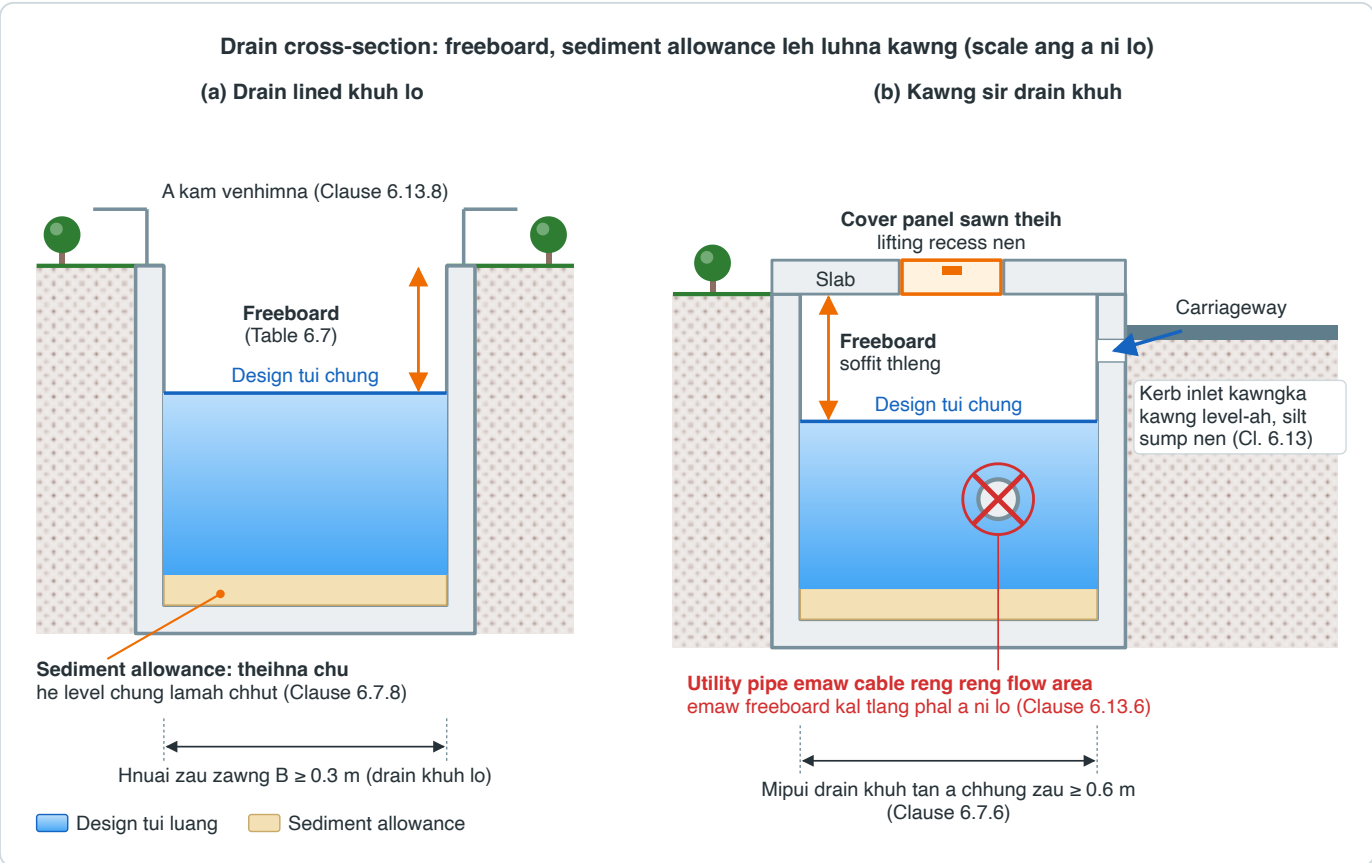
- (a) Drain kawi centreline radius chu drain zau zawng let 3 tal a ni tur a ni (CPHEEO 2019 §5.3.3). Engineered channel-ah chuan a chung lam zau zawng let 2 tal leh 30 m aia tlem lo a ni tur a ni (CPHEEO 2019 Table 5.11).
- (b) Drain-te an inhmuhna hmunah, drain chhuak zau zawng let hnih tal chhung lam zau zawng nei junction sump siam tur a ni. Drain lut chuan tui chhuak lam nen kil dik aia tlem in an lut tur a ni a, invert chhuak chu sump floor hnuaiah a awm tur a ni, sump-ah tui a dinh loh nan (CPHEEO 2019 §5.3.4).

6.7.11 **Pipe-a manhole leh access chamber.** Junction tinah, size, kawng emaw gradient inthlakna tinah leh pipe tin chhipah manhole siam tur a ni. Run dik-ah inkar chuan Table 6.8 a khum tur a ni lo.

Table 6.8 — Pipe run dik chunga manhole inkar sang ber

Pipe diameter	Inkar sang ber
300–600 mm	40 m
700–1,000 mm	100 m
1,050–1,400 mm	150 m
1,500 mm leh a chunglam	300 m

Thu lakna: CPHEEO 2019 Table 11.5. Manhole size, drop leh cover: Bung 9, Clause 9.12.



Milem 6.3 — Drain cross-section: freeboard, sediment allowance leh luhna kawng. He Kaihhruaina Bu tana milem siam thar, CPHEEO, Manual on Storm Water Drainage Systems (2019), Table 5.3 leh 5.12, leh IRC:SP:50-2013 aṭanga siam danglam.

Hrilhfiahna. Value n-te hi CPHEEO (2019) Table 5.1-a mi an ni. Design value tlem ber sang zawkte hi a entirna hmasa chiang a awm lo; CPHEEO chuan spun pipe tana value 0.011 chu "manufacturer pek ang anga lak theih" ("may be taken as given by the manufacturer") a tih avangin he Kaihhruaina Bu hian a ruat a ni. Chu chu pipe thianghlim value a ni a, Mizoram drain-te hian leidip leh bawlhhlawh tam tak an phur. Velocity tlem ber 0.6 m/s hi CPHEEO-a mi (Table 5.2) a ni, sand 0.09 mm phur tura innghat (§5.3.1). Pipe tana value 0.9 m/s hi a khauh zawk, leidip khat pipe chu drain khuh lo angin tihfai awlsam a nih loh avangin. Sang ber 3.0 m/s hi CPHEEO Table 5.2 (WPCF/ASCE 1982) aṭanga lak a ni. Froude limit 0.8 hi CPHEEO §5.3 aṭanga lak a ni, critical flow pumpelh turin a rawt, tui chung lam a nghet lo ṭhin avangin.

Drain khuh tana 0.6 m × 0.6 m tlem ber hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Drain khuh hei aia zim chu cover kawngka aṭangin kut emaw machine tê hmangin leidip laih chhuah theih a ni lo, tin drain leidip khat, luh theih loh hi Aizawl ruahpui hnuah hmuh fo a ni, khawpui "Aizawl Urban Area 67% hi kutcha drain a ni a, 18% hi tui luanna system reng reng a nei lo" ("67% of Aizawl Urban Area is having kutcha drains and 18% are without any drainage system at all") tihna, drain-te "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") tihna, leh bawlhhlawhin kawng sir drain a tihtawp avangin Aizawl W-I ṭhena thum ṭhena khat "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") tui tling a hmuhna (Master Plan for Aizawl: Vision 2030), leh 2022-23 leimin hnuah, leimin lian zirchian zinga ṭhena thum ṭhena hnih "tui luanna ṭha lo" ("improper drainage") avanga thleng nia sawi (Directorate of Geology and Mineral Resources, chanchin tlangzarh angin). Cover tlem ber 0.6 m hi CPHEEO (2019) pipe-design chhutna sheet entirna (Part A, Chapter 5)-a hman value a ni. Carriageway hnuaia cover 0.9 m hi he Kaihhruaina Bu-in a ruat a ni.

Sediment allowance value-te (drain tan 75 mm emaw 10%, pipe lian tan 5%) hi he Kaihhruaina Bu-in a ruat a ni. India standard reng rengin design tan sediment allowance a ruat lo. Aizawl tawnhriat chuan kum chhung tam zawk drain-te hi leidipin a chanve vel an khat a, chuvangin cross-section thianghlim tana theihna chhut chuan theihna tak aia a sang zawkin a sawi.

CPHEEO freeboard table (Table 5.3) chuan row hmasa ber chu "Beyond 300 mm bed width" tiin a chhut. Row pahnihna ("Beyond 300 mm & up to 900 mm") nen chhiar chuan, row hmasa chu "300 mm thleng" ("up to 300 mm") tihna a ni ngei ang; Table 6.7 hi chutiang chuan ziah a ni. CPHEEO manhole inkar table (Table 11.5) chuan range inchuhpawlh (700–1,050 mm leh 1,000–1,400 mm) a pe; Table 6.8 hian 1,050 mm chu 150 m class-ah dahin inchuhpawlh chu a paih.

6.8 Hydraulic grade line

6.8.1 **HGL zirchianna.** Pipe leh drain khuh network tin tan, designer chuan minor design event leh check event tan HGL chu outfall aṭanga ṭanin chung lam panin a chhut tur a ni. Zirchianna chuan friction loss leh junction, manhole, kawi, inlet, outlet leh gate-a loss-te a tel tir tur a ni.

6.8.2 **Tui level ṭanna.** Outfall-a ṭanna (tailwater) level chu heng zinga a sang zawk a ni tur a ni:

- (a) Bung 5-a tailwater level: tidal outfall (Mizoram-ah a awm lo)-a minor-system design tan mean high water springs (MHWS) leh sea-level allowance +0.3 m, leh outfall dangah coincident event tana drain dawngtu, luipui emaw dil (tank)-a level; leh
- (b) tui dawngtu a hniam zawk chuan, outlet pipe-ah critical depth leh pipe diameter aṭanga chhut level, (dc + D)/2.

6.8.3 **Minor-event limit.** Minor design event-ah, HGL chu inlet tin chhip leh manhole leh access chamber tin cover level aia **0.3 m tal a hniam** tur a ni.

6.8.4 **Check-event leh 1% limit.** Check event leh 1% AEP event-ah, HGL chu inlet chhip chungah a sang thei. Tui luanna system tenau chhuahsan tui chu tui luanna system lian-in Table 6.2 limit chhungin a phur tur a ni a, building reng rengah a lut tur a ni lo. Heng event-a lei chung thlenga surcharge thei manhole-te chuan bolt emaw lock nei cover an nei tur a ni (Bung 9, Clause 9.12).

6.8.5 **Structure loss.** Manhole leh junction-a loss-te chu FHWA HEC-22 (2009 emaw 2024 edition)-a energy-based access-hole kalphung, emaw phalna pek hydraulic model-a kalphung tluk hmangin chhut tur a ni. HEC-22 ạtanga coefficient nen loss-coefficient kalphung awlsam ($h = K V^2/2g$) chu 16 ha hnuai Tier B network tan hman phal a ni.

6.8.6 **Invert leh soffit level.** Manhole-ah pipe size a lian zel chuan, pipe lut leh chhuak soffit (crown) chu inmil tir tur a ni, emaw soffit chhuak chu hniam zawkin dah tur a ni. Invert chhuak chu invert lut hniam ber aia sang a ni tur a ni lo. Manhole chhunga vertical drop-te chuan Bung 9, Clause 9.12 an zawm tur a ni.

6.8.7 **Gate leh valve.** Flap gate leh non-return valve hawn lai head loss chu HGL-ah telh tur a ni (Bung 9, Clause 9.10).

6.8.8 **Private connection.** Public drain, a 1% HGL chu building drainage fitting hniam ber aia sang, a zawm building drainage chuan non-return valve a nei tur a ni.

> Hrilhfiahna. Minor-event HGL leh inlet chhip inkar 0.3 m hi he Kaihhruaina Bu-in a ruat a ni. Model-in a chhut tlem loss tan zau a dah a, system design-na event-ah inlet ạtanga tui a put chhuak lo turin a veng. Mizoram-ah khawpui drain tam zawk hi outfall hnuaia zalen taka luang lui-ah an tawp a, chuvangin free outfall hi a dik tlangpui, mahse outfall-a lui ngei 1% AEP level endik hnuah chauh, luite hi minute tlem tê chhungin an pung a, lung leh leimin bal an phur a, outlet hniam chungah an ding thei si avangin (Clause 5.8.5(a)). Phai drain-te hi ni engemaw zat chhung tui sang luipui-ah an tawp, Tlawng kama Sairang leh Bairabi-ah leh Khawthlangtuipui kama Tlabung-ah, a inte June 2017 leh July 2019-ah tui hnuaia pil nia sawi (chanchin tlangzarh angin); Tuirial dam hnuaia outfall-te chu release lui chhung-ah an tawp; tin Aizawl drain-te hian CPCB-in tihbawlhhlawh anga a tarlan luite-ah in chhunga tui bal an phur (CPCB, 2025). Khawpui chhunga lui emaw luipui chhung reng reng tuilian level, leh outfall reng reng design level zirchianna hunah hmuh a ni lo. Drain, chu endikna nei lova free outfall ạtanga HGL ṭan, emaw lui, luipui emaw reservoir level nei lova a sei zawng pakhat zelin chhut chu, chutiang chiahin a chhe ṭhin. Outfall ạtanga Bung 5-a tidal tailwater nena HGL chhut hian chung dik lohnate chu design stage-ah a lantir. MHWS leh 0.3 m ṭanna level hi CPHEEO (2019) Table 6.2 ạtanga lak a ni. Access-hole kalphung hi HEC-22-ah 2009 edition ạtangin sawi a ni.

6.9 Tui luanna system lian: overland flow path, easement leh drainage reserve

6.9.1 **Kawngpui chu tui luanna system lian pui ber angin.** Kawngpuite chu 1% AEP tui luanna system lian tui luang chu road reserve zawhin tui dawngtu waterway thlengin, Clause 6.10 hnuaia design sag-ah lo chuan, a tang lova a phur theih nan an sanzawng siam tur a ni.

6.9.2 **Kawngpui pawn lama overland flow path.** Tui luanna system lian kawng chuan road reserve a chhuahsan chuan, hetiang hi a ni tur a ni:

- (a) public ram, layout open space emaw layout phalna leh title-a record easement chhungah;
- (b) 1% AEP tui luang chung lam zau zawng leh sir tinah 0.5 m tal a zau a, 3.0 m aia tlem lovin;
- (c) building, compound wall (in hung bang), fence, lei vur, thil dah leh tui luang dangtu thing leh hnim chin awm lovin;
- (d) outlet nei lo sag awm lova, a chhuk zel tura siam; leh
- (e) Table 6.3-a hlauhawmna limit chhungah.

6.9.3 **Compound wall.** Map-a tarlan overland flow path kal tlangin compound wall emaw fence sak loh tur a ni. Bang chuan a kal tlang ngei ngei a ngaih chuan, 50% tihtawp nen 1% AEP tui luang a luan tir thei kawngka, he bung limit aia chung lam tui level tisang lo, a nei tur a ni.

6.9.4 **Drain khuh lo zawha luhna kawng.** Chung lam zau zawng 2 m emaw aia zau drain khuh lo chuan kam khatah 3.5 m tal zau enkawlna kawng (maintenance access strip) a nei tur a ni a, 500 m aia hla lo inkarah public kawng nen inzawm.

6.9.5 **Supply channel, surplus course leh dil.** Dil (tank) supply channel leh surplus course-te hi tui luanna system lian ṭhen an ni a, Bung 7 hnuaiah humhalh tur a ni.

6.9.6 **Drainage reserve.** Drainage reserve chu drain enkawl, tihzau leh tuilian kawng atana hman theih nan building awm lova vawn, drain tiamin, ram zawl tê a ni. Drainage reserve hi heng hmunah hian siam tur a ni:

- (a) layout emaw site siam mek emaw siam ṭhat mek kal tlang emaw a bul zawh, chhung lam zau zawng 1.0 m emaw aia zau public drain emaw channel tin zawhin;
- (b) pawm Basin Ruahtui Luanna Master Plan (Bung 11)-a tarlan drain emaw channel tin zawhin, chu plan-a drain lo awm tur zau zawngin; leh
- (c) public body-in a sak, chhung lam zau zawng 1.0 m emaw aia zau public drain thar tin zawhin.

6.9.7 **Zau zawng.** Reserve chu Table 6.9-a zau zawng, drain chhung lam zau zawng W aṭanga teh, aia tlem a ni tur a ni lo. Zau zawng hi drain size awm mek ni lovin, drain size **mamawh** (ruahman drain tan, master plan-a size) innghahna a ni. Clause 6.9.4-a access strip chu Table 6.9-a margin aia a zau zawk chuan, a zau zawk chu hman tur a ni.

Table 6.9 — Drainage reserve zau zawng tlem ber (PUB Singapore aṭanga lak)

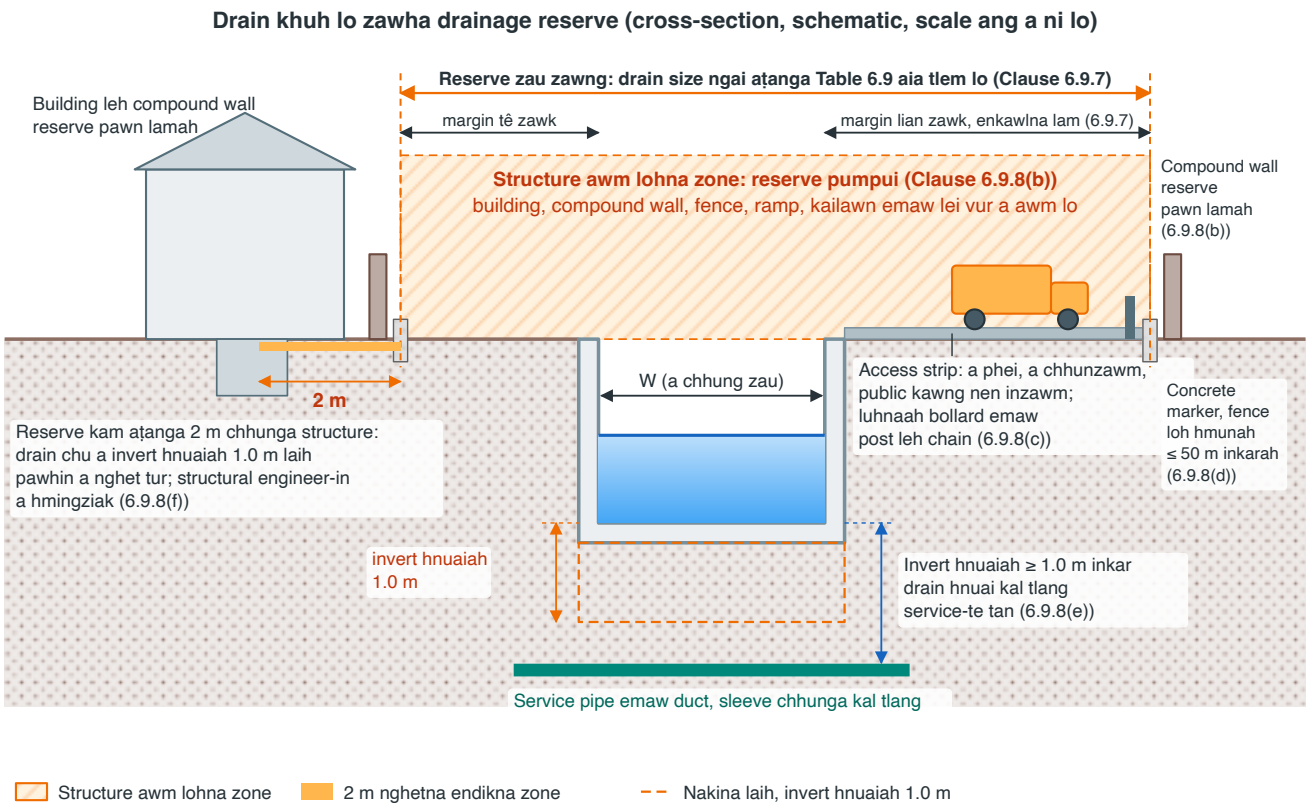
Drain chhung lam zau zawng, W	Drain khuh lo	Drain khuh (closed)
1.0 m aṭanga 1.2 m	3.0 m	W + 0.6 m
1.2 m aia zau aṭanga 3.0 m thleng	W + 2.6 m	W + 1.6 m
3.0 m aia zau aṭanga 4.5 m thleng	W + 3.5 m	W + 1.6 m
4.5 m aia zau aṭanga 6.0 m thleng	W + 4.5 m	W + 3.0 m
6.0 m aia zau aṭanga 9.0 m thleng	W + 6.0 m	W + 3.0 m
9.0 m aia zau aṭanga 25.0 m thleng	W + 7.5 m	W + 3.0 m
25.0 m aia zau	W + 12.0 m	W + 3.0 m

Drain khuh lo tan, margin ṭhen lian zawk chu enkawlna atana hman lam sirah a awm tur a ni.

6.9.8 **Hmanna leh humhalhna.**

- (a) Reserve chu layout emaw site plan-ah plot hran angin tarlan tur a ni a, kawng leh open space reservation ang bawkin Approving Authority (phalna petu Authority) hnenah a man nei lovin hlan tur a ni. Drain chu IWRD channel a nih chuan, reserve chu IWRD hnenah hlan a ni.
- (b) Reserve chhungah building, compound wall, fence, ramp, kailawn, lei vur emaw structure dang reng reng sak loh tur a ni. Compound wall leh ramri fence-te chu a pawnah an ding tur a ni.
- (c) Reserve chhunga access strip chu a phei leh a chhunzawm a ni tur a ni a, public kawng nen inzawm. Enkawlna motor bak motor dang luh loh nan a luhna-ah bollard emaw post leh chain hman phal a ni.
- (d) Reserve chu fence-a hung a nih loh chuan, a kam chu 50 m aia hla lo inkarah concrete marker-in chhinchhiah tur a ni.
- (e) Service-te chu drain hnuaiah, invert hnuaiah 1.0 m tal inkar nen, emaw phalna pek structure chungah kal tlang tur a ni. Service-te chu drain cross-section chhungah reserve zawhin kal loh tur a ni.

- (f) Reserve kam aṭanga 2 m chhunga structure chu drain chu a invert hnuai 1.0 m thlenga an laih hunah a nghet reng tura design tur a ni. Design chu structural engineer thiam nei-in a ziak hming tur a ni.
- (g) Reserve hi Approving Authority dan-in a phal chauhah site open space mamawhah chhiar a ni a; Bung 7-in a phut setback reng reng a tihtlem lo.



Milem 6.4 — Drain khuh lo zawha drainage reserve: Table 6.9 aṭanga reserve zau zawng, structure awm lohna zone, enkawlna lama access strip, invert hnuaia service inkar 1.0 m leh nghetna endikna zone 2 m (Clause 6.9.6 aṭanga 6.9.8 thleng). He Kaihhruaina Bu tana milem siam thar, PUB Singapore, Code of Practice on Surface Water Drainage (7th ed., with Addendum No. 3, 2025), clause 5.1, 5.3, 9.6 leh 9.7 leh Appendix 1 aṭanga siam danglam.

Hrilhfiahna. Drainage reserve-te hi Singapore, "drainage reserve zau zawng hi drain size mamawh innghahna a ni" ("the width of a drainage reserve is based on the required drain size") tihna leh reserve chu plot hran anga dah hran, "thil dangtu reng reng awm lova vawn" ("kept free of all encumbrances") a nihna, an zawm a ni (PUB Code of Practice on Surface Water Drainage, 7th ed. with Addendum No. 3, 2025, cl. 1.1). Table 6.9 hian PUB Appendix 1 zau zawngte a tarlang. Clause 6.9.8(b) aṭanga (f) thleng hian PUB clause 5.1 (drain emaw drainage reserve chhunga structure awm lo tur), 5.3 leh 5.3.1 (invert hnuai 1.0 m laih tana nghetna; reserve aṭanga 2 m chhunga engineer chhutna), 9.6 (a phei, a chhunzawm luhna kawng, bollard emaw post leh chain nen) leh 9.7 (50 m inkar sang berah marker) an zawm. Drain hnuaia kal tlang service tana inkar 1.0 m hi PUB development-plan kaihhruaina aṭanga lak a ni. Mizoram-ah, building leh compound wall-te hi drain kam thlengin an sa fo a, chuvangin machine-in tihzau emaw leidip laih chhuah theih a ni lo. Plot siam emaw siam ṭhat hunah ram dah hran hi a hum hun man tlawm ber a ni, a hnua tihzau chuan ram lakna a ngai si avangin. Zau zawng chu master-plan drain size (6.9.6(b))-ah innghah hian drain lo awm tur mamawh ram a humhalh. Mizoram-ah drain emaw lui zawha dan anga zau zawng ruat a awm lo, leh floodplain (tuilian luanna phai) zone eng ang mah a awm lo. Ri awm mekte hian an huamna hmunah chauh thu an nei a, tin pakhat theuh hian dinhmun mahni theuh an nei. Master Plan for Aizawl: Vision 2030 chuan "drainage channel lian zawng zawng zawhin, a sir lehlam zawngin metre 15 zau green buffer" ("all along the major drainage channels, a 15 meters wide green buffer on both sides") vawng turin a rawt, plan rawtna a ni a, a phalna notification hmuh a ni lo [TBC], 2023 amendment aṭang khan Corporation online permit system chuan "AMC Building Regulations, 2012 leh Master Plan for Aizawl, Vision-2030

dan ang ni lo" ("not as per the provisions of the AMC Building Regulations, 2012 and the Master Plan for Aizawl, Vision-2030") rawtna reng reng a hnawl kir ṭhin naa; channel engte nge "lian" ("major") tih sawifiah a ni lo. Plan hian Tlawng zawhin "Mizo District (Forest) Act, 1955, section 14 leh section 21 chhiar kawpin" ("as per the Mizo District (Forest) Act, 1955, section 14 read with section 21") "luipui laili aṭanga a sir tin-ah 800 m green belt" ("an 800 m green belt on either side from the centre of the river") a vawng bawk a, mahse chu innghahna 1965 notification, luipui 16 sir tin-a mile chanve chhunga ramngaw reserved forest a puangtu, chu Gauhati High Court-in January ni 27, 2021-ah a hlihsak; April 2021 notification chuan luipui laili aṭanga 800 m restricted zone, phalna hmasa nena hmasawnna hna nen, a ruat nia sawi a ni a, a thuziak chhiar a ni lo; State writ appeal chu November ni 9, 2022-ah withdrawn angin hnawl a ni; special leave petition thehluh a ni a, a rah hmuh a ni lo; tin Supreme Court chuan April 2024-ah riverine reserved forest-a hnathawhte chungchangah notice a chhuah (a zavaia chanchin tlangzarh angin). He Kaihhruaina Bu hian 800 m hi dan anga ri angin engtikah mah a ngai lo a, a hmang lo. SD&SM reg. 28 chuan "lui pianphung bula awm emaw a tel plot-te tan, riverine reserve vawn tur a ni" ("For plots adjacent to or including natural streams, the riverine reserve shall be maintained") a ti a, mahse dan hmuh reng rengin "riverine reserve" a sawifiah lo emaw zau zawng a pe lo (NEER chhiar dan), leh reg. 29 chuan lei laih chhuah chu "tui luan kawng emaw riverine reserve" ("drainage courses or riverine reserves") aṭangin a hlat tir. Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, chuan River Conservation Zone, chu chhungah State Authority phalna hmasa nei lovin sakna emaw "tui luan kawng emaw channel dal emaw her" ("obstruction or diversion of the water course or channel") reng reng tih theih loh, a ruahman; Protected River emaw River Conservation Zone reng reng notify a ni lo (NEER chhiar dan). AMCBR reg. 33 chuan septic tank leh soak pit chu "tui hnar aṭanga radius metre 15 chhung" ("a radius of 15 metres from a water source") aṭangin a hlat tir. Tlang pang ri-te chu 60° chunglamah site development permit pek loh (SD&SM reg. 14), Moderate, High emaw Very High leimin hlauhawm zone tinah leh plot map nei lo-ah 24° aṭanga engineered site development (SD&SM 2017), leh master plan "SL" zone, "tlang pang 36° aia chho hmun, drainage line lian bula hmun" ("areas with slope higher than 36°, areas adjacent to major drainage lines") tan an ni. Regulation pahnih zingah pakhatah mah lui aṭanga metric setback a lang lo (NEER chhiar dan). Municipality chhungah, public lui leh drain-te hi municipality-ah an innghat (Mizoram Municipalities Act, 2007, s.80(b) leh (d)), tin tumahin municipal drain, culvert emaw ruahtui channel chungah in an sa thei lo (s.300), mahse section pahnih hian zau zawng an pe lo. MPCB chuan National Green Tribunal hnenah "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area") a ti (O.A. 593/2017 leh O.A. 673/2018); chu chu Tlabung, Bairabi, Sairang emaw Champhai phai, an luipui aṭanga tui lian ṭhin, ah a dik lo (Clause 5.8.5(c) leh (d)), leh flood plain zoning dan reng reng, leh SD&SM reg. 6-in site plan-in a lantir tura a phut "Aizawl Municipal Corporation-in a ruat leh a hrilhfiah tuilian hlauhawm hmun" ("flood hazard areas as designated and defined by Aizawl Municipal Corporation") hmuh a ni lo (NEER chhiar dan). Heng zinga pakhatin mah lui emaw khawpui drain zawha reserve zau zawng a pe lo. He Kaihhruaina Bu tan, a rawtna ngei angin, dan awmzia angin ni lovin, channel kam chu a kam chhip (top of bank) a ni a, lui laih thuk, a kam chu 10° aia nasa tlang pang a nih chuan, chu kam pang chhip (crest of the bank slope); dil emaw reservoir kam chu Bung 7-in a sawifiah ang a ni; tin lui leh tui luanna pianphung dang 8 ha emaw aia tam tui luang khawm tin chu Clause 7.4.1(b) hnuaia channel pianphung a ni, tu pawhin enkawl se, lined, pipe emaw khuh emaw ni se ni lo se (a zavaia he Kaihhruaina Bu-in a ruat). Chuvangin he Kaihhruaina Bu hian reserve hi zau zawng a pe, a rawtna ngei angin, dan anga zau zawng angin ni lovin: hydraulic corridor (lui leh drain kama humhalh tur ram zau), Table 6.9-a reserve, Clause 6.3.6(g)-a bulking factor nena design flow phur tura drain size mamawh innghahna (Clause 6.9.7), access bank-a Clause 6.9.4-a access strip, leh, 8 ha emaw aia tam tui luang khawm channel pianphung tin zawhin leh he Kaihhruaina Bu huam dil tin vel-ah, Clause 7.4-a setback-te, kam chhip aṭanga 15 m aia tlem lo Zone 1, emaw 10° aia nasa lui laih thuk kam pang chhip aṭanga, leh 1% AEP zau zawng leh 10 m thleng Zone 2, phai leh Tlabung-ah a pawimawh, ri a zau zawk zawk hman; master plan, River Conservation Zone notify a lo nih chuan, wetland notify a nih emaw court-in ri zau zawk a ruat chuan, chu ri chu a thu a neih chhung hman tur a ni, tin a zau ber chu hman tur a ni (Clause 7.4.5). Corridor hi dan, hla zawng reng ruat lo, aia a khauh zawk a, master plan 15 m chu channel lian aṭangin 8 ha lui tin thlengin a tizau. He Kaihhruaina Bu hnuaia phalna pek hmasawnna hna thar leh siam ṭhatnaah a huam a, building awm mekah a huam lo, leh Clause 7.4.7 hian a hnuaia variance a phal lo. Ram record leh ram hman dan hi Corporation area chhungah pawh Land Revenue & Settlement Department-ah a awm (CAG, 2025), ram tam tak hi private emaw land pass hmanga chelh a ni, leh Village Council-te chuan municipality pawn lamah in hmun an sem (Mizoram (Village Councils) Act,

2025), chuvangin Zone 1 ram leh reserve ram private emaw land pass hmanga chelh chu **master plan-ah dah hran emaw chelhtu nena inremna hmangin humhim** a ni a, layout phalna leh ram record-ah record, lak lovin; chutianga humhim a nih chuan, Clause 6.9.8(a)-a hlanna chu title hlanna ni lovin chu inremna record hmangin siam a ni; tin Lai, Mara emaw Chakma Autonomous District Council area-ah chuan District Council kal tlangin chauh humhim theih a ni [TBC] (he Kaihhruaina Bu-in a ruat). Corridor hi master plan leh zonal leh ward plan-ah, an regulation-te May ni 17, 2023-a Mizoram sawrkar hnena thawn leh September 2023 thlenga phalna pek a nih loh (CAG, 2025), tarlan a ṭha a, NOC thar siam ai chuan, OBPAS-ah leh site development permit-ah endik a ṭha, chutah plan-te chuan "lui pianphung, riverine reserve emaw flood hazard area" ("natural streams, riverine reserves or flood hazard areas") leh, engineered development tan, "drain reng reng-in a enkawl area drainage area leh a ruahtui luang ngaihtuah zat lantirna map" ("A map showing the drainage area and the estimated runoff of the area served by any drains") an lantir tawh tur a ni (SD&SM reg. 6).

Reserve hi a pawimawh, Mizoram khawpui drain-te hi neitu hrang hrang inṭhen an nih a, notification reng rengin an inṭhen loh avangin (NEER chhiar dan). Dan angin, "public drain zawng zawng, leh public kawngpui chhungah, a bulah emaw a hnuaiah emaw drain zawng zawng, Municipal Fund aṭanga siam emaw siam lo emaw" ("All public drains, and all drains in, alongside, or under any public street, whether made out of Municipal Fund or otherwise") chu municipality-ah an innghat (s.289(1)), chu chuan "municipal area chhungah emaw a pawnah emaw drainage emaw sewerage system leh outfall him leh tawk a siam leh a enkawl tur a ni" ("shall provide and maintain a system of drainage or sewerage as well as a safe and sufficient outfall in or outside the municipal area") (s.288), leh drain zawng zawng, "private emaw public emaw ni se, Board of Councillors survey leh thununna hnuaiah a awm tur a ni" ("whether private or public, shall be under the survey and control of the Board of Councillors"), chu chuan a tihfai tur a ni (ss.290–291). Mahse "Roads & Bridges, Water supply … leh Fire Services hi hlan a ni lo" ("Roads & Bridges, Water supply … and Fire Services were not devolved") Aizawl Municipal Corporation hnenah (CAG, 2025), chuvangin State kawng drain-te hi a takah PWD-in a sa a, a enkawl (NEER chhiar dan), tin drain ang bawk chu dan angin Corporation-ah a innghat. Roadmap to Stability (2014) chuan Corporation hian "AMC ram chhunga hmasawnna hna zawng zawng (Kawng, Tui luanna, lung laihna etc.) thunun thuneihna a nei tur a ni" ("should have controlling authority for all developmental activities (Roads, Drainage, quarries etc.) within AMC area") leh "drainage system design leh sak, enkawl leh siam that emaw tihṭhat turin Public Health Engineering Department chhungah" ("within the Public Health Engineering Department to design and build, monitor and repair or improve drainage systems") office siam turin a rawt; chung zinga engemaw tih a ni em tih hmuh a ni lo [TBC]. Khawpui reng reng drain inventory hmuh a ni lo [TBC], leh master plan-a drain rawt map (Map 8.3) chu he Kaihhruaina Bu tan lak chhuah a ni lo [TBC]. He Kaihhruaina Bu tan, leh State-in chutiang dan a chhuah hma chu [TBC], drain-te chu hetiang hian pek a ni: Corporation area chhunga public drain leh public kawngpui zawha drain-te chu **Aizawl Municipal Corporation**-ah (ss.80(d), 288, 289(1) leh 290–291), a **Local Council**-te nen; State kawng leh highway-te kawng sir drain, catch-water drain, scupper leh culvert-te chu **PWD**-ah, Corporation dan anga innghatna nena a inchuhpawlh chu hetah sawi a ni a, tihfel a ni lo, chuvangin an pahnih hi register-ah record a ni a, an pahnihin connection an remti (Clause 5.8.5(g)); national highway-te, chung zingah NH-6, ta chu **national-highway agency**-te hnenah; lui pianphung leh riverine reserve-te chu **EF&CC** leh **Land Revenue & Settlement Department**-ah (NEER chhiar dan); luipui chunga tuilian venna leh tui lak siam hna tenau (minor irrigation) hnate chu **IWRD**-ah (NEER chhiar dan); sewer leh Chite sewage treatment plant chu **PHED** leh **SIPMIU**-ah, s.289(3)-in a phal angin (Clause 8.9); Tuirial dam, a reservoir leh a release lui chhung chu **NEEPCO**-ah, leh Serlui B dam chu **State power department**-ah (NEER chhiar dan); Lunglei-ah, municipal drain-te chu Municipalities Act hnuaiah **Lunglei Municipal Council**-ah (Council regulation reng reng hmuh a ni lo [TBC]); municipality pawn lama khaw drain-te chu **Village Council**-ah, a hna pek theihte zingah "tihfaina leh tui luanna" ("Sanitation and drainages") a tel (Mizoram (Village Councils) Act, 2025, s.15(1)(q)); leh Lai, Mara emaw Chakma Autonomous District Council area-ah chuan **District Council** leh a Village Council-te hnenah [TBC] (he Kaihhruaina Bu-in a ruat). Khawpui tin chuan **drain register**, drain chhung tin neitu he pekna anga a ni, lui emaw luipui a thlen, leimin hlauhawm map-a a class, ek tui a phur em, a chunga flap gate awm leh gate chelhtu pawl, leh a outfall tarlanna, a vawng tur a ni (he Kaihhruaina Bu-in a ruat). Clause 6.9.8(a) hnuaiah, IWRD hnena pek channel zawha reserve chu IWRD hnenah hlan emaw humhim a ni. Channel dinhmun an inhnial chuan, corridor chuan channel a zui a, a hming a zui lo: Aizawl luite hi lui pianphung, storm drain leh ek tui phurtu an ni kawp a, an zinga pahnih chu CPCB list-ah an awm (Clause 8.9). State-a khawpui reng reng tan design return period nei drainage master plan phalna pek hmuh a ni

lo. A bula ram la bang tawk tura a lenzawng ruat drain chu tihlian theih a ni lo, chuvangin reserve hi size mamawh innghahna a ni. Basin Ruahtui Luanna Master Plan pawm a nih hma chu (Clause 6.9.6(b)), Clause 6.9.7-a drain size mamawh chu he bung hnuaia designer-in a chhut size a ni. He Kaihhruaina Bu hian cross-section lined emaw lined lo a ruat lo, Clause 6.3.6(j) leh Bung 9-in tlang nasa, shale leh lei vur chungah lining a phutna hmunah lo chuan. Cross-section chuan Clause 6.7.3 leh Bung 9-a velocity limit a zawm turin a phut a, cross-section lined lo emaw hlo nei, phal a nih chuan, tan tawk zau reserve chu duh thlan pahnih hawng reng tura vawngtu reserve a ni.

Hrilhfiahna. Phut 6.9.2(b)–(e), 6.9.3 leh 6.9.4 hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Plot mal tin vela compound wall hi Mizoram-ah a awm deuh vek a, overland flow path tihtawpna kawng hmuh tam ber zinga pakhat a ni. Bang kawngka tana tihtawp 50% ngaihdan hi Clause 6.6.3-a grate clogging factor nen inmil turin ruat a ni. Access zau zawng 3.5 m hi he Kaihhruaina Bu-in a ruat a ni, excavator tê emaw leidip laih chhuahna motor tan lenzawng siam. Khaikhin nan, APWA 5600 (2006, 5608.4) chuan detention facility (ruahtui dah rihna, a luan chhuah zat tihhniam nan) tan 15 ft (4.6 m vel) maintenance access strip a phut.

6.10 Sag leh hmun hniam-a tui tlin

6.10.1 **Minor event.** Sag tinah, minor design flow chu inlet (clogging hnu)-in a la chhuak tur a ni a, tui tlin spread chu Table 6.2 chhungah.

6.10.2 **1% AEP event.** Sag tinah:

- (a) tui tlin thuk zawng chu carriageway thuk berah 350 mm a khum tur a ni lo;
- (b) lei chunga overflow kawng siam tur a ni (entirnan kerb leh kekawng tihhniam kal tlangin overland flow path ruat-ah), chutiang chuan tui tlin level chu overflow level chungah a sang thei lo; leh
- (c) sag vela building floor level-te chuan Clause 6.11 an zawm tur a ni.

6.10.3 **Tawp vek endikna.** Sag-ah, 1% AEP tui tlin level chu tui luanna system tenau a tawp vek a, tui zawng zawng lei chunga overflow kawngin a chhuak angin chhut bawk tur a ni. Sag vela floor level-te chu tui tlin level pahnih zinga a sang zawk aṭangin ruat tur a ni.

6.10.4 **Trapped sag.** Sag-in lei chunga overflow kawng a neih loh chuan, inlet leh conduit (clogging hnu)-in 1% AEP tui luang a phur tur a ni a, approving authority-in chu ruahmanna chu a remti tur a ni.

6.10.5 **Kawng underpass.** Public kawng chunga underpass leh trapped sag dangte chu:

- (a) 2% AEP (kum 50) tui luang tana design, 1% AEP tui luang-a endik, tui luanna system tenau (gravity drainage theih loh hmunah Bung 9, Clause 9.9 hnuaia pump nen) hmangin tui luan chhuah tir tur a ni;
- (b) hmun hniam ber a thlen hmaa tui man turin a luhna lam pahnihah flanking inlet a nei tur a ni;
- (c) theih chinah luhna crest tihsan hmangin a vela kawngpui aṭanga tui luh lut lakah humhim tur a ni; leh
- (d) carriageway-ah 150 mm thuk-a thawk depth marker leh automatic vaukhanna emaw kal tawp tirna signal a nei tur a ni.

Hrilhfiahna. Tawp vek endikna, trapped-sag dan leh underpass phutte hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. State-a kawng underpass tui lian record reng reng zirchianna hunah hmuh a ni lo [TBC]. Kawngte hi tui luanna system lian angin an thawk tawh a, tlang ramah chuan a ṭhen nasa ber angin: Aizawl-a Hunthar-a NH-6 hi ruahpui tam berah a kal theih loh ṭhin nia sawi a ni, a lei laih pangte June 2018-ah a nghet lo nia sawi a ni a, Cyclone Remal-ah May ni 28, 2024-ah a chim leh (a zavaia chanchin tlangzarh angin; chanchinbu-in NH-6 leh NH-54 hlui number chu an inthlak pawlh ṭhin); May ni 24, 2025 aṭanga June ni 3, 2025 thleng ruahpui

> chuan kawng kal theih lohna 257 a thlen (DM&R chhiar dan, chanchin tlangzarh angin); leh 2017-18 aṭanga 2021-22 thleng leimin chuan kawng km 219 a tichhe (CAG, 2025). Clause 6.10.5(d) hian Table 6.2-a crown thuk zawng limit 150 mm chu motor kal a tawp tur hun nen a zawm.

6.11 Building floor level

6.11.1 Floor awmna hniam ber, leh building-a tui luh theihna kawngka tin (kawngka, ventilator, basement ramp, lift pit leh service luhna) chu **1% AEP tuilian level chungah 0.5 m tal** a sang tur a ni.

6.11.2 1% AEP tuilian level chu heng zinga a sang ber a ni:

- (a) building bula kawngpui emaw overland flow path-a 1% AEP tui luanna system lian tui level (Clause 6.9 leh 6.10, sag-a tawp vek endikna tiamin);
- (b) luipui, channel, dil emaw tui awmna reng reng 1% AEP tuilian level (Bung 7); leh
- (c) Bung 5-a tailwater nena 1% AEP level; leh
- (d) Approving Authority-in Clause 7.3.4 hnuaiah 1% AEP tuilian thuk zawng map a pawm tawh chuan, plot-a lei level leh map-a 1% AEP thuk zawng.

6.11.3 **Level chhut a nih loh hmuna default.** Bung 1 threshold hnuaia plot tan, emaw plot tan 1% AEP level chhut a nih loh hmunah, floor awmna hniam ber leh kawngka-te chu heng zinga a sang zawk tal a ni tur a ni:

- (a) **plot hmai kawng crown level sang ber chungah 0.65 m**; leh
- (b) 1% AEP tuilian thuk zawng map pawm tawh-in plot a huam chuan, **lei level leh map-a 1% AEP thuk zawng leh 0.5 m**.

Approving Authority chuan regional map, State-in a phalna pek map emaw model-a chhut 1% AEP tuilian thuk zawng ram pum map tlangzarh (entirnan India Flood Atlas) ang chi, local zirchianna-in a thlak hma chu a pawm thei. Storm surge (tuifinriat tui chho, Mizoram-ah a awm lo) model lo map chu Clause 6.11.6 aiah hman loh tur a ni.

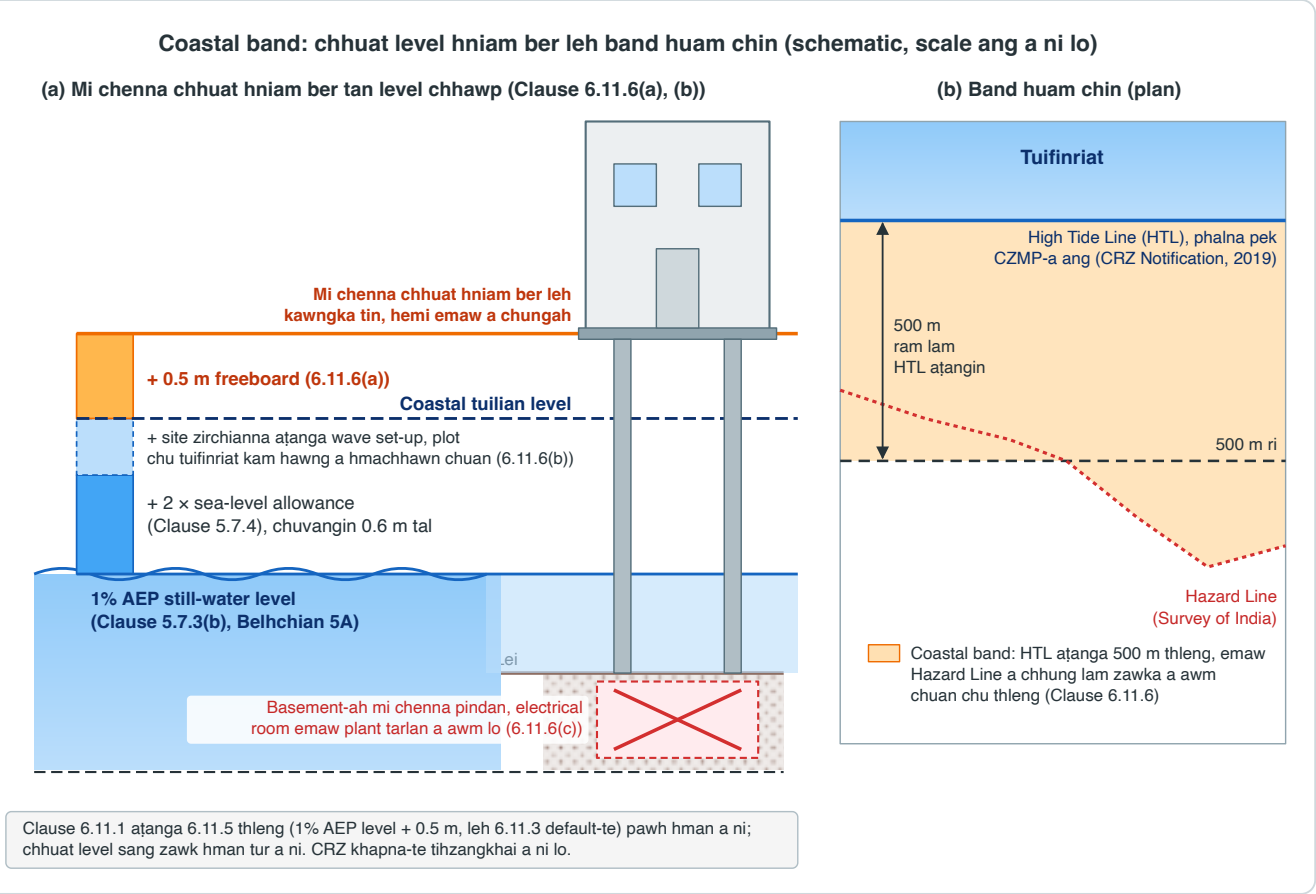
6.11.4 **Basement.** Basement ramp tin crest leh basement kawngka tin sill chuan Clause 6.11.1 a zawm tur a ni. Basement tui chu non-return valve kal tlangin surface drain-ah pump-a chawi chhuah tur a ni.

6.11.5 **Service.** Building rawngbawltu electrical panel, transformer, standby generator, lift machinery leh pump-te chuan Clause 6.11.1 an zawm tur a ni.

6.11.6 **Coastal band.** Coastal band (tuifinriat kam ram, Mizoram-ah a awm lo) chu tuifinriat kama High Tide Line aṭanga ram lam panna **500 m** chhunga ram, CRZ Notification, 2019-in a sawifiah angin, High Tide Line chu phalna pek Coastal Zone Management Plan-a ri ruat angin, a ni. Survey of India Hazard Line chu 500 m aia ram lam zawka a awm chuan, band chu Hazard Line thlengin a zau. Coastal band chhungah, Clause 6.11.1 aṭanga 6.11.5 thleng bakah:

- (a) floor awmna hniam ber leh kawngka tin chu **coastal flood level chungah 0.5 m tal** a sang bawk tur a ni, chu chu 1% AEP still-water level (Clause 5.7.3(b), Belhchian 5A) leh Clause 5.7.4-a sea-level allowance **let hnih** (chuvangin 0.6 m tal) a ni, building-te hi kum 50 aia rei design life an neih avangin (Clause 5.7.4(c));
- (b) plot chu tuifinriat kam hawng hmaa a awm chuan, coastal flood level chuan site zirchianna aṭanga wave set-up a tel tir tur a ni;
- (c) awmna pindan, electrical service pindan emaw Clause 6.11.5-a tarlan plant reng reng basement-ah dah loh tur a ni; leh
- (d) basement kawngka, ramp crest leh ventilation kawngka tin chuan Clause 6.11.6(a) an zawm tur a ni.

Clause 6.11.6 hian CRZ Notification-in a khap sakna reng reng a phal lo. Pahnih an huam chuan, a khauh zawk chu hman tur a ni.



Milem 6.5 — Coastal band: 1% AEP still-water level, sea-level allowance let hnih, plot chu tuifinriat kam hawng hmaa a awm chuan wave set-up leh 0.5 m freeboard aṭanga floor level tlem ber siam; leh band zau zawng, High Tide Line aṭanga 500 m thleng emaw Hazard Line chu ram lam zawka a awm chuan chu thleng (Clause 6.11.6). He Kaihhruaina Bu tana milem siam thar, CRZ Notification, 2019 (para 1(i) leh Annexure IV) leh PUB Singapore, Code of Practice on Surface Water Drainage (7th ed.), cl. 2.1.1 aṭanga siam danglam.

Hrilhfiahna. 1% AEP level chunga 0.5 m freeboard hi DID Malaysia 2008 checklist (platform leh floor hniam ber chu kum 100 ARI + 0.5 m-ah) a zawm a ni. APWA 5600 (2006, 5601.8 A2)-in 1% stage chungah 1 ft (0.3 m vel) a phut aia a tam zawk. Clause 6.11.3-a default 0.65 m hi he bung limit dangte aṭanga lak a ni a, hrang taka thu hnar a nei lo: crown-a 1% tui level chu 150 mm thleng a ni thei (Table 6.2), leh 0.5 m freeboard. A entirna hmasa chiang a awm lo a, tuilian level awm lohna plot-ah a huam. URDPFI (2015) pawhin a flood-plain zoning-ah plinth level tlem ber chu tuilian thlen fo dan nen a zawm, chu chu Bung 7-ah sawi a ni.

Clause 6.11.3(b) hian local zirchianna awm lohna hmunah plot tê chuan kawng level chauh aṭanga ring mai ai chuan map-a 1% AEP thuk zawng a hmang thei. Model-a chhut ram pum map-te hi an chiang tawk lo a (30 m vel), tin a tam zawk chuan ruahtui leh luipui tuilian an model a, storm surge erawh an model lo, chuvangin 6.11.3 hian kawng-crown endikna a vawng a, Clause 6.11.6 hian coastal dan hran a siam.

Clause 6.11.6-a coastal band hian CRZ Notification, 2019 (G.S.R. 37(E), para 1(i): "High Tide Line aṭanga … ram lam panah meter 500 thleng ram" ("the land area from High Tide Line ... to 500 meters on the landward side")) 500 m ri a hmang, coastal authority tin-in an map tawh a, survey thar a ngai lo si avangin. Hazard Line, Survey of India-in tuilian leh tuifinriat kam inthlak zau zawng lantir tura a ruat, chu ram lam zawka a awm chuan band chu a tizau (CRZ Notification, 2019, Annexure IV). Band hian coastal level chu ruahtui map aṭangin ni lovin Bung 5-a joint-case still-water level aṭangin a la. Standard sang zawk hian a dinhmun a lantir: coastal tuilian chu tuifinriat nen a chho a, tide a san laiin tui luan chhuah tir theih a ni lo, leh tuifinriat nen a la chho zel ang. Singapore pawhin hetiang bawk hian a ti, a chhim lam kamah datum chunga 4.0 m leh a hmar lam kamah 4.5 m platform level tlem ber nghet nen, ruahtui tuilian level eng pawh ni se (PUB Code of Practice on Surface Water Drainage, 7th ed., cl.

2.1.1). Coastal State tin tide leh surge level hi a kam zawhin level nghet pakhat tan a danglam lutuk a, chuvangin he Kaihhruaina Bu hian chu aiah still-water level chhut a hmang. Sea-level allowance let hnih hman hian Clause 5.7.4(c)-a sensitivity case chu design case angin a hmang, building chu, drain ang lovin, a hnuah tihsan awlsam a ni lo si avangin. 6.11.6(c)-a basement khapna hi he Kaihhruaina Bu-in a ruat a ni: coastal band-a basement chu ruahtui aṭanga chauh ni lovin tuifinriat aṭangin a khat a, tide-locked outfall-ah pump-a chawi chhuah theih a ni lo. Mizoram-ah tuifinriat kam, High Tide Line leh Coastal Regulation Zone a awm lo, chuvangin coastal band hi State-ah a ruak a, Clause 6.11.6 hi chutah a huam lo. Chu aiah Clause 6.11.3 leh 6.11.4 an pawimawh. Floor-level dan hmuh awmchhun chu Corporation building regulation-a plinth a ni: plinth "site drainage tawk taka a awm theih nan lei level emaw kawng level chungah tihsan. Hei hi metre 0.45 aia tlem lo ni se a ṭha" ("raised above ground level or road level so that adequate drainage of site is assured. This may preferably be not less than 0.45 metre") (AMCBR reg. 26(2)(a)), drainage dan, a hnungah tuilian level nei lo; tin engineered site development chuan "tui luanna plan, site grade zawh hnua floor sanzawng nen" ("A drainage plan, including elevations of floors with respect to finish site grade") a mamawh (SD&SM reg. 6). State-a khawpui reng reng tan tuilian level sang ber tlangzarh a ni lo [TBC], dan-ah flood plain zone a awm lo (State chuan National Green Tribunal hnenah "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area") a ti), leh SD&SM reg. 6-in site plan-in a lantir tura a phut "Aizawl Municipal Corporation-in a ruat leh a hrilhfiah tuilian hlauhawm hmun" ("flood hazard areas as designated and defined by Aizawl Municipal Corporation") chu ruat a nih hmuh a ni lo (NEER chhiar dan); mahse Tlabung, Sairang leh phai dangte hi an luipui aṭangin tui a lian ṭhin (Clause 5.8.5(c) leh (d)). He Kaihhruaina Bu tan, phai ramah Clause 6.11.2-a 1% AEP tuilian level chu Clause 5.8.5(c) emaw (d)-a luipui level-te hmangin chhut a ni a, emaw, chhut a nih loh chuan, tuilian chhinchhiahna aṭanga survey-a tuilian level sang ber, a thu hnar tarlan nen, la a ni, tin Clause 6.11.1-a floor level, 1% AEP level chunga 0.5 m, chu reg. 26(2)(a)-a plinth aia a sang zawk chuan hman tur a ni (he Kaihhruaina Bu-in a ruat). Clause 6.11.3, tuilian level chhut a nih loh hmunah floor awmna hniam ber leh kawngka tin chu kawng crown chungah 0.65 m-a ruattu, leh Clause 6.11.4, level ang bawk, emaw 1% AEP tuilian level chunga 0.5 m, basement ramp tin crest leh basement kawngka tin sill-ah hmangtu, hi he Kaihhruaina Bu-in a ruat a ni a, regulation-te an belh. Tlang pangah kawng crown hi a dik reng lo: kawng hnuaia building chuan kawng ruahtui luang a dawng a, tlang panga building chuan "ground floor level tam tak" ("multiple ground floor levels") a nei (AMCBR reg. 3(11)(iii)), chuvangin Clause 6.11.2(a) hian tlang chung lam sira floor leh kawngka tin level chu a kal pelh tui luan kawng 1% AEP level aṭangin a ruat, Clause 6.3.6(l)-a chung lam diversion leh lei laih pang bula drain nei hmun awm sa nen, tin tlang panga laih lut floor emaw basement chuan Clause 4.11-a tlang dan geotechnical certificate leh, Corporation area-ah, a trigger huam apiangah SD&SM 2017-a engineered site development a mamawh bawk. Lui leh luipui zawhin, dil leh tuikhur vel-ah leh reservoir kamah, Bung 7-a ri-te pawh an huam.

6.12 Culvert leh kawng kal tlanna

6.12.1 **Design AEP.** Drain emaw waterway chunga kawng phurtu culvert emaw bridge chuan chu kawng class tana Table 6.1-a design AEP tui luang chu kawng khum lovin, leh Bung 9, Clause 9.4-a headwater limit nen, a luan tir tur a ni. Waterway chu State highway emaw national highway kal tlanna a nih chuan, design AEP chu span tana IRC:SP:42-2014 §7.1.4 aia tlem a ni bawk tur a ni lo. AEP thleng tlem zawk chu hman tur a ni.

6.12.2 **Check event leh 1% AEP.** Check event leh 1% AEP event-ah, kawng kal tlanna leh kawng chuan tui luang chu hetiang hian an luan tir tur a ni:

- (a) kawng crown-ah khum thuk zawng ≤ 150 mm leh kawng thuk berah ≤ 350 mm nen;
- (b) Table 6.3-a hlauhawmna limit chhungin;
- (c) notify a nih evacuation route arterial kawng chu khum reng reng lovin; leh
- (d) chung lama building emaw ram ramri reng rengah 1% AEP tuilian level chu dinhmun awm mek level aia tisang lovin, nghawng neitute leh approving authority an remtih loh chuan.

6.12.3 **Khum phal loh hmun.** 1% AEP event-ah khum hi structure span 6 m aia tlem **leh** 1% AEP tui luang zat sang ber 7 m³/s aia tam lo-ah chauh phal a ni, khumna ṭhen hnuai lamah guard rail bun a nih loh chuan. Chu lo chuan, kawng kal tlanna chuan 1% AEP tui luang chu khum lovin a luan tir tur a ni.

6.12.4 **Tihtawp endikna.** 1% AEP endikna chu inlet tawp nen nawn leh tur a ni:

- (a) span emaw diameter 1.5 m hnuai culvert tan inlet area 50% tawp; leh
- (b) culvert lian zawk tan 20% tawp.

He endikna rah chuan Clause 6.12.2(a) leh (d) a zawm tur a ni.

6.12.5 **Size tlem ber.** Public kawng hnuaia culvert-te chu diameter 900 mm tal, emaw box culvert tan 900 mm × 900 mm tal a ni tur a ni.

6.12.6 **Hydraulic design.** Culvert hydraulics, inlet leh outlet control, tailwater, kawng khum leh outlet humhimna tiamin, chuan Bung 9, Clause 9.4 leh 9.6 a zawm tur a ni.

> **Hrilhfiahna.** Design AEP-te hi Table 6.1-a mi an ni. Khum limit-te hi Table 6.2-a kawngpui thuk zawng limit an ni. Clause 6.12.3-a span leh tui luang threshold hi APWA 5600 (2006) SI inthlak a ni: structure span 20 ft hnuai leh 1% tui luang sang ber 250 cfs emaw a hnuai-ah chauh khum phal, hnuai lamah guard fence bun a nih loh chuan. IRC:SP:42-2014 (§7.1.4) chuan span 2 m thleng NH/SH culvert tan kum 25 leh span 2–6 m tan kum 50 a ruat. Clause 6.12.4-a tihtawp percentage-te leh size tlem ber 900 mm hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Value 50% hi grate clogging factor nen a inmil.

6.13 Mizoram sakna hna mamawhte

6.13.1 **Kawng sir drain khuh.** Kawng sir drain chu kekawng niin slab-in a khuh chuan:

- (a) cover slab soffit thlenga teh Table 6.7-a freeboard nen channel khuh lo angin design tur a ni a, a HGL chuan kekawng leh inlet level thlenga tehin Clause 6.8 a zawm tur a ni;
- (b) kawng ruahtui luang chu kawng level-a drain bang kawngka, pakhat theuhah silt sump (Clause 6.6.7) nen, Clause 6.6.4-a inkarah, kal tlangin a lut tur a ni (Clause 6.6.1(b));
- (c) kekawng ruahtui luang chu kekawng chunga tui tlin hmangin ni lovin, cover-a slot emaw grate nei kawngka kal tlangin a lut tur a ni; leh
- (d) a chhung zau (clear section) chuan Clause 6.7.6(c) a zawm tur a ni.

6.13.2 **Cover sawn theih leh luhna kawngka.** Drain khuh chuan hengte hi a nei tur a ni:

- (a) **10 m** aia hla lo inkarah cover panel sawn theih, pakhat theuh 0.6 m tal sei leh a chhung zau zawng zawng khuh, lifting point khur nen, mi pahnihin emaw kut-a hman lifting device-in chawi theih, leh kekawng nen inzawl;
- (b) junction, kawi leh cross-section inthlakna tinah, leh run dik-ah **30 m** aia hla lo inkarah, 0.6 m × 0.6 m tal kawngka hawng nei access chamber; leh
- (c) a awmna hmuna motor emaw kea kal rihna tana rating nei cover (Bung 9, Clause 9.11).

6.13.3 **Silt trap.** Clause 6.6.7-a inlet sump bakah, silt trap chamber hetah hian siam tur a ni:

- (a) arterial kawng hnuaia culvert tin chung lamah;
- (b) pump station leh detention facility tin chung lamah; leh
- (c) dil (tank), luipui emaw tui awmna dang-a outfall tinah (Bung 8-in a phut gross pollutant trap nen).

Silt trap tin chu tihfai hun ruat inkara leidip lo awm tur a dawn theih tur leh Belhchian 6B-a sediment yield hmangin a lenzawng ruat tur a ni a, leidip laih chhuahna motor-in a thlen theih tur a ni.

6.13.4 **Bawlhhlawh leh gross pollutant screen.** Drain khuh lo chu drain khuh, pipe emaw culvert-a a luhna hmunah, leh Bung 8 hnuaia outfall-ah screen siam tur a ni. Screen tin chuan:

- (a) Bung 9, Clause 9.8 hnuaiah design tur a ni;
- (b) bypass emaw overflow a nei tur a ni, chutiang chuan screen tawp vek pawhin ram emaw kawng-ah he bung limit pelin tuilian a thlen lo; leh
- (c) a area 50% tawp nen hydraulic-in endik tur a ni.

6.13.5 **Drain chunga sak loh.** Public drain chungah kal tlanna phalna pek emaw cover sawn theih bak structure reng reng sak loh tur a ni. Drain kal tlang dawr hmai, ramp leh kailawn chu sawn theih a ni tur a ni, emaw Clause 6.13.2 zawm luhna kawngka a dah tur a ni.

6.13.6 **Utility.** Tui pek main, sewer, power emaw telecom cable, gas pipe emaw duct reng reng drain reng reng tui luanna area emaw freeboard zawhin emaw kal tlangin dah loh tur a ni. Drain kal tlang ngei ngei tur utility chuan:

- (a) sleeve chhungah, cover soffit chungah emaw drain invert hnuaiah emaw a kal tlang tur a ni; leh
- (b) drainage plan-ah a level nen tarlan tur a ni.

Utility kal tlanna awm mek chuan drain a dan chuan, utility sawn a nih hma chu, a area chu drain cross-section aṭangin paih tur a ni, a bal man tan 50% tihtawp allowance nen. Drain sak ṭhat hunah utility neitu chuan a sawn tur a ni.

6.13.7 **Ek tui.** Storm drain-ah ek tui connection reng reng phal a ni lo (Bung 8). Drain khuh chu sewer bula a kal hmunah tui put chhuak thei lo joint (sealed joint) nen sak tur a ni.

6.13.8 **Kam humhimna.** Kekawng, carriageway emaw public open space bula 1.0 m aia thuk drain khuh lo chuan railing emaw barrier a nei tur a ni. Drain khuh lo eng thuk pawh ni se kekawng kal tlangin khuh lovin dah loh tur a ni.

6.13.9 **As-built level.** Public drain, pipe leh manhole tin as-built invert level chu survey-a thehluh tur a ni (Bung 10). Invert-te chu design aṭanga ±15 mm chhungah a awm tur a ni. A awm loh chuan HGL endik nawnna thehluh tur a ni.

6.13.10 **Leidip laih chhuah.** Public drain-te chu Bung 10-a tarlan angin kum tin fûr hun hmain leidip laih chhuah tur a ni.

> Hrilhfiahna. Clause 6.13 hi a entirna hmasa chiang a awm lo; he Kaihhruaina Bu hian Mizoram sakna kalhmang innghahna-in a ruat a ni. State-a khawpui drain tam zawk hi kekawng hnuaia kawng sir drain khuh an ni. Cast-in-situ slab chhunzawm leh kawngka tlem tê nen an sa fo a, chuvangin tihfai theih an ni lo va, fûr hun khat chhungin leidip leh bawlhhlawhin an khat ṭhin. CPHEEO (2019) chuan channel khuh lo-te hi "bawlhhlawh paih nan an hman fo" ("are prone to the dumping of garbage") a ti (Part A, Ch 2), chu chu drain an khuh chhan a ni. Luhna kawngka nei lova khuh hian harsatna chu mit hmuh loh hmunah a sawn mai a ni. Mizoram-ah drain-te hi a tam zawk khuh an la ni lo: Aizawl Urban Area-ah area 67%-ah kutcha drain a awm a, 18%-ah drainage reng a awm lo va, 15% chauhah pucca drain a awm (Master Plan for Aizawl: Vision 2030), chuvangin a chunga sawi kawng sir drain khuh hi Clause 6.13 ziah chhan drain a ni a, State drain pangngai a la ni lo, tin Clause 6.13 hi tun aṭanga drain khuh sak tin-ah a huam. NDMA (2010) chuan fûr hma leidip laih chhuah hi March ni 31-ah zawh turin a rawt. Mizoram-ah chu ni chu he Kaihhruaina Bu-in a sawifiah anga fûr hun, April ni 1 aṭanga October ni 31 thleng, ṭan ni a ni bawk. Aizawl-a south-west monsoon lo thlen (onset) ni pangngai IMD-a mi chu lak a ni lo [TBC]; 2026-ah south-west monsoon chu June ni 6 vel khan Mizoram a thleng (chanchin tlangzarh angin), leh a kir leh (withdrawal) ni pangngai pawh lak a ni lo [TBC]. Ruahpui chhiatna thlentute hi a lo thlen hmain an lo thleng: April ni 27–28, 2026-a ruahpui chuan district panga aṭanga pakua thlengah school a chawlh tir a, Serchhip-ah 70.5 mm leh Hnahthial-ah 55 mm a sur (chanchin tlangzarh angin); tin State-a ruah tlak thihna thlen ni chiang nasa ber zawng zawng hi May thlaah an tlu, May ni 11, 2013-a Aizawl-a Laipuitlang lungpui tlak (paper pakhatah May ni 15), May ni 28, 2024-a Cyclone Remal leimin, chung zingah Melthum–Hlimen quarry hnathawh tawh loh chim, leh May ni 24, 2025 aṭanga June ni 3, 2025 thleng leimin 598 (paper bak chu a zavaia chanchin tlangzarh angin). CGWB chuan "May aṭanga September tawp lam thleng ruahpui" ("heavy rainfall during May to late September") a hmu (CGWB, Lunglei booklet). Ruahpui hi fûr hun hnuah pawh an lo thleng: "Fûr hnu hun (October aṭanga December) cyclone-te hi fûr hma hun (April leh May) cyclone-te aiin an nasa zawk" ("the cyclones of the Post Monsoon season (October

to December) are more intense than those of Pre-Monsoon season (April & May)") (NAFCC DPR, 2016), leh October 2025-ah Chawngte-ah ni khatah 130 mm a sur (chanchin tlangzarh angin). Master plan chuan "monsoon a lo thlen hmain kum tin drain-te tihfai a ngai" ("drains need to be cleaned every year before the onset of monsoon") a ti chauh; UD&PA, Corporation, Village Council emaw District Council-te leidip laih chhuah order, zawh ni nei, reng reng zirchianna hunah hmuh a ni lo [TBC]. Chuvangin Clause 6.13.10 hian he Kaihhruaina Bu-in a sawifiah anga fûr hun a kawk a, Bung 10 chuan drain, lui inlet, catch-pit, rack leh culvert aṭanga, leh SD&SM reg. 27-a terrace swale, interceptor drain leh down-drain aṭanga leidip laih chhuah leh bal, bawlhhlawh leh leimin bal tihfai chu March ni 31-ah zawh turin a phut, retaining wall weep hole leh subsurface drain endik leh tihfai, leh flap gate leh pump awm chu ni ang bawkah inpeih tih certify nen (Clause 5.11.5 leh 5.12.9); drain, swale, interceptor drain, rack, culvert inlet leh catch-pit fûr hun laia tihfai chu April ni 30-ah, April ruahpui hnu leh May ruahpui hmaah; April ni 1 aṭanga October ni 31 thleng inpeih reng; leh fûr hun hnua leimin bal leh leidip tihfai, lei laih pang, terrace leh retaining wall survey nen, November ni 15-ah, cyclone tlai tan drain-te an fai theih nan. Fûr hun laia tihfai hi April ni 30-ah tih tur a ni, he series North-East edition dangte anga May ni 31 emaw May ni 15 ni lovin; a chhan chu, thla ruahpui thihna thlen ni chiang hmasa ber, May thlaa mi, chu May ni 11-ah a tlu vang a ni: May ni 15-a zawh tur tihfaina chu a hnuah a thleng thei a, May ni 31-a zawh tur chu pathum hnuah. Heng ni-te hi he Kaihhruaina Bu-in a ruat a ni. Mizoram khawpuite hian vur (snow) dinhmun an nei lo.

Municipality chhungah tumahin "Municipality-a innghat municipal drain, culvert emaw gutter emaw ek tui hna emaw ruahtui channel lui hnuai, kam emaw embankment chungah" ("over any municipal drain, culvert or gutter or bed, bank or embankment of any sewage works or storm water channel vested in the Municipality") in an sa thei lo (Mizoram Municipalities Act, 2007, s.300). Lui pianphung-te hi drainage reserve nei channel khuh lo an ni (Clause 6.9), tin khuh, deck emaw a chunga sak loh a ṭha: master plan chuan "khawpui chhunga drainage kawng awm mek chu nghet tir a, tui luanna pianphung pawh tihṭhat leh humhalh" ("existing drainage alignment within urban area be made permanent and also the natural drainage system be improved and protected") turin a ngen (Master Plan for Aizawl: Vision 2030, 8.3.4). Drain chu khuh a nih chuan, Clause 6.13.2 chu a kimin a huam; kekawng emaw carriageway bula a hawn chuan, Clause 6.13.8 a huam. Tlang chhip khawpuiah drain tam tak hi ram nasa chunga kailawn leh kekawng bulah an kal a, chutah drain khuh lo chu tlak hlauhawmna a ni a, drain khuh chu a luhna kawngka nei lovin lung leh bawlhhlawh tihfai theih a ni lo.

Clause 6.13.7 hi kalhmang pangngai a la ni lo, tin Aizawl catchment pakhat pawn lamah chuan sewer a awm hma chu a ni thei lo. "Sewerage system a awm loh avangin, mipuiin septic tank leh soak pit an hmang. Hmun tam takah ek tui chu tihfai lovin drain khuh lo-ah luan tir a ni a, a tawpah luipui-ah a luang lut" ("In absence of sewerage system, people are using septic tanks and soak pits. In most of the places sewage is discharged into open drains without any treatment, which ultimately gets discharged to rivers"), leh "in chhunga tui bal [chaw siamna leh inbualna tui bal] chu drain-ah luan tir a ni a, a tawpah tui thianghlim hnar a tibawlhhlawh" ("the sullage [i.e. kitchen and bathroom waste] is discharged into drains which ultimately pollutes the fresh water sources") (master plan). State chuan ek tui 51.81 MLD a chhut a, "Tihfaina hmanrua awm mek … 10 [MLD] Aizawl khawpui tan chauh" ("Existing Treatment Facilities … 10 [MLD] only for Aizawl city") a ni, Chite-a plant pakhat aṭangin (O.A. 606/2018-a National Green Tribunal hnena State report, August ni 31, 2025 dinhmun), tin CPCB chuan Chite leh Tuikual lui chu Priority II-ah a tarlang (CPCB, 2025). Clause 8.9 hian storm drain-a ruah sur lohna hun tui luang chu connection-te paih a nih hma chu survey leh interception dan a ruat, interception chuan drain theihna a tihtlem tur a ni lo tih dan tiamin (Clause 8.9.5(b)).

Inkar 10 m leh 30 m leh ±15 mm tolerance hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Clause 6.13.6 hi tui pek main leh cable drain kal tlanga hmuh fo chhanna a ni. A pakhat theuhin bal a man a, cross-section a tizim. Mihring a chhunga luh ai chuan cover kawngka aṭanga machine-a tihfai hi a pumpuiin ngaih a ni, *Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013* nen inmil takin.

6.14 Outfall

6.14.1 Outfall-te chu Bung 5-a tailwater dinhmun tan design tur a ni. 1% AEP still-water level hnuaia outfall-te chuan flap emaw tide gate emaw non-return valve an nei tur a ni (Bung 5 leh Bung 9, Clause 9.10).

6.14.2 Outfall humhimna leh tui chakna tihnemna chu Bung 9, Clause 9.6 hnuaiah design tur a ni. Dil (tank) leh tui awmna-a outfall-te chuan Bung 7 leh 8 an zawm bawk tur a ni.

6.15 Thehluh tur mamawhte

Conveyance thehluh tur tin chuan hengte hi telin **Tui Luan Tirna Design Report** (Form 6-1) a tel tir tur a ni:

1. sub-catchment, tui luanna system tenau, inlet awmna leh 1% AEP event tana tui luanna system lian overland flow path lantirtu catchment plan (Clause 6.3.2);
2. element tin tana ram hman dan leh kawng class AEP hman (Table 6.1), leh high-density area dinhmun;
3. design flow, Bung 2-a ruahtui tlak sheet leh Bung 3-a kalphung nen;
4. minor, check leh 1% event tana gutter spread, thuk zawng leh D·V endikna (Table 6.2 leh 6.3);
5. tihfai lai theihna, clogging factor, design theihna leh bypass flow nei inlet schedule (Clause 6.6);
6. n, velocity, sediment allowance leh freeboard nei pipe leh drain design table (Clause 6.7);
7. minor leh check event tana HGL profile, tailwater hman nen (Clause 6.8);
8. sag tui tlin level, tawp vek endikna tiamin (Clause 6.10);
9. building tin tana floor-level schedule (Clause 6.11);
10. culvert leh kawng kal tlanna chhutna (Clause 6.12 leh Bung 9); leh
11. drain khuh tana utilities-crossing schedule leh luhna kawngka layout (Clause 6.13).

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Belhchian leh Form

Belhchian / Form	A chhunga thu
6A	Mizoram tana standard inlet chi, theihna curve nen (grade chungah leh sag-ah)
6B	Silt-trap lenzawng ruatna leh sediment allowance calibration tana sediment yield
6C	Standard drawing: cover sawn theih nei kawng sir drain khuh, access chamber, silt sump nei inlet
Form 6-1	Tui Luan Tirna Design Report checklist

BUNG 7

Tui Awmnate, Dil (Dil Lian leh Dil Tê) leh Setback

7.1 Tum leh a huam chin

7.1.1 He bung hian tui awmnate (waterbody) chu tui luanna (drainage) system peng angin a ngai a. Heng atan hian dan a siam:

- (a) hmasawnna hna (development) emaw sawrkar hna (public work) emaw-in a nghawng tui awmna zawng zawng hmuh chhuah leh map-a dah;
- (b) tui awmnate vela setback (tui kam aṭanga hmun kalhlen tur) zone-te, leh zone tin-a hman phal dan;
- (c) tuilian hlauhawm ramah lei vur (fill), leh lei vur phal a nihna hmuna compensatory storage (lei vur avanga tuilian tui khawlna bo thlakna) mamawh;
- (d) dil (tank) tui khawlna, dil cascade (dil inzawm zawm, dil pakhat tui liam a dawt-a luang lut) tiamin, design khawlna (design storage) anga chhiar;
- (e) dil leh dil tê siam ṭhat leh a leidip laih chhuah (desilting);
- (f) supply channel (dil-a tui luh tirna), surplus course (dil tui liam luanna), inlet (luan lutna) leh outlet (luan chhuahna) humhalh;
- (g) wetland (tui awm reng hmun hnawng), marsh (hmun hnawng) leh estuary (luipui tuifinriat luhna); tuifinriat nei lo State Mizoram-ah chuan heng hi an ni: Palak Dil, Siaha district-a Pala wetland, State-a Ramsar site awm chhun (no. 2484; a Ramsar Information Sheet ang chuan August ni 31, 2021-ah thlan a ni a, thu hnar ang chauhin hmuh a ni; July ni 26, 2022-ah puangchhuah a ni, chanchin tlangzarh angin), Saitual bula Tam Dil leh dil dangte, Tuirial leh Serlui B reservoir (tui khuah) an drawdown zone (tui hniam huna ram lang) nen, tuikhur hnuaia tui chiar hmun (seepage ground), phai-a marsh emaw tui chiah hmun reng reng, Champhai phai ang, tui a dah reng hmunah (he Kaihhruaina Bu tan pakhat mah survey a ni lo [TBC]), leh 2017 Rules hnuaia notify (Gazette-a tarlan) a nih wetland reng reng (notify a nih hmuh a ni lo);
- (h) luah hnehna (encroachment) leh a tihbo nena inzawmna;
- (i) bial dil khawlna (regional tank storage) tana fee-in-lieu (hmun ngeia siam aiah sum pek) thawhlawm (Bung 4 nen); leh
- (j) dil bund (dil kam lei dai) leh embankment (dai) dangte himna.

7.1.2 Bung 1 ang chuan he Kaihhruaina Bu huam chhunga hmasawnna hna leh sawrkar hna zawng zawng, heng a hnuaia mi ang hi chu, he bung hian a huam:

- (a) tui awmna bula awm, emaw a setback (Clause 7.4) chhunga a pumin emaw a ṭhenin emaw awm;
- (b) Bung 5-a luanna hnuailam zirchianna (downstream analysis) huam chhungah tui awmnaah a tui a luang lut tir, a nghawngin emaw drain (tui luanna) kaltlangin emaw; emaw
- (c) tui awmna, a bund, sluice (dil tui chhuah tirna kawngka), surplus weir (dil tui khat liam chhuahna weir), supply channel emaw surplus course emaw a tidanglam.

7.1.3 Dan (statute) emaw dan anga siam rule-in setback zau zawk emaw khapna nasa zawk emaw a siam chuan, chu dan chuan a thunun (Clause 1.3.3). He bung-a thu reng reng hian heng dante-in a khap hna reng reng a phal lo: Mizoram Municipalities Act, 2007 leh a hnuaia siam Aizawl Municipal Corporation Building Regulations, 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017; Mizoram Water Resources

(Management and Regulation) Act, 2024; Mizoram (Village Councils) Act, 2025; Mizo District (Forest) Act, 1955; Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, hman mek a nih chuan; Wetlands (Conservation and Management) Rules, 2017; emaw dan dang reng reng.

Hrilhfiahna. Mizoram-ah dil lian, dil tê, tank emaw tuikhur humhalh bik nan Act a awm lo. A tui awmnate hi humhalh an nih chuan, heng hian an humhalh: municipal area chauh huam tlang pang regulation, building regulation leh municipal Act; Autonomous District Council pathum pawn lam State bang zawng huam tui hnar Act leh Village Councils Act; enact a nih finfiah a nih loh Rivers Ordinance leh Bill; riverine reserve (lui kam ramngaw humhalh) chungchang ramngaw dan; wetland rule-te leh court-te. **Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017** (No. B.13017/75/2016-UD&PA, April ni 4, 2017) chuan lui pianphung bula ram (plot) tan "riverine reserve chu vawn tur a ni" ("the riverine reserve shall be maintained") (reg. 28) a ti a, lei laih chhuah chu "tui luan kawng emaw riverine reserve" ("drainage courses or riverine reserves") aṭangin hlatah dah turin a ti a (reg. 29), site plan-ah "Aizawl Municipal Corporation-in a ruat leh a hrilhfiah ang lui pianphung, riverine reserve emaw tuilian hlauhawm hmun" ("natural streams, riverine reserves or flood hazard areas as designated and defined by Aizawl Municipal Corporation") lantir turin a phut bawk (reg. 6); mahse reserve emaw tuilian hlauhawm hmun (flood hazard area) emaw a hrilhfiah lo va, tuilian hlauhawm hmun pakhat mah ruat a ni lo (Clause 7.3, Hrilhfiahna). **Aizawl Municipal Corporation Building Regulations, 2012** chuan, siam ṭhat angin, septic tank leh soak pit chu "tui hnar" ("a water source") aṭanga 15 m-ah a dah tir a (reg. 33), lui aṭanga hlat zawng erawh a siam lo. Corporation huam chhungah "vantlang dil, lui, reservoir leh tuikhur zawng zawng" ("all public tanks, streams, reservoirs, and wells") chu Municipality thuneihnaah a awm (**Mizoram Municipalities Act, 2007**, s.80(b)). **Mizoram Water Resources (Management and Regulation) Act, 2024** (Act No. 1 of 2024) chuan "khawtlang tui hnar" ("community water resources") chu "tuikhur, dil tê, dil lian, tank, ruahtui khawl khawmna hmanraw hlui, tuikhur laih, leihnuai tui emaw hming eng pawh nei khawtlang tui awmna ang, tihdan pangngai anga khawtlang tui hnar" ("customary common water resources such as springs, ponds, lakes, tanks, traditional water harvesting structures, wells, groundwater or local water bodies by whatever name") tiin a hrilhfiah a (s.2(1)(i)), Village leh Local Water Resources Committee-te chu "khua / veng tui hnar hriat tawhte bawlhhlawh laka veng" ("Prevent pollution of identified water sources of the village / locality") turin mawhphurhna a pe (ss.9–12); Mizoram-ah tui awmna Act nen a inhnaih ber a ni, mahse tui aṭanga hlat zawng a siam lo va, Autonomous District Council-te a huam lo. **Mizoram (Village Councils) Act, 2025** (Act No. 7 of 2025) chuan "tuikhur" hi dan thumal a siam a, "tui pekna lak theihna hmun reng reng" ("any place wherein water supply is obtained") a ti a (s.2(29)), Village Council tin chu "khaw chhunga tui hnar humhalh" ("Conserve water resources within the village area") turin a ngen (s.14(6)). **Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo**, chuan Protected River leh River Conservation Zone a siam a, chutah chuan State Authority phalna lak hmaa thil sak, tui luanna dan emaw tihdanglam reng reng phal a ni lo; chutiang Authority din a nih hriat a ni lo va, zone pakhat mah notify (Gazette-a tarlan) a ni lo (Clause 7.4, Inpuanna). **Mizo District (Forest) Act, 1955** hnuaiah kum 1965-ah lui 16 sir tin mile chanve chhunga ramngaw chu riverine reserved forest atan puan a ni a; chu notification chu Gauhati High Court-in January ni 27, 2021-ah a tihbo (chanchin tlangzarh angin). Wetland chu **Wetlands (Conservation and Management) Rules, 2017** hnuaiah a awm; Mizoram tan State Wetlands Authority dinna notification hmuh a ni lo [TBC], State-a Ramsar site awm chhun Palak Dil chu Mara Autonomous District Council huam chhungah a awm (Clause 7.12, Hrilhfiahna). He bung-ah **IWRD** chu Irrigation & Water Resources Department a ni a, a Chief Engineer chu 2024 Act hnuaiah WARDMA member secretary a ni; **NEEPCO** chu North Eastern Electric Power Corporation Ltd a ni a, Tuirial reservoir, State-a tui ding lian ber, a nei a, State-a enkawltu (custodian) zingah a reservoir tui sang zawng ziaka hmuh a nih chhun a ni (CERC); IWRD dil register hmuh a ni lo. He bung-in NEEPCO record, rule emaw freeboard (tui sang ber chunga zau dah) a sawi apiangah, a khawlna chhiar reservoir, dil emaw check-dam pool (check dam hnunga tui dil) dang enkawltu tan pawh a inang: Serlui B reservoir chu State-a power department ta niin ngaih a ni (NEER chhiar dan [TBC]), dil leh tuikhur enkawltute chu inventory-ah (Belhchian 7A) pakhat zelin ziah a ni. Municipality-te, Village Council huamte leh Lai, Mara leh Chakma Autonomous District Council-te-ah tuin nge khawiah thunun a, hmun tin-a competent authority tu nge ni tih chu Bung 1-ah a lang.

He Kaihhruaina Bu hian tui awmna ziak lut zawng zawng chu tui luanna infrastructure angin a ngai. Thil panga hian Mizoram a dang bik tir. A pakhatna chu **lui (stream)** a ni: tlang chhip khawpui tin hian a tlang pang zawhin lui chho takah a tui a luang thla a, Chite lui ang, Aizawl "chhak lam ṭhena thum ṭhena hnih aia tam" ("more than two-third of eastern portion") tui Tuirial-ah a luan tir a, Ser lui pawh, khawthlang lam lui têten Tlawng pan kawngah an luan luhna a ni; master plan chuan Chite, Chanmari, Theihai, Bethlehem, Tuikhurhlu, Mirawng leh Bangla lui chu "fûr hun chhungin tui luan chak tak nen an luang buai" ("turbulent with high velocities of currents during the monsoon season") leh "a tichhe nasa hle" ("very destructive") a ti a, Khatla, Tuikual, Vaivakawn leh Chanmari west lui chu "lui leh nullah tichhe nasa ber" ("the worst destructive streams and nullahs") a ti; heng lui hian khawpuite ek tui pawh an luan tir (Clause 8.9, Hrilhfiahna). A pahnihna chu **tuikhur (spring)** a ni: "Mizoram hi tuikhur awmna a ni" ("Mizoram is an abode of springs"), a tui chu "mipuiin in chhunga mamawh atan an hmang nasa" ("widely utilized by people for domestic needs") (CGWB), Aizawl-ah "khawpui ṭhanna hian tuikhur ang chi tui hnar hlui-te a tihro" ("Urbanisation has led to drying up of traditional water sources, like tuikhur") (chanchin tlangzarh angin). A pathumna chu **tlang pang (slope)** a ni: Mizoram-ah tui luanna avanga lo thleng thei hlauhawm chu leimin a ni a, lui kam hi tlang pang ke a ni fo va, lei laih (cut), lei vur emaw soak pit-in a tlu thla thei a, chuvangin lui laih thuk (incised lui) zawh corridor (lui leh drain kama humhalh tur ram zau) chu a kam pang chhip (crest of the bank slope) aṭangin teh a ni (Clause 7.4). A palina chu **reservoir** a ni: Kolasib district-a NEEPCO Tuirial reservoir (full reservoir level 90.5 m) leh Serlui B reservoir, an tui khuahna (dam) hnuaia lui chhungte nen. A pangana chu **phai (valley floor)** a ni: hmun zawl tlem tê, Tlabung, Sairang, Bairabi leh Vairengte-a lui kam zawl (river terrace) leh Champhai phai te hi luipui tuilianin khawpui a tihlian theihna hmun awm chhun an ni a, Tlabung-ah Khawthlangtuipui tuilian kum 2017, 2019 leh 2023-ah a thleng (chanchin tlangzarh angin). **Dil**, dil lian leh dil tê, an tlem: Siaha district-a Ramsar site Palak Dil leh Saitual bula sangha vulhna reservoir atana siam ṭhat Tam Dil (chanchin tlangzarh angin) hi an hriat lar ber. Mizoram-ah lo tui pek nana dil cascade (irrigation tank cascade) a awm lo; he bung-a dil (tank) clause-te chu dil, check-dam pool leh reservoir-ah hman a ni a, master plan chuan Aizawl luiteah check dam pariat a rawt, "Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum leh Hlimen hnuaiah" ("below Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum and Hlimen") (Clause 7.7). He bung hian heng tui awmnate tui khawlna leh tui luan tirna humhalh nan design dan a pe. Chunga regulation leh Act-te, khaw tin dan hlui (customary rules), District Council-te dan, wetland rule-te, emaw Gauhati High Court (Aizawl Bench), National Green Tribunal leh Supreme Court thupekte chu a thlak lo.

7.2 Thumal awmzia

Thumal	He Kaihhruaina Bu-a a awmzia
Tui awmna (waterbody)	Lui emaw luipui (Mizo-in lui; luipui, river), Tlawng (Dhaleswari) leh Tuirial (Sonai) ang, Aizawl luite khawthlang leh khawchhak lamah dawngtu; Chite lui, Aizawl khawchhak lam ṭhena thum ṭhena hnih aia tam tui Tuirial-a luan tirtu; Ser lui, khawpui khawthlang lam lui têten Tlawng pan kawngah an luan luhna; hmar lama Tuivai, Serlui leh Langkaih; khawchhak ramri-a Tiau; Tlabung-a Khawthlangtuipui (Karnaphuli); Chhimtuipui (Kaladan), Tuichang, Tuichawng leh Mat; drain emaw khur (Mizo-in tui luankawr emaw tuihawr); dil (lake emaw pond, a pianphung emaw laih; dil tê, pond tê emaw tank tê), Palak Dil, Siaha district-a Pala wetland, leh Saitual bula Tam Dil ang; reservoir, NEEPCO Tuirial reservoir leh Kolasib district-a Serlui B reservoir ang, a drawdown zone nen; check dam hnunga tui dil (pool); tuikhur emaw tuikhur tui chhuahna (Mizo-in tuikhur; hna emaw tuihna, lui hnar) a catchment (ruahtui luan khawmna hmun) humhalh nen; wetland, marsh emaw tui chiar hmun; supply channel emaw surplus course, kum tluan emaw hun bik chauh luang (Bung 1-a ang).
Dil (tank)	Lei bund-in a khuah tui awmna, amah catchment leh/emaw supply channel-in tui a pe a, surplus weir leh sluice pakhat emaw a aia tam a nei.
Dil cascade (tank cascade)	Dil inzawm zawm, dil pakhat surplus emaw sluice aṭanga tui luang chhuak chuan a dawt a pe (Bung 3-a ang).
Full tank level (FTL)	Dil surplus weir (spillway, overflow emaw outlet) crest sang zawng, emaw a thununna structure crest nghet. FTL thleng chu dil-in tui a dah thei a, a liam lo.

Thumal	He Kaihhruaina Bu-a a awmzia
Maximum water level (MWL)	Surplus weir-in dil design tuilian a paltlang tir laia dil tui sang zawng sang ber. He Kaihhruaina Bu tan chuan IWRD-in a ziak tui sang zawng leh Clause 2.8-a climate factor nena 1% AEP (kum 100) tui luang lut tana chhut tui sang zawng zinga sang zawk a ni (Clause 7.7.4).
Top bund level (TBL)	Dil bund crest sang zawng.
Waterspread	FTL-a dil tui zau zawng (tuiin a chim ram).
Foreshore	Dil vela FTL contour leh MWL contour inkara ram. Dil a liam apiangin foreshore ram chu tuiin a chim a, dil tuilian khawlna ṭhenkhat a ni.
Supply channel (lui emaw feeder channel)	Luipui, anicut emaw chunglam dil aṭanga dil-a tui luan luh tirna channel.
Surplus course	Surplus weir aṭanga tui liam chhuak chu a dawt dil, luipui, drain emaw tuifinriat thlenga luan tirna channel.
Sluice (sluice, spillway gate emaw regulator)	Dil bund kaltlanga thunun theih outlet, a tlangpuiin lo tui pek nana channel (irrigation channel) pan.
Kam chhip (top of bank)	Channel tan chuan, channel kam-a tlang pang inthlakna (break in slope). Hmuh chhuah theih a nih loh chuan, 50% AEP (kum 2) tui luang laia tui chung kam.
1% AEP tuilian zau zawng	Clause 2.8-a climate factor nena 1% AEP (kum 100) tuilianin a chim ram, Bung 3 leh Bung 5 zawm hydraulic model aṭangin, emaw Clause 7.3.4 hnuaia Authority (phalna petu Authority)-in a pawm map aṭangin.
Floodway	Tui awmna leh a bula ram, 1% AEP tuilian chu hmun reng rengah 1% AEP tui sang zawng **0.1 m** aia tam tihsan lova a luan pelh theih nana dangna awm lova vawn ngei ngei tur (Clause 7.6.1). Dil tan chuan MWL hnuaia ram zawng zawng.
Flood fringe	1% AEP tuilian zau zawng zinga floodway pawn lam.
Zone 1 (tui awmna humhalhna zone)	Clause 7.4.3-a hrilhfiah setback zone chhung lam.
Zone 2 (flood fringe setback)	Clause 7.4.4-a hrilhfiah setback zone pawn lam.
Setback	Zone 1 leh Zone 2 a vaiin.
Compensatory storage	Clause 7.6.4 hnuaia, lei vur avanga tuilian khawlna bo thlak nana laih chhuah khawlna.
Flood cushion	Tuilian dawn turin, kalpui dan (operating rule) ziak lang hnuaia FTL hnuaia khawlna ruak vawn (Clause 7.8).

Mizoram thumalte. Chunga mite bakah he bung-ah heng thumalte hi hman a ni (Belhchian 7E pawh en rawh):

Thumal	He Kaihhruaina Bu-a a awmzia
Dil	Dil lian emaw dil tê, a pianphung emaw laih: Lorrain leh Savidge *Grammar and Dictionary of the Lushai Language* (1898)-ah "(s.) a lake", *dil té* "(s.) a pond, a tank" nen, leh Pachuau *English–Mizo Dictionary* (1997)-ah "lake: dil" leh "pond: dil, tui tling reng" (Belhchian 7E). He Kaihhruaina Bu-ah a hmasa berin "dil (Mizo: a lake or pond; *dil té*, a small pond or tank; plural dils)" tiin hman a ni. Plural "dils" hi he Kaihhruaina Bu English ziah dan a ni a, Mizo editor-in a finfiah tur a ni: Mizo-in plural chu *-te*-in a chhinchhiah a, chu chu *té*, "small", nen a inpawlh thei. Outlet thunun theih nei dil chu Clause 7.2 hnuaiah dil (tank) a ni: a outlet gate chu a sluice a ni a, a FTL chu gate khar vek laia a outlet chunga a liam chhuahna sang zawng, survey-a hmuh chhuah a ni. Outlet thunun theih lo nei dil FTL chu chu outlet crest-ah a ni. Dil pianphungte chuan an hming ngei an vawng, Palak Dil leh Tam Dil ang. He Kaihhruaina Bu hnuaia khawlna siam chu "detention pond" (ruahtui dah rihna dil siam) a ni a, dil emaw tuikhur emaw tih ngai lo.

Thumal	He Kaihhruaina Bu-a a awmzia
Tuikhur	Tuikhur emaw tuikhur tui chhuahna: "(s.) a well, a waterhole" (Lorrain leh Savidge, 1898) leh "fountain: tuikhur" (Pachuau, 1997); dan-ah chuan, "tui pekna lak theihna hmun reng reng" ("any place wherein water supply is obtained") (Mizoram (Village Councils) Act, 2025, s.2(29)). He Kaihhruaina Bu-ah a hmasa berin "tuikhur (Mizo: a spring or water point)" tiin hman a ni a, tuikhur leh a chunga tui lakna siamte tan chauh hman a ni. Tuikhur chu Clause 7.3 tan tui awmna a ni a, Clause 7.4 hnuaia a Zone 1 chu a tui chhuahna (outlet) emaw a tank emaw chamber kam aṭangin teh a ni. Clause 8.8.1-a tuikhur dan chu a velah hman a ni: 15 m chhungah ruahtui outfall (drain tui luan chhuahna), soakaway emaw drain tui luan chhuah awm loh tur a ni; ruahtui chu a chhungah emaw a chung lam tlang pang hnai berah emaw luan tir loh tur a ni; drain, lei laih emaw lei vur, a tui luang dang, a chhuahna phum emaw a kalh tlanga dah reng reng awm loh tur a ni; tui chhuahna chunglama a catchment, hydrogeologist-in a map angin, chu catchment humhalh a ni. Tuikhur chu ruahtui laka humhalh a ni a, khawlna atan hman ngai lo. Heng dan hi he Kaihhruaina Bu-in a ruat a ni.
Lui; lui laih thuk (incised lui)	Lui emaw luipui chu Mizo-in *lui* a ni a; luipui lian chu *luipui* a ni (Belhchian 7E). 8 ha emaw a aia tam tui luan khawmna lui reng reng chu, a hming eng pawh ni se, kum tam zawka a ro emaw ro lo emaw, lined, pipe-a dah emaw khuh emaw ni se, Clause 7.4.1(b) hnuaiah channel pianphung (natural channel) a ni. Lui laih thuk chu a channel chu 10° aia chho kam tlang pang ke-a luang a ni; Clause 7.4.3 leh 7.13.1 tan a kam chhip chu chu kam pang chhip a ni: lui-in a laih kam chhipah, channel chunglama tlang pang inthlakna chiang hmasa ber, survey-a hmuh chhuah leh Form 7-1-a lantir, tui kam emaw a luanna bed kam emaw a ni lo. Chutiang inthlakna hmuh chhuah theih a nih loh chuan kam chhip chu a luanna bed kam-ah ngaih a ni a, site development engineered (SD&SM reg. 26) geotechnical report chuan ri zau zawk a ngai em tih a sawi. Lui-in tuilian laiin lungpui, leimin bal leh bawlhhlawh a phur: a inlet leh culvert (kawng hnuaia tui kalna)-te chu Clause 6.3.6-a rack, bulking leh tihtawp (blockage) dan a zawm. He hrilhfiahna hi he Kaihhruaina Bu-in a ruat a ni.
Setback tehna ri (reference line)	Ri pahnih hman a ni a, tui aṭanga hla ber thlen setback chuan a thunun: (a) channel kam chhip (lui laih thuk-ah chuan a kam pang chhip), dil emaw reservoir FTL, emaw tuikhur tui chhuahna, chu aṭanga Clause 7.4.3-a Zone 1 teh; leh (b) Clause 7.3.4-a 1% AEP tuilian zau zawng, Clause 7.4.4-a 10 m belh. Dan, regulation, plan, phalna emaw court ri zau zawk reng reng chuan a khap hman danah a thunun (Clause 7.4.5); ri awmte leh an dinhmun chu Clause 7.4 Inpuanna-ah a lang. He dan hi he Kaihhruaina Bu-in a ruat a ni.
Dil emaw reservoir ramri	He Kaihhruaina Bu tan chuan, Clause 7.3.3 leh 7.13.1 hnuaia dil ramri chu heng zinga zau ber hi a ni: a ramri ziak, a FTL survey, leh kum hnai lama milem (imagery) ni chhinchhiah nei emaw survey emawa lang April ni 1 aṭanga October ni 31 thleng hun chhunga a tui kam pawn lam ber; reservoir ramri chu a full reservoir level leh a kalpuitu (operator)-in a sawi tui sang zawng sang ber zinga sang zawk, Clause 7.3.5-a datum-a sawi a ni. Tuirial reservoir tan full reservoir level chu 90.5 m a ni a, minimum drawdown level chu 68.0 m a ni (Petition 125/MP/2021-a CERC order), datum sawi a ni lo [TBC]; Serlui B reservoir tan tui sang zawng hmuh a ni lo [TBC], a kalpuitu-in a sawi hma chu ramri chu tui ri sang ber survey-in tih nghet a ni. Chu tui sang zawng hnuaia reservoir drawdown ram chu reservoir ṭhenkhat a ni. He hriatthiamna hi he Kaihhruaina Bu-in a ruat a ni.
Tlang ramah floodplain clause-te	Tlang ramah, Mizoram ram tam zawk, Clause 7.4 aṭanga 7.6 thleng chu **stream-corridor leh debris-flow (lui zawh hmun leh bal leh lei luang)** dan angin hriatthiam a ni: lui floodway chu a channel, a kam pang chhip thlenga a kam tlang pang, leh a thlen debris fan emaw leimin kawng reng reng a ni a, Zone 1 chu a zawh corridor a ni a, fihlim taka vawn tur hlauhawm chu tui ang bawkin lui-in a phur bal leh leimin bal a ni. Phai ramah chauh (Belhchian 2A: luipui 1% AEP tuilian sang zawng hnuaia ram, sub-area MZ-A1, MZ-C1 leh MZ-D1-a ang, Tlawng-a Sairang leh Kau-a Chawngte-ah) floodplain (tuilian luanna phai) dan angin hriatthiam a ni a, 1% AEP zau zawng, floodway leh flood fringe chu luipui model aṭangin map a ni. He hriatthiamna hi he Kaihhruaina Bu-in a ruat a ni.
Check-dam pool	Lui-a check dam hnunga tui dil, master plan-in Aizawl luiteah a rawt check dam pariat ang. He bung tan chuan Clause 7.7.1 hnuaia a khawlna chhiar a nih chauhin dil (tank) a ni; a nih loh chuan thil awm sa (existing feature) angin model a ni a, design ruahpui tin ṭan hunah leidip leh tuiin a khat vek niin ngaih a ni a, Clause 7.9 hnuaiah fihlim taka vawn a ni.
Ram neitu (landholder)	Tui awmna emaw a setback ram, vantlang ram a nih loh chuan, a neitu: mimal neitu, Land Revenue & Settlement Department aṭanga land pass emaw settlement neitu, Village Council-in a pek site neitu, emaw Lai, Mara leh Chakma Autonomous District Council huamah District Council ram dan hnuaia neitu [TBC]. Vantlang ram ni lo Zone 1 ram chu master plan-ah vawn hran (reserve) a ni emaw, ram neitu nena inremna ziak hmanga he Kaihhruaina Bu tan tih nghet a ni emaw a, lak a ni lo; Autonomous District Council huamah chuan District Council kaltlangin chauh tih a ni [TBC]. He dan hi he Kaihhruaina Bu-in a ruat a ni.

7.3 Tui awmnate inventory leh map siam

7.3.1 **State pum inventory.** Authority chuan IWRD leh Land Revenue & Settlement Department nen, a huam chhunga tui awmna zawng zawng GIS layer a enkawl tur a ni (Belhchian 7A). Tui awmna tin tan heng hi a ziak tur a ni:

- (a) a chi (Clause 7.2), a hming leh a survey number-te;
- (b) a enkawltu: Aizawl Municipal Corporation (a huam chhunga vantlang dil, lui, reservoir leh tuikhur leh vantlang drain-te tan, Mizoram Municipalities Act, 2007 section 80 leh 289 hnuaia a thuneihnaa awm), Lunglei Municipal Council (a huam chhungah), PWD emaw national-highway agency (an kawng drain leh culvert-te tan), IWRD (luipui, tui lak siam hna tenau (minor irrigation) leh tuilian venna hna tan), PHED (tui pek hnar leh tui lakna tan), NEEPCO (Tuirial reservoir leh a dam hnuaia lui chhung tan), State-a power department (Serlui B reservoir leh a dam hnuaia lui chhung tan [TBC]), Fisheries Department (Tam Dil tan, chanchin tlangzarh angin), EF&CC (ramngaw ram, riverine reserve leh wetland-te tan), Land Revenue & Settlement Department (ram record leh land pass-te tan), Mizoram Water Resources (Management and Regulation) Act, 2024 hnuaia a Village emaw Local Water Resources Committee nena Village Council (municipality pawn lama khua emaw notify khawpui tuikhur, drain leh tui awmnate tan), Lai, Mara leh Chakma Autonomous District Council huamah District Council leh a Village Council-te (Palak Dil tan chuan, Mara Autonomous District Council huama Pala Wetland Reserve Forest nen a inang a, ramngaw authority leh District Council [TBC]), mimal neitu emaw land pass neitu, developer (layout drain-te tan, an hlan hma chu), State Wetlands Authority (notify wetland tan; pakhat mah hmuh a ni lo), emaw pawl dang);
- (c) Revenue record-a a ramri ziak;
- (d) dil tan: FTL, MWL, TBL, surplus weir crest a sei zawng leh a chi, sluice-te, supply channel leh surplus course, an datum theuh nen;
- (e) dil cascade-a a awmna, a chunglam leh hnuailam dil-te nen;
- (f) 1% AEP tuilian zau zawng, map a nih chuan; leh
- (g) luah hnehna hriat sa, ziah ni nen.

7.3.2 **Project map.** Drainage report tin-ah Tui Awmna Sheet (Form 7-1) telh tur a ni a, heng hmuna tui awmna zawng zawng a lantir tur a ni:

- (a) site chhunga;
- (b) site ramri aṭanga 100 m chhunga; leh
- (c) luanna hnuailam (downstream), Bung 5-a luanna hnuailam zirchianna huam thlenga.

Sheet chuan, (a) leh (b) tan scale 1:1,000 emaw a lian zawka plan-ah, heng hi a lantir tur a ni:

- Revenue record ramri;
- FTL emaw kam chhip survey;
- MWL contour (dil) leh 1% AEP tuilian zau zawng;
- Zone 1 leh Zone 2 (Clause 7.4); leh
- supply channel, surplus course, sluice leh surplus weir zawng zawng.

7.3.3 **Hmuhna hnar.** Tui awmnate chu heng zawng zawng aṭanga hmuh chhuah tur a ni. An inang loh chuan tui awmna zau zawk chuan a thunun:

- (a) Land Revenue & Settlement Department ram record leh map-te, ram record vawngtu leh Aizawl Municipal Corporation huam chhunga ram hman dan la enkawl zeltu (CAG, 2025), a pek land pass leh settlement record-te nen (he Kaihhruaina Bu tan pakhat mah chhiar a ni lo [TBC]); Mizoram (Village Councils) Act, 2025 hnuaia Village Council-te-in in hmun leh ram dang an pek-te; Lai, Mara leh Chakma Autonomous District Council huamah, chuta ram nei leh settle-tu District Council-te ram record (Lai Autonomous District Council (Land Holding and Settlement) Act, 2002 hi thu tlem tê aṭangin chauh hriat a ni a, heng record-te pakhat mah chhiar a ni lo [TBC]); Mizoram Municipalities Act, 2007 section 80 leh 289 hnuaia Aizawl Municipal Corporation thuneihnaa awm vantlang dil, lui, reservoir, tuikhur leh drain-te; Master Plan for Aizawl: Vision 2030 ram hman dan map-te, a "W" use zone (luipui, lui, tuikhur, dil tê, dil lian, wetland leh tui luan khawmna hmun), Aizawl Municipal Corporation

(Site Development and Slope Modification) Regulations, 2017-in "Stream" hrilhfiahna atana a lak a luite, leh a drain leh catchment map (Map 8.3, he Kaihhruaina Bu tan lak chhuah a ni lo [TBC]); Corporation Landslide Hazard Maps (leimin hlauhawmna map) leh Aizawl leh khawpui thlan bikte tana MIRSAC leimin hlauhawm zonation atlas; Mizoram Water Resources (Management and Regulation) Act, 2024-in kum nga chhunga a phut tui hnar map siam (s.17), tih a nih hunah; Tuirial reservoir tui sang zawng leh ram chungchang NEEPCO record-te; tuikhur inventory reng reng, Aizawl tan pakhat mah hmuh a ni lo [TBC]; leh khawpui tin drain register (Bung 6);

- (b) NEEPCO leh Village Council dil register leh FTL leh MWL record-te;
- (c) Authority inventory (Clause 7.3.1) leh court thupek anga list tlangzarh reng reng;
- (d) hun hlui topographic map leh satellite milem, ISRO National Wetland Inventory and Assessment tiamin; leh
- (e) licensed surveyor-in site survey a siam, Clause 7.3.5-a datum anga level.

7.3.4 **Tuilian zau zawng map.** Authority chuan a huam chhung tan 1% AEP tuilian zau zawng emaw tuilian thuk zawng map a pawm thei. He clause hnuaia thuk zawng map pawm chuan Clause 6.11 hnuaia floor sang zawng pawh a ruat. Map pawm a nih chuan, Bung 3 leh 5 hnuaia site hydraulic study-in zau zawk a lantir loh chuan, hman tur a ni. Map pawm a nih loh chuan, heng site-te tan dilna thehluhtu (applicant)-in hydraulic study hmangin 1% AEP zau zawng a zawn chhuah tur a ni:

- (a) tuilian hlauhawm catchment (Bung 1)-a site reng reng;
- (b) tui awmna bula 1 ha emaw a aia lian site reng reng; leh
- (c) Authority-in a phut site reng reng.

Site dangte tan chuan Clause 7.4.6-a setback zau zawng nghet hman phal a ni.

7.3.5 **Datum.** He bung-a tui sang zawng (level) zawng zawng chu datum pakhatah sawi tur a ni a, drawing tin-ah datum chu ziah tur a ni. NEEPCO record-in datum local emaw hlui emaw a hman chuan, project datum-a thlakna chu survey-a sawi tur a ni.

> Hrilhfiahna. Mizoram-ah tuilian map a awm lo, tuilian ri a awm lo, floodplain dan a awm lo. State chuan National Green Tribunal hnenah "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo va, chuvangin chutiang flood plain zone chungchang hmalakna hi a inmil lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area and hence actions pertaining to such flood plain zones is irrelevant") a ti (O.A. 593/2017 leh 673/2018-a MPCB report). Chu chu tlang chhip tan a dik a, phai tan erawh a dik lo: Khawthlangtuipui-in June 2017-ah Tlabung a tilian a, sub-division chhunga in 350 vel tuiin a chim tih a ni (report dang chuan a pumin 9 leh a ṭhenin 60 aia tam a chhiar); July 2019-ah in 400 vel, khawpui chhunga 150, tuiin a chim tih a ni a; August 2023-ah chhungkaw 40 sawn chhuah an ni; June 2018-ah Tlawng-a Sairang-ah chhungkaw ṭhenkhat an tang; Bairabi-a Tlawng leh Champhai-a Tiau pawh a lian ṭhin (a zavaia chanchin tlangzarh angin). Floodplain zoning dan hmuh a ni lo va, SD&SM reg. 6-in site plan-a lantir tura a phut "Aizawl Municipal Corporation-in a ruat leh a hrilhfiah tuilian hlauhawm hmun" ("flood hazard areas as designated and defined by Aizawl Municipal Corporation") chu ruat a ni lo (pakhat mah hmuh a ni lo); master plan chuan "chhiatna thlen theihna hmun tana ram hman dan zoning regulation" ("Regulations for land use zoning for natural hazard prone areas"), "development loh zone" ("no development zone") anga lantir, chu Zonal Development Plan-te kutah a dah a, chung regulation-te chu May ni 17, 2023-ah sawrkar hnenah thawn a ni a, September 2023 thlengin phalna pek a ni lo (CAG, 2025). Awm chu leimin map a ni a, tuilian map a ni lo: Corporation Landslide Hazard Maps, "2014 emaw a hnu lama Landslide Policy Committee for Aizawl City-in a pawm standard anga siam" ("created in 2014 or later to the standards adopted by the Landslide Policy Committee for Aizawl City"), chuan site development permit tin kalphung a ruat a, MIRSAC leimin hlauhawm zonation atlas chuan Aizawl leh khawpui thlan bikte a huam. Luipuite hi teh tlem hle a ni: CWC chuan Mizoram-ah tui sang zawng enna hmun pasarih a nei a, a panga chu hman lohin a awm a, forecasting hmun a nei lo va, pakhat mah tan warning emaw danger level a awm lo; tuilian sang ber chhut chhuah awm chhun chu "Turial"-a Tuirial tan 149.0 m, June ni 17, 1995-a thleng a ni (SANDRP-in CWC table a ziak chhawnna, chanchin tlangzarh angin). He Kaihhruaina Bu tana thu hnar chhiar zingah chu level datum sawi a awm lo va, Tuirial reservoir full level 90.5 m (CERC) nen a inzawm dan sawi a ni lo [TBC]; hetah pakhat mah ngaihtuah chhuah a ni lo. Mizoram khawpui reng reng tan tuilian sang ber tlangzarh a ni lo [TBC], regulation-a floor dan awm chhun chu plinth, lei emaw kawng sang zawng aṭanga "a theih chuan … metre

> 0.45 aia hniam lo" ("preferably … not less than 0.45 metre"), "site tui luanna ṭha tawk a awm ngei theihna turin" ("so that adequate drainage of site is assured") (AMCBR reg. 26(2)(a)) a ni. Chuvangin phai-a tuilian zau zawng finfiahna ṭha ber chu hmun ngeiah a awm: Tlabung, Sairang leh Bairabi-a tuilian chhinchhiahna leh chenghote thusawi. Clause 7.3.4 chuan tuilian map a awm hunah Authority-in a pawm theihna a siam; chu hma chu phai ram leh site lian zawk leh tuilian hlauhawm site-te tan dilna thehluhtuin 1% AEP zau zawng a siam a, lui-a Clause 6.3.6-a bulking leh Clause 5.8.5(c) leh (d)-a tuilian chhinchhiahna survey leh tailwater (outfall hnuaia tui sang zawng) nen. He Kaihhruaina Bu hian phai ramah 1% AEP zau zawng a map a, nakina ruatna (designation) atan input angin a pe chhuak a, zone angin a ni lo; tlang ramah a corridor chu kam pang chhip aṭanga teh lui corridor a ni (Clause 7.2 hnua hrilhfiahna). Tui sang zawngte chu datum pakhatah sawi tur a ni a (Clause 7.3.5), level hman tin tan gauge leh datum hming sawi tur a ni. Clause 7.3.3 chuan ziak leh survey zau zawng zinga zau zawk a thunun tir, Revenue ramri leh survey-a tui kam hi an danglam fo va, luah hnehna avangin pakhatin emaw a tlem tawh thei a nih avangin. Clause 7.3.2-a 100 m zawnna band hi he Kaihhruaina Bu-in a ruat a ni.

7.4 Setback

7.4.1 **Setback hman tur tui awmnate.** Setback hi heng hi a hman a ni:

- (a) Clause 7.3.1 hnuaia ziah emaw Clause 7.3.3 hnuaia hmuh tui awmna zawng zawng, a lian leh tê eng pawh ni se; leh
- (b) channel pianphung (natural channel) zawng zawng, ziah emaw ziah loh emaw, site-ah **8 ha** emaw a aia tam tui luan khawmna.

7.4.2 **Zone pahnih.** Setback-ah zone pahnih a awm, Milem 7.1-a lantir angin:

- **Zone 1 (tui awmna humhalhna zone)**, tui awmna bulah; leh
- **Zone 2 (flood fringe setback)**, Zone 1 pawnah.

7.4.3 **Zone 1 zau zawng.** Zone 1 chu FTL contour (dil (tank), dil lian leh dil tê) emaw kam chhip (channel) aṭanga pawn lam pan teh a ni. A pahnih a hman theih chuan, zone zau zawk petu chu hman tur a ni. Zone 1 chu heng zinga **zau ber** thlengin a zau:

- (a) **15 m**, he Kaihhruaina Bu-in a ruat hniam ber, 8 ha emaw a aia tam tui luan khawmna channel pianphung tin zawh leh dil, reservoir leh tuikhur tin velah, kam chhip aṭanga teh, emaw a kam chu 10° aia chho tlang pang a nihna lui laih thuk-ah chuan, chu kam pang chhip aṭanga teh (ri zau zawk chu a nghet hmunah Clause 7.4.5 hnuaiah a thunun: Aizawl Municipal Corporation Building Regulations, 2012 leh Site Development and Slope Modification Regulations, 2017 pakhat mahin lui aṭanga hlat zawng an siam lo va, a pahnihna chuan "riverine reserve chu vawn tur a ni" ("the riverine reserve shall be maintained") (reg. 28) tih chauh a phut a, a hrilhfiah lo; drainage channel lian zawh master plan-a 15 m green buffer chu rawtna a ni; Tlawng zawh 800 m belt chu kum 1965-a Riverine Reserved Forest notification kum 2021-a tihbo a nih khan (chanchin tlangzarh angin) dan anga innghahna a hloh a, hman a ni lo; enact a nih finfiah loh kum 2023-a Rivers Ordinance leh Bill hnuaiah River Conservation Zone pakhat mah notify a ni lo; floodplain zone emaw tuilian hlauhawm hmun pakhat mah ruat a ni lo; a hnuaia Inpuanna en rawh);
- (b) floodway pawn kam (Clause 7.6.1); leh
- (c) dil (tank) tan, MWL contour.

7.4.4 **Zone 2 zau zawng.** Zone 2 chu Zone 1 pawn kam aṭanga **1% AEP tuilian zau zawng leh 10 m** thleng a ni. 1% AEP tuilian zau zawng chu Zone 1 chhunga a awm chuan, Zone 2 chu 10 m a zau.

7.4.5 **Dan leh phalna anga setback.** Heng hian Zone 1 emaw Zone 2 aia setback zau zawk an siam chuan, setback zau zawk chuan a khap hman danah a thunun: dan (statute), dan anga siam rule, planning permission thuthlung, emaw Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023 (enact a nih finfiah a ni lo) hnuaia River Conservation Zone-a tui luanna kawng-a thil sak, dan emaw tihdanglam tana State Authority phalna lak

hmasa (Mizoram River Protection Authority din a nih hriat a ni lo va, zone pakhat mah notify a ni lo); Mizoram Water Resources (Management and Regulation) Act, 2024 hnuaiah (Autonomous District Council pawnah) khawtlang tui hnar, tuikhur emaw dil tê ang tana WARDMA emaw District, Village emaw Local Water Resources Committee thupek; Aizawl Municipal Corporation drain emaw tui luanna kawng (water-course) reng rengah drain luh tir nana Corporation phalna ziak (Mizoram Municipalities Act, 2007 section 295 leh 296); Corporation site development permit thuthlung, SD&SM reg. 28-a riverine reserve leh reg. 26-a setback-te tiamin; District Disaster Management Authority phalna nena, Village Council-in in sak nana hmun him lo a puan (Mizoram (Village Councils) Act, 2025 s.13(6)); Tuirial emaw Serlui B reservoir emaw a dam hnuaia lui chhung emaw-a tui luang lut emaw a bula awm hna tan NEEPCO emaw State-a power department remtihna; riverine reserve, reserve forest emaw wetland-a hna tan EF&CC remtihna; a huam chhunga District Council thuthlung (pakhat mah hmuh a ni lo [TBC]); emaw Gauhati High Court (Aizawl Bench), National Green Tribunal emaw Supreme Court thupek.

7.4.6 **1% AEP zau zawng a awm loh chuan setback zau zawng nghet.** Clause 7.3.4-in hydraulic study a phut loh a, map pawm a nih loh chuan, setback (Zone 1 leh Zone 2) chu Clause 7.4.3-a ang zela teh, a hnuaia mi aia tlem loh tur a ni:

Table 7.1 — 1% AEP zau zawng a awm loh chuan setback zau zawng nghet

Tui awmna	Setback zawng zawng (Zone 1 + Zone 2)	Chu zinga Zone 1
8 ha aṭanga 65 ha thleng tui luan khawmna channel	25 m	15 m
65 ha aṭanga 20 km² thleng tui luan khawmna channel	40 m	15 m
20 km² aia tam tui luan khawmna channel, leh luipui	50 m	20 m
Dil (tank), dil lian emaw dil tê	MWL contour + 25 m	MWL contour thleng, FTL aṭanga 15 m aia tlem lo
Marsh, estuary emaw backwater	Authority-in a notify angin, 50 m aia tlem lo	15 m

He table hi Policy Supplement (Belhchian 1C)-a alternative S-3 a ni a, Clause 1.7 hnuaiah pawm theih a ni.

7.4.7 **Engtik lai pawhin a hniam ber.** He bung hnuaia setback reng reng leh Clause 1.10 hnuaia variance reng reng hian Zone 1 chu 15 m aia hniamin a tihtlem loh tur a ni (Clause 1.10.3(c)).

> Hrilhfiahna. 15 m hniam ber hi he Kaihhruaina Bu-in a ruat a ni, ri zau zawk a nghet lohna hmuna hydraulic corridor hniam ber atan. Mizoram building emaw site-development regulation-ah lui emaw tuikhur aṭanga hlat zawng metre-a teh a awm lo; ri awmte chu rawtna, hrilhfiah loh reserve, a innghahna tihbo belt leh Bill an ni. Master Plan for Aizawl: Vision 2030 chuan drainage channel lian-te tan "a sir lehlam zawngin metre 15 zau green buffer" ("a 15 meters wide green buffer on both sides") a rawt; Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 chuan lui pianphung bula ram tan "riverine reserve chu vawn tur a ni" ("the riverine reserve shall be maintained") (reg. 28) a phut a, mahse a hrilhfiah lo; master plan-a Tlawng sir tin 800 m green belt chu kum 1965-a Riverine Reserved Forest notification, Gauhati High Court-in January ni 27, 2021-a a tihbo (chanchin tlangzarh angin), chungah a innghat a, he Kaihhruaina Bu-ah hman a ni lo; Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, River Conservation Zone-te chu notify a ni lo. Regulation-a tui aṭanga hlat zawng awm chhun chu septic tank leh soak pit-in "tui hnar" ("a water source") aṭanga an hlat zawng 15 m hi a ni (AMCBR reg. 33). 15 m hniam ber hian master plan-a channel lian tana number a la a, 8 ha emaw a aia tam tui luan khawmna channel pianphung tin leh dil leh tuikhur tin velah a pharh. A kam chu 10° aia chho tlang pang, Clause 4.11 tlang dan (hill rule) bul ṭanna, a nihna lui laih thuk-ah chuan, tui kam aṭangin ni lovin chu kam pang chhip aṭangin teh a ni, kam leimin chu a chhip aṭangin a ṭan a, chhip bula lei laih, lei vur emaw soak pit-in a tlu thla thei a nih avangin (he Kaihhruaina Bu-in a

ruat). He Kaihhruaina Bu hnuaia phalna pek hmasawnna thar leh siam ṭhatna (redevelopment) tan a ni a, in awm sa tan a ni lo; Zone 1 ram chu mimal ta emaw land pass hnuaia neih a nih chuan master plan-ah vawn hran emaw neitu nena inremna hmangin tih nghet a ni a, lak a ni lo (Autonomous District Council huamah chuan District Council kaltlangin chauh [TBC]). He Kaihhruaina Bu rawtna a ni a, dan anga zau zawng a ni lo, ri zau zawk reng reng a tihtlem ngai lo (a hnuaia Inpuanna en rawh). Setback chu map-a 1% AEP zau zawng leh belh thlenga pharh hi Kansas City Metro APWA Section 5600 (2025.01) zone pahnih ruangam a zui:

- APWA Zone 1 (lui sir) chu kam chhip aṭangin teh a ni a, utility leh kawng kaltlanna chauh a chhungah phal a ni.
- APWA Zone 2 chu 1% AEP tuilian zau zawng leh 10 ft (3 m vel) a ni, acre 20–40 tui luan khawmna lui tan.
- APWA chuan 2025.01-ah lui setback bul ṭanna chu acre 40 aṭanga acre 20 (8 ha vel)-ah a tihniam.

(MARC, APWA 5600 Policy Supplement, Nov 2025.) Clause 7.4.1(b) hian 8 ha bul ṭanna hi a hmang. He Kaihhruaina Bu-a 10 m belh hi APWA 10 ft aiin a zau a, a entirna hmasa chiang a awm lo. He Kaihhruaina Bu-in a ruat chhan chu: Mizoram tuilian map, a awm chuan (Mizoram khawpui reng reng tan pakhat mah hmuh a ni lo), US map aiin a tlangpuiin a chiang lo; Mizoram khawpui-a hmun zawl awm chhun chu a tlangpuiin lui kam zawl emaw phai a ni, Tlabung, Sairang, Bairabi leh Vairengte-a ang te, Champhai phai buh lo ram, emaw dil emaw reservoir kam (chuvangin tui sang zawng dik lo tê-in tuilian kam a sawn hla hle); belh hian tui awmna zawh enkawlna kawng tan hmun a pe bawk.

Clause 7.4.6-a table zau zawng nghet hi he Kaihhruaina Bu-in a ruat a ni. A channel zau zawngte hi kum 2006-a APWA lui buffer pangngai, acre 40 aia tlem, acre 40–160, acre 160–5,000 leh acre 5,000 aia tam tui luan khawmna tan 40 ft, 60 ft, 100 ft leh 120 ft (12, 18, 30 leh 37 m) (KC APWA 5600, 2006, §5605.3) aṭanga teh a ni. A chung lam pana kim (round up) a ni a, 15 m hniam berah a ding. APWA chuan chhan inang avangin table zau zawng nghet a pe: tui luan khawmna tê tan 1% zau zawng hi map a ni lo fo tiin khawtlangte an dodal (MARC Supplement, 2025). Authority-in map-a zau zawng a pawm veleh table hi chung map-te-in thlak a ṭha.

URDPFI (2015) chuan kum 10 danga tuilianin a chim hmun chu park leh infiamna hmun atan a vawng a, kum 25 tuilian zone-ah chenna chu stilt (ban chunga sak) chungah chauh, plinth sang zawng hniam ber nen, basement nei lovin a phal. He bung hi a khauh zawk. In chenna chu 1% AEP zau zawng leh belh zawng zawngah a phal lo, 1% AEP (kum 100) hi he Kaihhruaina Bu-a tui luanna system lian (major system) standard a nih avangin (Bung 6).

Mizoram tui zawh ri-te chu plan rawtna, hrilhfiah loh reserve, a innghahna tihbo ramngaw belt, Bill, septic tank hlat zawng leh tlang pang ri ṭhenkhat an ni; a regulation pakhat mahin lui aṭanga hlat zawng metre-a teh a siam lo (NEER chhiar dan). Pakhat zel hi a hman theihna hmunah chauh a nghet a, he Kaihhruaina Bu-in a hman angin a dinhmun hetah sawi a ni. **(a) Master plan-a 15 m.** "Drainage channel lian zawng zawng zawhin, a sir lehlam zawngin metre 15 zau green buffer rawt a ni bawk" ("All along the major drainage channels, a 15 meters wide green buffer on both sides have also been recommended") (Master Plan for Aizawl: Vision 2030). Plan rawtna a ni. Plan phalna notification hmuh a ni lo (thu hnar pakhatin March 2013-ah phalna pek a ni a ti; finfiah a ni lo), mahse 2023-a amendment aṭang khan Corporation online permit system chuan "AMC Building Regulations, 2012 leh Master Plan for Aizawl, Vision-2030 dan ang ni lo" ("not as per the provisions of the AMC Building Regulations, 2012 and the Master Plan for Aizawl, Vision-2030") rawtna reng reng a hawn kir a, chuvangin plan chu hman takah a en tel a ni; channel engte nge "lian" ("major") tih hrilhfiah a ni lo. **(b) Tlawng zawh 800 m belt.** "Tlawng lui zawng zawng zawhin, lui laili aṭanga a sir tin 800 m green belt chu Mizo District (Forest) Act, 1955, section 21 nena section 14 ang zelin vawn hran a ni" ("All along the river Tlawng an 800 m green belt on either side from the centre of the river has been kept reserved as per the Mizo District (Forest) Act, 1955, section 14 read with section 21") (master plan). A dan innghahna, lui 16 sir tin mile chanve chhunga ramngaw chu reserved forest-a puangtu January ni 28, 1965-a notification, chu land pass neitute petition-ah Gauhati High Court (Aizawl Bench)-in January ni 27, 2021-ah a tihbo; April 2021-a executive notification chuan lui laili aṭanga 800 m restricted zone, phalna lak hmasa hmanga hmasawnna nen, a siam nia sawi a ni (a thu chhiar a ni lo); State writ appeal chu November ni 9, 2022-ah lak kir a nih avangin paih a ni; special leave petition thehluh a ni a, a rah chhuah hmuh a ni lo; Supreme Court chuan April 2024-ah riverine reserved forest-a hna chungchangah State leh NHIDCL hnenah notice a chhuah (a zavaia chanchin tlangzarh angin). 800 m hi he Kaihhruaina Bu-ah **engtik lai mahin dan anga buffer a ni lo** a, Zone 1 ruat nan hman a ni lo; April 2021 notification aṭanga khapna reng reng site-ah a nghet em tih dilna

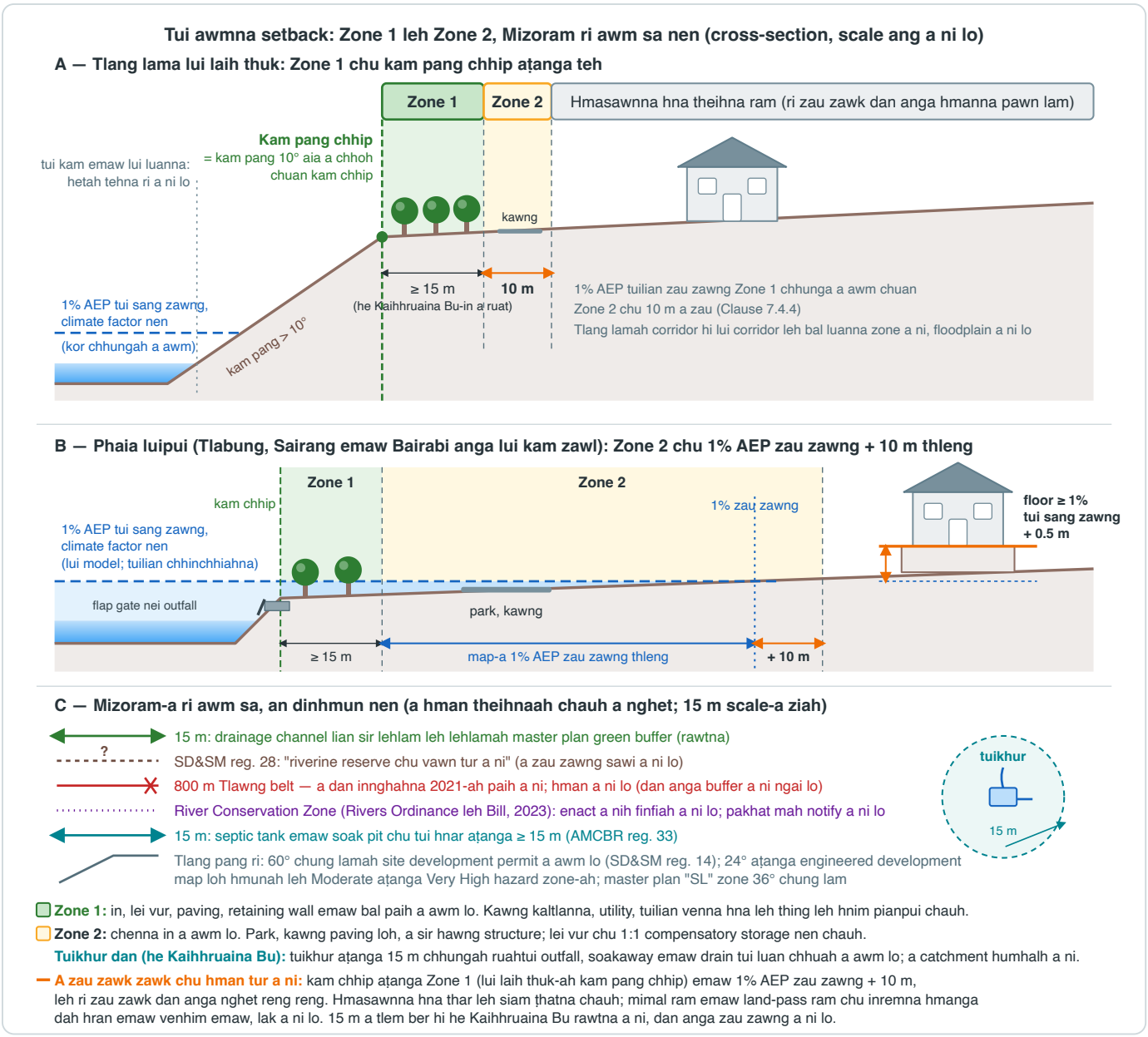
thehluhtuin Form 7-1-ah a sawi. **(c) Riverine reserve.** "Lui pianphung bula emaw a chhunga lui awm ram tan, riverine reserve chu vawn reng tur a ni a, site aṭanga lei emaw bal emaw lui emaw riverine reserve-a a luan luh loh nan hmalakna tih tur a ni" ("For plots adjacent to or including natural streams, the riverine reserve shall be maintained, and measures shall be taken to prevent erosion of materials or sediment from the site into the stream or riverine reserve") (SD&SM reg. 28); lei laih chhuah chu "tui luan kawng emaw riverine reserve" ("drainage courses or riverine reserves") aṭangin hlatah dah a ni (reg. 29). "Riverine reserve" hi regulation-ah hrilhfiah a ni lo (NEER chhiar dan), a zau zawng pawh hmuh a ni lo. **(d) River Conservation Zone.** Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, chuan State Authority phalna lak hmasa lovin tumahin "protected river emaw river conservation zone-ah hmasawnna hna reng reng … tui luanna kawng emaw channel dan emaw tihdanglam tiamin, emaw land pass chi reng reng pek emaw lak emaw" ("any developmental activity … including obstruction or diversion of the water course or channel, or issue or obtain land pass of any kind in the protected river or river conservation zone") an sak emaw an tih emaw a khap ang a, "bridge leh culvert, check dam, tuikhur" ("bridges and culverts, check dams, waterholes") tiamin a hlihsak ang (Bill s.15(1)(a)), State-in zone pawn lam catchment-te "leimin emaw kor leh tui luang chak (torrent) siam lohna atan" ("for the prevention of landslips or of the formation of ravines and torrents") leh "tuikhur, lui leh luipuia tui pekna vawn reng nan" ("for the maintenance of water supply in springs, streams and rivers") a thunun theih ang (s.16); Autonomous District Council-te an huam lo. Protected River emaw River Conservation Zone pakhat mah notify a nih hriat a ni lo. **(e) Septic tank hlat zawng.** Septic tank leh soak pit chu "tui hnar aṭanga metre 15 radius chhungah dah loh tur a ni" ("shall not be located within a radius of 15 metres from a water source") (AMCBR reg. 33). Regulation-a tui aṭanga hlat zawng metre-a teh awm chhun a ni a, septic system a thunun a, in emaw drain emaw a thunun lo. **(f) Tlang pang ri-te.** "Tlang pang degree 60 aia chho hmuna project tan" ("for a project located in an area with slopes greater than 60 degrees") site development permit pek a ni lo (SD&SM reg. 14); Moderate, High leh Very High leimin hlauhawm zone-ah, ram map loh a tlang pang 24° emaw a aia chho a nih chuan, leh lei laih lian emaw sang leh structure chelhtu hna tan, site development chu engineered a ni a, geotechnical report nen, "tlang pang 24 degree emaw a chung lam reng reng aṭanga metre thum chhungah" ("within three meters of any slope of 24 degrees or more") hlihsakna phal a ni lo (SD&SM reg. 4); master plan "SL" zone chuan "tlang pang 36° aia chho hmun, drainage line lian bula hmun" ("areas with slope higher than 36°, areas adjacent to major drainage lines") a huam a, "36 degree aia chim tlang pangah development chu nasa takin tihtlem a ṭha" ("development on slope more than 36 degree should be strongly discouraged") tih a awm, July 2024-ah High Court-in a tarlan thu (chanchin tlangzarh angin). Corporation huam pawnah heng regulation-te pakhat mah hman a ni lo: Lunglei Municipal Council regulation hmuh a ni lo [TBC], Village Councils Act-a model building bye-laws siam a ni lo (pakhat mah hmuh a ni lo), Lai, Mara emaw Chakma Autonomous District Council-in in sak emaw tui luanna chungchang dan a siam hmuh a ni lo. Clause 7.4.7 chuan he Kaihhruaina Bu hman apiangah Zone 1 hniam ber chu 15 m a siam.

Inpuanna. Mizoram-ah **dan emaw regulation hmuh reng rengah lui, dil emaw tuikhur aṭanga hlat zawng metre-a teh a awm lo**: a building leh site-development regulation-te chuan pakhat mah an siam lo (a pahnihna chuan "riverine reserve chu vawn tur a ni" ("the riverine reserve shall be maintained") tih chauh a phut, zau zawng tel lovin); drainage channel lian zawh master plan-a 15 m chu **rawtna** a ni; Tlawng zawh 800 m belt chu kum 1965-a riverine reserved forest notification kum 2021-a tihbo a nih khan **dan anga innghahna a hloh** (chanchin tlangzarh angin); Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, hnuaiah **River Conservation Zone pakhat mah notify a ni lo**; State-ah khawi hmunah mah **floodplain zone emaw tuilian hlauhawm hmun ruat a ni lo**. Clause 7.4.3 leh 7.4.7-a Zone 1 **15 m hniam ber**, leh Table 7.1-a a aṭanga lak value zawng zawng hi, zau zawk a nghet lohna hmunah hydraulic corridor angin **he Kaihhruaina Bu-in a ruat a ni**: 8 ha emaw a aia tam tui luan khawmna channel pianphung tin zawhin, dil, reservoir leh tuikhur tin velah, leh **a kam chu 10° aia chho tlang pang a nihna lui laih thuk-ah, chu kam pang chhip aṭanga teh**. Chutiang bawkin Clause 7.4-a setback zone-te, Zone 2 thunun 1% AEP zau zawng, he Kaihhruaina Bu-a tehna ri pahnih, dil emaw reservoir ramri leh tlang ramah core floodplain clause-te stream-corridor leh debris-flow dan anga a hriatthiamna, leh tuikhur dan (Clause 7.2 hnua hrilhfiahna; Clause 8.8.1) pawh. Hengte hi **he Kaihhruaina Bu rawtna a ni a, dan anga zau zawng emaw dan a ni lo**, sawrkar pawl, municipal pawl, Village Council emaw District Council reng rengin pawm a ni lo, thlawp a ni hek lo. 15 m hi master plan-a channel lian tana number a ni a, he Kaihhruaina Bu huam channel zawng zawng leh dil leh tuikhur-te thlengin pharh a ni. **He Kaihhruaina Bu hnuaia phalna pek**

hmasawnna thar leh siam ṭhatna tan a ni a, in awm sa tan a ni lo; Clause 7.4.7 chuan a hnuaia variance a phal lo; Zone 1 ram chu mimal ta emaw land pass hnuaia neih a nih chuan **master plan-ah vawn hran emaw neitu nena inremna hmangin tih nghet a ni a, lak a ni lo** (Autonomous District Council huamah chuan District Council kaltlangin chauh [TBC]). Setback chu **tehna ri pahnih leh a setback zinga hla ber thleng chu** hman a ni a, chuvangin he Kaihhruaina Bu hi lui, dil leh tuikhur tin zawhah **dan aiin a khauh zawk** a, khawi hmunah mah a khauh lo zawk lo. Awm sa, zau zawk emaw khauh zawk a nih apianga thunun (Clause 7.4.5), chu hetiang hi a ni:

- **Aizawl Municipal Corporation regulation-te.** Corporation-in site pakhat tana a zau zawng a ruat apianga SD&SM reg. 28-a riverine reserve; lei laih chhip leh lei vur ke aṭanga SD&SM reg. 26-a setback-te, "interceptor drain ngai reng reng atan tihpun a ngai thei" ("may need to be increased for any required interceptor drains"); SD&SM regs. 4 leh 14-a permit kalphung (Moderate, High leh Very High leimin hlauhawm zone-a leh map loh 24° emaw a aia chho tlang pang-a engineered hmasawnna; 60° chunglamah permit pek a ni lo); septic tank emaw soak pit leh "tui hnar" ("a water source") inkara 15 m (AMCBR reg. 33), he Kaihhruaina Bu tuikhur dan-in ruahtui outfall tan hlat zawng atan a lak bawk. Corporation huamah chauh hman an ni.
- **Master plan.** Drainage channel lian zawh 15 m green buffer, tlang pang 36° chunglam leh "drainage line lian bula hmun" ("areas adjacent to major drainage lines") "SL" zone, leh luipui, lui, tuikhur, dil tê, dil lian, wetland leh tui luan khawmna hmun "W" use zone (Master Plan for Aizawl: Vision 2030): **plan rawtna an ni**, 2023 aṭanga Corporation online permit system-in an en tel; dilna thehluhtuin Form 7-1-ah a sawi. Tlawng zawh 800 m belt chu **hman a ni lo**: a dan innghahna chu 2021-ah tihbo a ni a, April 2021 executive notification (a thu chhiar a ni lo [TBC]) hnuaia restricted zone reng reng, site-ah a nghet a nih chuan, Form 7-1-ah sawi a ni a, dan anga buffer angin engtik lai mahin a ni lo.
- **Rivers dan, hman mek a nih chuan.** River Conservation Zone, a chhunga tui luanna kawng-a thil sak, dan emaw tihdanglam tana State Authority phalna lak hmasa nen, dan chu hman mek a nih finfiah a nih a, zone notify a nih hnu chauhin Clause 7.4.5 hnuaiah dan anga ri angin a thunun ang; pakhat mah finfiah a ni lo.
- **Tui hnar leh khaw dante.** Mizoram Water Resources (Management and Regulation) Act, 2024 hnuaia Village leh Local Water Resources Committee-te "tui hnar hriat tawhte bawlhhlawh laka veng" ("Prevent pollution of identified water sources") leh catchment humhalh mawhphurhna, leh District Disaster Management Authority phalna nena Village Council-in "leimin tihziaawm nan in sak nana hmun him lo" ("unsafe site for house construction for mitigation of landslide") a puan reng reng (Mizoram (Village Councils) Act, 2025, s.13(6)); pakhat mahin hlat zawng a siam lo, pakhat mahin Autonomous District Council-te a huam lo.
- **Wetland, ramngaw, court leh enkawltute.** Wetlands (Conservation and Management) Rules, 2017 hnuaia notify wetland reng reng (pakhat mah hmuh a ni lo) leh Ramsar site Pala wetland (Clause 7.12); EF&CC hnuaia reserve forest leh ramngaw ram; Gauhati High Court (Aizawl Bench), National Green Tribunal leh Supreme Court thupek, a din angin; Tuirial reservoir-a NEEPCO ri-te leh Serlui B-a State power department ri-te; leh District Council ri reng reng (pakhat mah hmuh a ni lo [TBC]).

He Kaihhruaina Bu hian 15 m hi a hniam ber atan a siam, chhan chu: Mizoram regulation-te-in a luite tan hlat zawng engmah an pe lo; tlang chhip khawpui-a lui chu a chunglam drain tin tawpna a ni a, an tui, ek tui leh leimin bal channel pakhatah a phur (Clause 8.9, Hrilhfiahna); 15 m hi master plan ngei-in channel lian tana a hman number leh regulation ngei-in tui hnar aṭanga a hlat zawng a ni; leh 15 m hi Table 7.1 teh chhuahna APWA lui buffer pangngai tê ber (12 m) aiin a sang. Lui laih thuk-ah kam pang chhip hi ri a ni, lui-a tlu thla tlang pang chu a chhip aṭangin a tlu ṭhin a nih avangin: Directorate of Geology and Mining chuan 2022-23-a leimin lian a zirchian ṭhena thum ṭhena hnih chu "tui luanna ṭha lo" ("improper drainage") avangin a ti (chanchin tlangzarh angin), SD&SM 2017 tum clause chuan "sewerage leh tui luanna chu thunun ṭha lova tlang pangah paih" ("disposing of sewerage and drainage onto slopes in a poorly controlled manner") chu "tlang pang nghet lohna a tipung nasa thei" ("can greatly increase slope instability") hna zingah a sawi. Dan (statute), rule, notification, master plan, District Council dan emaw court-in a pawm hma chu, 15 m hniam ber hi he Kaihhruaina Bu-in a rawt standard a ni a, chunga dan hmanrawte chauh dan anga hniam ber an ni. Phalna petu authority-te chuan phalna tin-ah eng nge an hman tih an sawi a ṭha.



Milem 7.1 — Tui awmna setback zone-te: dil (tank) emaw channel cross-section, FTL, 1% AEP tuilian sang zawng, 15 m hniam ber ri, Zone 1 leh Zone 2 lantirna. He Kaihhruaina Bu tana milem siam thar, Kansas City Metro APWA, Section 5600 Version 2025.01 leh Policy Supplement (MARC, 2025) aṭanga siam danglam.

7.5 Zone tin-a hman phal dan

7.5.1 **Zone 1.** Zone 1-ah in, lei vur, paving, retaining wall, ramri bang, compound wall (in hung bang), lei, bal emaw bawlhhlawh paih, thil dahkhawm, emaw sak lai hunah thil chhawm (stockpile) reng reng dah loh tur a ni. A hnuaia mite chauh phal a ni, pakhat zel enkawltu NOC nen:

- (a) Clause 7.10.3 zawm kawng, rail leh utility kaltlanna;
- (b) tuilian leh tui luanna hna: outfall, inlet structure, gross pollutant trap (bawlhhlawh dawnna), sluice, surplus weir, bund tihchakna leh kam venna;
- (c) a pianphung thing leh hlobet, thing phun leh ramsa chenna hna;
- (d) lei pangngai sang zawnga kawng zawh lam leh enkawlna kawng, paving loh emaw tui luh theih (permeable); leh
- (e) Clause 7.9 hnuaia tui awmna siam ṭhat.

7.5.2 **Zone 2.** Zone 2-ah chenna in, basement, school, damdawi in, fuel dahna emaw thil hlauhawm dahna dah loh tur a ni. A hnuaia mite hi phal a ni:

- (a) Zone 1-a hman phal zawng zawng;
- (b) park, infiamna hmun, pawn lama infiamna field leh khawpui chhunga lo neih;
- (c) a sir hawng structure (shelter, pavilion), tui luang dang bang nei lo;
- (d) lei pangngai sang zawnga tui luh theih surface nena motor dahna, 1% AEP tuilian thuk zawng 0.3 m aia tam lohna hmunah;
- (e) Bung 4 leh 8 hnuaia retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw), detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) leh tui ṭhatna facility, floodway pawna an awm a, an khawlna vawi hnih chhiar a nih loh chuan (Clause 7.6.5); leh
- (f) lei vur, (a) aṭanga (e) thleng tan emaw vantlang infrastructure pawimawh tan chauh, Clause 7.6.4 hnuaia compensatory storage nen chauh.

7.5.3 **Daidanna (fence).** Zone 1 leh Zone 2-a daidanna chu a hawng (chain-link emaw railing) tur a ni a, lei pangngai chunglamah plinth bang nei lovin, tui luang a dan loh nan leh bal a man loh nan.

7.5.4 **Open space vawn hran.** Authority-in a remtih chuan, Zone 2 ram chu Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017-in a phut open space-ah chhiar tel theih a ni. Zone 1 ram chu Authority thutlukna angin enkawltu hnenah hlan emaw mimal hman loh turin vawn emaw tur a ni.

> **Hrilhfiahna.** Hman phal dante hi APWA 2025.01 a zui: Zone 1-ah utility leh kawng kaltlanna chauh; Zone 2-ah utility sei, kawng zawh lam leh a sir hawng structure; zone pahnih chhungah phalna lovin thing kih, lei tihtlang, lei vur emaw paving tih loh (MARC Supplement, 2025). Clause 7.5.2 chuan URDPFI (2015)-in kum 10 tuilian zone-a a phal park leh infiamna hmun a belh. Clause 7.5.1 leh 7.5.3-a bang khapna hi tlang khawpui tihdan chhanna a ni: channel leh dil zawha compound wall-te hi tuilian laiin dam angin an awm a, luah hnehna kawng hmasa ber an ni fo. Clause 7.5.2(d)-a motor dahna tana thuk zawng 0.3 m khapna hi a entirna hmasa chiang a awm lo va, he Kaihhruaina Bu-in a ruat a ni.

7.6 Floodway, flood fringe leh compensatory storage

7.6.1 **Floodway ri siam.** Floodway chu 1% AEP tuilian (climate factor nen) hydraulic model hmangin, encroachment method hmangin ri siam tur a ni: flood fringe tui luan tirna (conveyance) chu kam pahnih aṭangin inang takin paih a ni a, 1% AEP tui sang zawng 0.1 m a san thleng. Floodway ri siam a nih loh chuan, 1% AEP tuilian zau zawng pumpui chu floodway angin ngaih tur a ni. Dil (tank) tan, MWL hnuaia ram zawng zawng chu floodway a ni.

7.6.2 **Floodway-ah lei vur phal a ni lo.** Floodway chhunga 1% AEP tuilian sang zawng hnuaiah lei vur, in, embankment, kawng tihsan emaw dangna dang reng reng dah loh tur a ni, Clause 7.5.1(a) leh (b) hnuaia Zone 1-a phal hnate erawh chu. Chung hnate chuan hydraulic analysis hmangin, dilna thehluhtu ram pawnah, chunglam emaw hnuailam emaw, 1% AEP tui sang zawng 0.01 m aia tam an tihsan loh tih lantir tur a ni.

7.6.3 **Flood fringe-a lei vur.** Flood fringe-a 1% AEP tuilian sang zawng hnuaia lei vur chu heng hunah chauh phal a ni:

- (a) Clause 7.5.2 hnuaia hman phal tan, emaw Clause 7.6.6 hnuaia Authority-in developed-fringe area (flood fringe-a in sak tawhna hmun) a notify hmuna setback pawnah; leh
- (b) Clause 7.6.4 hnuaia compensatory storage nen.

7.6.4 **Compensatory storage.** Flood fringe-a lei vur a nih chuan, compensatory storage, heng ang hi, siam tur a ni (Milem 7.2):

- (a) 1% AEP tuilian sang zawng hnuaia lei vur **1.0 m³ tin tan khawlna 1.0 m³** tal a thlak;
- (b) **sang zawng inangah** siam a ni: bo leh thlak tui zat chu **0.3 m** aia sang lo sanzawng band tinah inbuk tur a ni, tui sang zawng pangngai (emaw 50% AEP sang zawng, a sang zawk chuan) aṭanga 1% AEP tuilian sang zawng thleng;
- (c) tui awmna inang lui chhung inangah a awm a, a hydraulic inzawm a, lei vur aiin hnuailamah a awm lo;
- (d) tuilian a hniam lam rualin gravity-in tui awmnaah a kir leh fel a, pump hman lovin, tui sang zawng pangngai hnuaia tui ding reng a awm lo;
- (e) lei vur hmain emaw a rualin siam a ni; leh
- (f) covenant emaw hlanna hmangin tih nghet a ni a, nakinah vur ngai lo.

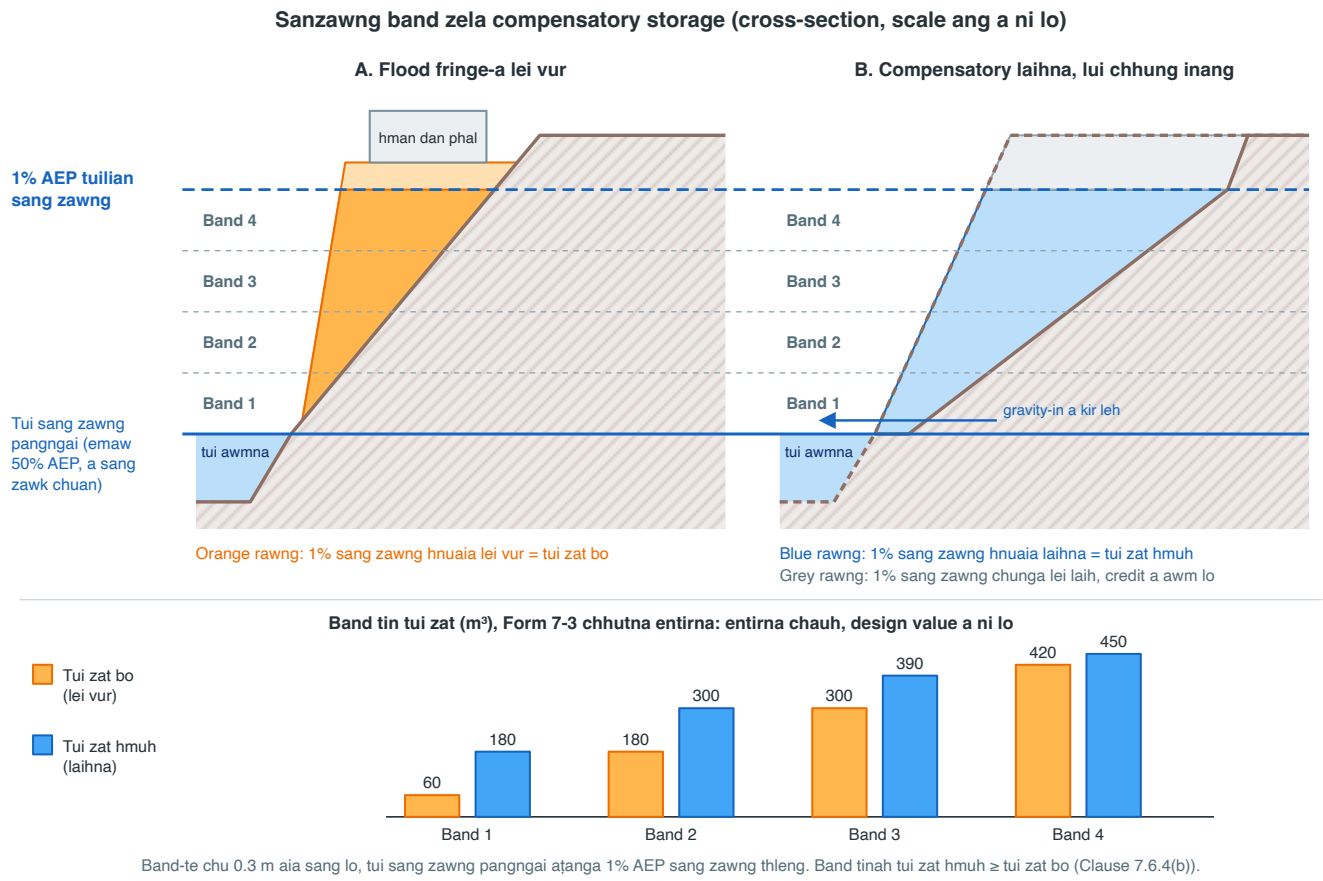
7.6.5 **Vawi hnih chhiar loh.** Compensatory storage chu Bung 4 hnuaia detention emaw retention khawlna angin chhiar loh tur a ni. 1% AEP tuilian zau zawng chhunga detention leh retention khawlna chu 1% AEP tuilian sang zawng chunglam tui zat chauh chhiar tur a ni, ruahpui inrual (joint event) model (Clause 2.12)-in a awm tih a lantir loh chuan.

7.6.6 **Developed-fringe area.** Authority chuan 1% AEP tuilian zau zawng chhunga floodway pawna in sak tawhna ram, siam ṭhatna-ah Zone 2 hman theih lohna hmun chu map hmangin a notify thei. Notify developed-fringe area-ah:

- (a) siam ṭhatna chu Zone 2 khapna tel lovin phalna pek theih a ni;
- (b) mi chenna chhuat hniam ber leh kawngka leh tukverh zawng zawng chu 1% AEP tuilian sang zawng aṭanga 0.5 m tal a sang tur a ni (Bung 6);
- (c) basement phal a ni lo;
- (d) siam ṭhatna chuan 1% AEP tuilian sang zawng hnuaia tuilian khawlna a tihbo loh tur a ni (Clause 7.6.4), chu atan stilt (ban chunga sak) hman theih a ni; leh
- (e) Zone 1 chu a pumin hman zel a ni.

> Hrilhfiahna. Sang zawng inanga 1:1 compensatory storage hi he Kaihhruaina Bu-in a ruat a ni. Tui zat inbuk mai chu a tawk lo: tui sang zawng pangngai hnuaia laih khawlna chu tuilian a thlen hmain a khat tawh a, tuilian tan ṭangkaina a nei lo. Chunglam hmuna khawlna hmuh chuan hnuailam hmuna khawlna bo a thlak lo, hnuailam khawlna chu tuilian tinah hman a nih a, chunglam khawlna chu tuilian lian berah chauh hman a nih avangin. Sanzawng band tin chhunga tui zat inbuk hian harsatna pahnih hi a pumpelh. 0.3 m band, kaltlanna tana 0.01 m phalna, leh Clause 7.6.1-a encroachment method hman hi he Kaihhruaina Bu-in a ruat a ni; encroachment method hi one-dimensional hydraulic model-ah floodway ri siamna kalphung pangngai a ni. 1% AEP tui sang zawng san phal 0.1 m hi US National Flood Insurance Program-in a hman 1 ft (0.3 m vel) aiin a khauh zawk. Mizoram phaite, Tlabung, Sairang, Bairabi leh Vairengte-a lui kam zawl leh Champhai phai te, chu a vela tlang pangte ang lovin an zawl a, chuvangin tui sang zawng san tê pawhin tuilian chu ram zau takah a pharh a, channel pakhat zawha luah hnehna tê tam tak chu an pung khawm.
>
> Mizoram-ah dil reng reng tan tui sang ber map a ni lo va, dan reng rengin dil aṭanga setback a teh lo, chuvangin dil emaw reservoir setback tehna ri chu he Kaihhruaina Bu aṭangin a lo chhuak tur a ni. A danglamna hi reservoir-ah a pawimawh ber, an tui sang zawng chu kum chhungin a danglam ṭhin a nih avangin: Tuirial reservoir chu full reservoir level 90.5 m leh minimum drawdown level 68.0 m inkarah kalpui a ni a (Petition 125/MP/2021-a CERC order; datum sawi a ni lo [TBC]), chuvangin tui hniam laia tui kam aṭanga ri zawn chuan reservoir ngei drawdown ram 22.5 m thleng in sak nan a hawng ang a, Serlui B reservoir tan tui sang zawng pakhat mah hmuh a ni lo [TBC]. November aṭanga March thleng thla roah a tê ṭhin dil chungchangah pawh chutiang bawk chu a dik, a tê zawk zawngin. He Kaihhruaina Bu hian dil leh reservoir tin chu survey ni-a tui kam aṭangin ni lovin, tui sang zawng sang aṭanga teh ramri a pe: hun chhunga dil kam leh reservoir full emaw sang ber sawi sang zawng chu a ramri ṭhenkhat a ni a (Clause 7.2 hnua hrilhfiahna), MWL thlenga foreshore chu a tuilian khawlna a ni. MWL hnuaia ram zawng zawng chu floodway anga ngaih (Clause 7.6.1) chuan dil foreshore-ah in thar emaw lei vur reng reng phalna pek a ni lo tihna a ni.

Clause 7.6.6-a developed-fringe kalphung hi he Kaihhruaina Bu-in a ruat a ni. Phai khawpuite ram tam tak, an in-te chu luipuiin a tihlian tawh lui kam zawlah a ding a, chung zinga pakhat mah tan tuilian zau zawng map a ni lo (NEER chhiar dan), Khawthlangtuipui-a Tlabung ang, June 2017-ah sub-division chhunga in 350 vel tuiin a chim tih a ni a (report dang chuan a pumin 9 leh a ṭhenin 60 aia tam a chhiar), July 2019-ah in 400 vel, khawpui chhunga 150 (chanchin tlangzarh angin), Tlawng-a Sairang, hmar lama Bairabi leh Vairengte, leh Champhai phai te hi 1% AEP zau zawng chhungah an awm tawh. Chutah Zone 2 khapna pumhlum chuan in hlui hniam zawk thlakna leh tuilian sang zawng chunga in tihsan a dang ang. Kalphung hi kum 25 tuilian zone tana URDPFI (2015) kalphung (stilt, plinth hniam ber, basement awm lo) a zui a, hetah 1% AEP zau zawngah hman a ni.



Milem 7.2 — Sanzawng band zela compensatory storage: flood fringe cross-section, 1% AEP tuilian sang zawng hnuaia lei vur leh 0.3 m aia sang lo band tin chhunga tui zat inang emaw a tam zawk laih chhuah, tui sang zawng pangngai (emaw 50% AEP sang zawng) aṭanga 1% AEP sang zawng thleng, laihna chu gravity-in tui awmnaah a kir leh lantirna. Band tin chhutna chu Form 7-3-ah. He Kaihhruaina Bu tana milem siam thar, Clause 7.6.4-a he Kaihhruaina Bu-in a ruat kalphung entirna.

7.7 Dil cascade design khawlna atan

Mizoram-ah dil (tank) Act a awm lo va, lo tui pek nana dil cascade a awm lo, a tui dingte chu tuikhur tui lakna tank tê aṭanga Tuirial reservoir thlengin a awm. Khawpui tui luanna tana khawlna pawimawhte hi chi nga an ni. A pakhatna chu reservoir, State-a tui awmna lian ber: Kolasib district-a Tuirial (Sonai)-a NEEPCO Tuirial hydro-electric project **Tuirial reservoir**, zoned earth-fill dam sang 75 m-in a khuah, open chute spillway nen, full reservoir level 90.5 m, minimum drawdown level 68.0 m leh full load-a normal tailwater level 30.7 m (Petition 125/MP/2021-a CERC order; datum sawi a ni lo [TBC]); leh Kolasib district-a Serlui-a **Serlui B reservoir**, sang 51.3 m leh sei 293 m tia sawi dam hnunga awm (chanchin tlangzarh angin), a full emaw maximum level hmuh a ni lo [TBC]. An tui chhuah tir chu design-ah tui luang lut

leh tailwater angin a lut a (Clause 5.8.5(e)), an khawlna chhiar a nih loh chuan heng clause-te tan dil (tank) an ni lo. A pahnihna chu **dil**: Palak Dil, Siaha district-a Pala wetland, ha 1,850 vel Ramsar site, tui awmna ha 135 vel leh a thuk zawng chanchhuah 20 m vel (a Ramsar Information Sheet thu hnar ang leh chanchin tlangzarh angin), leh Saitual aṭanga 6 km vela Tam Dil, Fisheries Department-in sangha vulhna reservoir atana a siam ṭhat (chanchin tlangzarh angin; a zau zawng hmuh a ni lo [TBC]); pakhat mah tan tui sang zawng, outlet record emaw FTL-a zau zawng hmuh a ni lo [TBC], chuvangin an khawlna chu thil awm sa angin model a ni a, Clause 7.7.1 a zawm loh chuan chhiar a ni lo, Ramsar site Palak Dil chu hmasawnna tan khawlna atan engtik lai mahin hman a ni lo. A pathumna chu **check-dam pool**: master plan chuan Aizawl luiteah check dam pariat a rawt, "Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum leh Hlimen hnuaiah" ("below Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum and Hlimen"), Rivers Bill chuan River Conservation Zone-a hna khapna aṭangin "check dam" ("check dams") a hlihsak ang; pakhat mah tan design, sang zawng emaw khawlna hmuh a ni lo [TBC], lui chho-ah check-dam pool chu leidip leh balin a khat a, chuvangin a khat angin model a ni a, Clause 7.7.1 a zawm loh chuan tuilian khawlna angin chhiar a ni lo. A palina chu **khaw leh khawpui dil tê leh tank** (dil tê), ruahtui luang an dan hmunah thil awm sa angin model an ni a, khawlna angin engtik lai mahin chhiar an ni lo, survey an ni lo va, outlet thunun theih an nei lo va, ruahpui sang ber hun thlengin an khat tawh ṭhin a nih avangin. A pangana chu **tuikhur** leh a chunga tank siamte, an tui avanga humhalh an ni a, khawlna angin engtik lai mahin chhiar an ni lo. Heng hi Milem 7.3 leh Clause 7.8-in a pawimawhna tui awmnate an ni: tlang chhip khawpuiah drain tin chu lui-ah a tawp a, lui tin chu luipui, reservoir emaw phai-ah a tawp. Dil, check-dam pool emaw reservoir a khawlna chhiar tur reng reng chu a enkawltu (NEEPCO, State-a power department, IWRD, Fisheries Department emaw dang) nen Clause 7.7.1 a pumin a zawm tur a ni a, dil tin enkawltu chu inventory (Belhchian 7A) tan finfiah tur a ni [TBC].

7.7.1 **Dil khawlna chhiar theih hun.** Dil emaw dil cascade khawlna chu design khawlna angin (basin plan, regional facility emaw Clause 7.11 hnuaia fee-in-lieu scheme-ah) heng zawng zawng a zawm **chauhin** chhiar theih a ni:

- (a) **Survey sang zawng.** FTL, MWL, TBL, surplus weir crest leh a sei zawng, leh sluice sill sang zawngte chu kum 5 kal ta chhungin Clause 7.3.5-a datum-ah survey a ni tawh.
- (b) **Stage–storage curve.** Kum 5 kal ta chhungin, emaw leidip laih chhuah hnuhnung ber hnuah, a hnu zawk zawk chu, waterspread leh foreshore bathymetric leh topographic survey aṭangin stage–storage curve (tui sang zawng leh tui zat inzawmna curve) siam a ni tawh.
- (c) **Kalpui dan.** Enkawltu nen kalpui dan (operating rule) ziak lang inremna siam a ni tawh (Clause 7.8).
- (d) **Structure enkawl.** Surplus weir, sluice leh bund chu O&M plan (Bung 10) hnuaiah enkawl a ni a, fûr hma endikna hnuhnung berin hman theih an ni tih a hmu.
- (e) **Enkawltu inremna.** NEEPCO emaw enkawltu dang chuan ziakin a inrem (concurrence).

(a) aṭanga (e) thleng zinga pakhat pawh zawm lo dil khawlna chu chhiar loh tur a ni, dil chu thil awm sa angin model zel tur a ni erawh chu (Bung 3).

7.7.2 **Model siam.** Dil cascade chu Clause 3.12.5 (dil tin level-pool routing, surplus weir leh sluice rating nen) leh Clause 3.13 (continuous simulation) hnuaiah model tur a ni. Cascade pumpui, a surplus-in site emaw facility a thlen theih dil chung ber aṭanga luipui, drain lian emaw tuifinriat outfall dawt thlengin, a vaiin model tur a ni, tlang chhip khawpui tan chuan tlang chhip leh a tlang pang aṭanga a hnuaia lui thlenga tla drain, terrace swale (tlang panga hmun zawl siam zawh tui luanna) leh down-drain (tlang pang zawh chhuk drain) zawng zawng, dil emaw check-dam pool reng reng a inlet leh outlet nen, tlang panga tuikhur-te an catchment humhalh nen, leh lui ngei, a tailwater ruattu luipui, reservoir emaw phai thlengin (Clause 5.8.5) tiamin, Milem 7.3-a lantir angin.

7.7.3 **Ṭan sang zawng.** Design ruahpui zirchianna tan dil tin ṭan sang zawng chu **FTL** a ni tur a ni. Clause 7.8 zawm flood-cushion kalpui dan hnuaiah chauh ṭan sang zawng hniam zawk hman theih a ni.

7.7.4 **Design sang zawng sang ber.** Climate factor nena 1% AEP tui luang lut, cascade kaltlanga route-a tan:

- (a) chhut sang zawng sang ber chu MWL (Clause 7.2-a hrilhfiah ang) aiin a sang loh tur a ni; leh
- (b) chhut sang zawng sang ber aṭanga bund hmun hniam ber (TBL) thlenga freeboard chu dil tana NEEPCO freeboard standard aiin a tlem loh tur a ni.

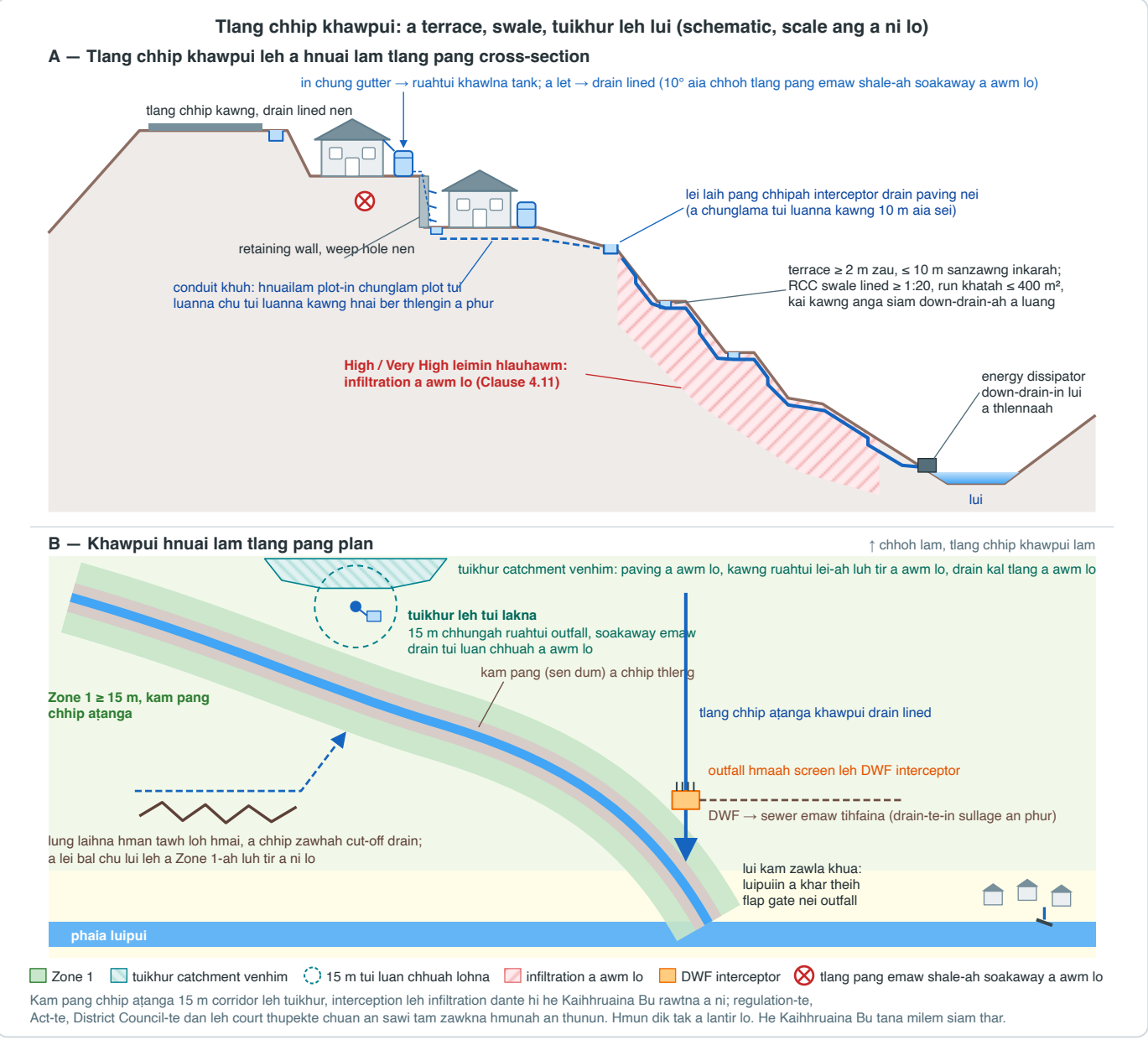
(a) emaw (b) a zawm loh chuan, surplus weir tui paltlang theih zat tihpun emaw Clause 7.7.6 hnuaia bund tihsan emaw a nih hma chu FTL chunglama dil khawlna chhiar loh tur a ni.

7.7.5 **Chhiar theih tui zat.** Dil design khawlna chhiar theih chu ṭan sang zawng (Clause 7.7.3) leh Clause 7.7.4-a chhut sang zawng sang ber inkara tui zat a ni, facility emaw scheme dang tana tiam sa tui zat paih hnuah.

7.7.6 **FTL, weir leh bund tihdanglam.** Enkawltu-in phalna a pek design, heng zawmtu, hnuaiah lo chuan surplus weir crest tihsan emaw tihhniam emaw, shutter emaw falling board belh emaw, bund tihsan, sat emaw tihchhiat (breach) emaw tih loh tur a ni:

- (a) Clause 7.7.2 hnuaia cascade route;
- (b) foreshore leh chunglama tuilian sang zawng, leh surplus course leh hnuailama tui luang chunga a nghawng lantir; leh
- (c) Clause 7.14 hnuaiah bund endik.

> Hrilhfiahna. He Kaihhruaina Bu hian dil cascade chu thil bul pathum (FTL survey, kalpui dan ziak lang leh surplus weir enkawl) hnuaiah design khawlna atan hman a phal. Clause 7.7.1 chuan stage–storage survey leh enkawltu inremna a belh, dil-in khawlna a pek tak tak chu a leidip sang zawng leh sluice thunun tu nge tih a innghah avangin. Kum 5 danga survey hi he Kaihhruaina Bu-in a ruat a ni.
>
> FTL ṭan sang zawng hi Clause 3.12.5 a zui. Mizoram-ah dil, check-dam pool emaw reservoir chu he Kaihhruaina Bu hun, April ni 1 aṭanga October ni 31 thleng chhungin engtik lai pawhin a khat thei a, ruahpui pawimawhte chu ni tam tak inzawm takin an lo thleng ṭhin. Ruahpui ni chhinchhiah nei thihna thlen nasa berte chu May thlaah, south-west monsoon lo thlen hma emaw a lo thlen laiin, an lo thleng (Aizawl-a Laipuitlang lungpui tlak, chanchinbu-ah May ni 11, 2013 leh chanchinbu pakhatah May ni 15, 2013; Cyclone Remal, May ni 28, 2024; leh May ni 24, 2025 aṭanga June ni 3, 2025 thlenga ruahpui, ni sawm leh pakhat chhungin leimin 598, chanchin tlangzarh angin); Serchhip district-ah June ni 1–13, 2018-ah 677 mm a sur (SANDRP, chanchin tlangzarh angin); October aṭanga December thlenga cyclone-te chu "fûr hma hun [April & May]-a mite aiin an nasa zawk" ("are more intense than those of Pre-Monsoon season [April & May]") (NAFCC DPR, 2016). Ruah sur reng laiin Palak Dil, Tam Dil emaw khaw dil reng reng an outlet sang zawng emaw a chunglama a awm rei dan record hmuh a ni lo va, fûr hun chhunga Tuirial reservoir NEEPCO kalpui sang zawngte hmuh a ni lo [TBC]. Dil emaw reservoir a khat lai chuan FTL hnuaiah engmah a khawl belh thei lo va, a chhunga luang lut luite chu a tui sang zawng dodalin an luang a, a tui chhuah tir chuan a hnuaia lui tui luang a tipung. Dil cascade chuan tuilian chu dil pakhat aṭanga a dawt-ah a pe chhawng a, chuvangin dil pakhat khawlna chhiar a, a chunglam dil aṭanga surplus lo thleng ngaihthah design chuan a ṭangkaina a sawi sang lutuk ang. Chuvangin Clause 7.7.2 chuan cascade pumpui model a phut a ni.



Milem 7.3 — Tlang chhip khawpui: a terrace, swale, tuikhur leh lui (schematic, scale ang a ni lo; khawpui, lui, tuikhur emaw hmun hriat bik reng reng lantir a ni lo). A: cross-section-ah, khawpui chu tlang chhip, catchment ṭhenna (divide), chungah a ding a, a kawng chu chhip zawhah a kal a, plot-te chu tlang pang zawhin kai kawng angin an chhuk. Kawng drain chu lined a ni. In chung tui chu gutter hmangin plot tin-a khawlna tank-ah a kal a (Bung 4), tank tui liam chu drain lined-ah a kal, 10° aia chho tlang pang emaw shale chungah soakaway dah a nih loh avangin (Clause 4.11, tlang dan). Lei laih pang chungah tui luanna kawng 10 m aia a sei chuan a chhip zawhah interceptor drain paving nei a awm a, lei laih leh lei vur tlang pangah 10 m aia sang lo inkar zelah 2 m tal zau terrace a awm a, swale lined, gradient 1:20 tal nen, kal khat-in 400 m² aia tam tui a luan khawm lo, kai kawng anga siam down-drain-ah a luang (SD&SM reg. 27). Retaining wall-te-ah weep hole a awm. Hnuailam plot chuan a chunglam plot tui luanna chu conduit khuh-ah tui luanna kawng hnai ber thlengin a phur (SD&SM reg. 27; AMCBR reg. 37). Down-drain chu lui a thlenna hmunah energy dissipator-ah a tawp, tlang pang emaw lui chho-a outfall tin-in a mamawh avangin (Clause 6.3.6). High emaw Very High leimin hlauhawm zone-a lei chuan infiltration engmah a dawng lo. B: plan-ah, khawpui hnuaiah tuikhur-in tui lakna a pe; a chunglama a catchment, hydrogeologist-in a map angin, humhalh a ni a, paving leh kawng ruahtui luan luh tir a awm lo, drain a kalh tlangin dah a ni lo, a 15 m chhungah ruahtui outfall, soakaway emaw drain tui luan chhuah a awm lo (Clause 8.8.1). Lui-ah a kam pang chhip aṭanga teh Zone 1, 15 m tal, a awm (Clause 7.4). Lui-a outfall-ah ruah sur lohna hun tui luang (DWF) interceptor leh screen a awm, drain-te-in in chhunga tui bal (sullage) an phur avangin (Clause 8.9). Lui chunglama lung laihna hman tawh loh hmai chu a chhip zawhah cut-off drain a nei a, a lei bal chu lui-ah luh tir a ni lo. Lui chu phai-a luipui thlengin a luang thla a, chutah lui kam zawla khua chu luipuiin a khar theih flap-gate nei outfall

kaltlangin a tui a luang chhuak (Clause 5.8.5(c)). Kam pang chhip aṭanga 15 m corridor, tuikhur, interception leh infiltration dan-te hi he Kaihhruaina Bu rawtna an ni; regulation-te, Act-te, District Council-te dan leh court thupekte chuan an sawi tam zawkna hmunah an thunun. He Kaihhruaina Bu tana milem siam thar.

7.8 Kalpui dan leh fûr hma flood cushion

7.8.1 **Kalpui dan chhunga thu awm tur.** Clause 7.7 hnuaia khawlna chhiar dil tin chuan kalpui dan ziak a nei tur a ni a, enkawltu remtih a ni ang a, O&M plan (Bung 10) nen vawn tur a ni. Heng hi a sawi tur a ni:

- (a) kum chhunga tui tihkhatna, vawnna leh tihhniamna (drawdown) sang zawng leh ni-te;
- (b) sang zawng tin-a sluice leh regulator dah dan;
- (c) sluice leh regulator kalpuitu, leh tui chhuah tir thupek thei tu nge;
- (d) tui chhuah tir zat sang ber, tui chhuah tir chu hnuailam catchment tui luang nena belh khawm a nih pawhin hnuailama in-ah tuilian a thlen tir loh nana ruat;
- (e) forecast leh warning bul ṭanna (IMD district warning, MSDMA alert, leh a awm chuan khawpui forecast system) leh bul ṭanna tin-a hmalakna;
- (f) tui chhuah tir hmaa hnuailam ULB leh chenghote hrilh; leh
- (g) record vawn tur: fûr hunah nitin tui sang zawng, tui chhuah tir leh gate dah dan.

7.8.2 **Flood cushion.** Dil chu flood cushion (fûr hun ṭhenkhat chhunga FTL hnuaia sang zawng) nen kalpui theih a ni a, cushion chu Clause 7.7.3 hnuaiah chhiar theih a ni, heng hunah chauh:

- (a) dil-in gate nei sluice, regulator emaw outlet thunun theih dang, kalpui dana sawi hun chhunga cushion sang zawng thlenga dil tihhniam theitu a nei;
- (b) kalpui dan chuan cushion sang zawng leh a hman ni-te a ruat;
- (c) continuous simulation (Clause 3.13)-in record-a fûr hun **90%** tal-ah design ruahpui ṭan hunah cushion a awm tih a lantir, ruahpui sang ber hma lama ruah sur ṭhin chhiar telin;
- (d) enkawltu-in lo tui pek emaw tui pek tui zat tlahniam reng reng a lo pawm a, chhawrna (compensation) inremna reng reng ziah a ni; leh
- (e) cushion siam emaw siam leh nana tui chhuah tir mamawh chuan Clause 7.8.1(d) a zawm.

7.8.3 **Thununna awm lovin khawlna credit pek a ni lo.** Dil-in outlet thunun theih a neih loh chuan, hmanlai tihdan eng pawh ni se, flood cushion awm angin ngaih loh tur a ni.

7.8.4 **Inrem taka hnathawh.** NEEPCO thununna hnuaia dil tan, kalpui dan chu NEEPCO dan a ni tur a ni. He Kaihhruaina Bu hian pawl dang reng reng NEEPCO dil kalpui a phal lo.

> **Hrilhfiahna.** Mizoram-ah kalpui dan ziak nei dil hmuh a ni lo va, dil tam zawk chuan kalpui tur gate an nei lo. Tuirial reservoir tana NEEPCO kalpui dan leh Serlui B tana State power department dan hmuh a ni lo [TBC]; tui sang zawng hmuh chhun chu Tuirial reservoir full leh minimum drawdown level (CERC) a ni. Tuirial dam dam-break study chuan "lui inkawpna bulah" ("near the confluence") 3,035.34 m³/s sang ber a route nia sawi a ni (2025-a IAHR abstract, chanchin tlangzarh angin); dam pahnih tan tui chhuah tir hun ruat emaw warning kalphung chhiar a ni lo. Ni, tui sang zawng, tui chhuah tir zat leh kalpuitu hming nena inremna dan tel lovin, dil emaw reservoir-a khawlna chu rinchhan theih a ni lo, hnuailam khuate hrilh lova tui chhuah tir chu amah ngei tuilian a ni. Clause 7.8.2 chuan chu thil bul chu endik theih dan-ah a chantir, rintlak dan endikna (reliability test) nen, April leh May ruahpuiin a tihkhat leh cushion chuan June aṭanga August thlenga fûr ruahpui, June 2018 laihawla mi ang, kar tam tak ruah sur hnua lo thleng a venhim lo a nih avangin. Clause 7.8.2(c)-a 90% rintlakna hi a entirna hmasa chiang a awm lo va, he Kaihhruaina Bu-in a ruat a ni.
>
> Dil pianphung tan chuan Clause 7.8.3 hi a thunun: outlet thunun theih a nei lo a nih chuan cushion awm angin ngaih a ni lo, dil rinchhan design chuan ruahpui chu a outlet sang zawng aṭangin a chhungah a route a, outlet chunga tui luang chhuak chu a hnuaia lui-in a ri a, Clause 6.3.6-a bal nen a phur thei tih lantir tur a ni. Reservoir tan

chuan design chuan ruahpui endik mek tan kalpuitu tui sang zawng leh tui chhuah tir a la (Clause 5.8.5(e)), kalpuitu-in ziaka a remtih loh drawdown a ni lo. Palak Dil hi Ramsar site a ni a, tuilian khawlna atan tihhniam a ni lo; Tam Dil hi sangha vulhna reservoir a ni a, a tihhniam chuan Clause 7.8.2(d) hnuaiah Fisheries Department lo pawmna a ngai ang; tuikhur tank-te chu tui pekna a ni a, tuilian khawlna engtik lai mahin a ni lo. Chuvangin he Kaihhruaina Bu hnuaia detention pond siam reng reng chu dil emaw tuikhur emaw tih a ni lo.

7.9 Siam ṭhatna, leidip laih chhuah leh tihthuk

7.9.1 **Hna hmaa survey.** Leidip laih chhuah emaw siam ṭhatna reng reng hmain, a rawttu (proponent) chuan:

- (a) waterspread, foreshore, bund, weir leh sluice-te a survey tur a ni (Clause 7.7.1(a) leh (b));
- (b) grid zelin test pit emaw augering hmangin, leh a awm chuan hun hlui record aṭangin, a bed sang zawng hmasa a zawng chhuak tur a ni; leh
- (c) dil-in khawpui ruahtui luang emaw ek tui a dawn chuan, paih dan ruat hmain leidip chu metal rit leh thil bawlhhlawh dang tan a endik tur a ni.

7.9.2 **Leidip laih chhuah tawpna.** Leidip laih chhuah chuan leidip khawm chu bed sang zawng hmasa thlengin a laih chhuak tur a ni. Clause 7.9.3 hnuaiah lo chuan, bed hmasa hnuaiah dil a tihthuk loh tur a ni.

7.9.3 **Tihthuk.** Bed hmasa hnuaia tihthuk chu hydrogeological report-in heng a lantir chauhin phal a ni:

- (a) dil-a tui vawngtu emaw aquifer tui bawlhhlawh laka vengtu clay emaw leidip layer a sat lo ang;
- (b) tuifinriat kam ramah, tui al dil emaw aquifer-ah a hip lut lo ang; leh
- (c) khawlna belh chu tihkhat leh hman leh a ni ang a, sluice sill hnuaiah a ding reng lo ang.

Sluice sill hniam ber hnuaia khawlna siam chu tuilian khawlna angin chhiar loh tur a ni.

7.9.4 **Kam him.** Mipuiin tui awmna kam an thlen theihna hmunah:

- (a) FTL chunglam 0.5 m aṭanga FTL hnuaia 1.2 m thlengin a sir tlang pang chu **1V:4H** aiin a chho loh tur a ni, emaw FTL hnuaia 0.3 m leh 0.5 m inkarah 3 m tal zau himna bench zawl siam tur a ni; leh
- (b) bed-ah khur thuk mal emaw laih ding chho reng reng hnutchhiah loh tur a ni.

7.9.5 **Khawlna tihtlem loh tur.** Siam ṭhatna chuan MWL hnuaia khawlna a tihtlem loh tur a ni. Waterspread emaw foreshore chhunga thliarkar (island), kawng zawh lam, waterspread lama bund tihzau, ring road, motor dahna, in leh "dil kam" ("lake-front") platform-te chu khawlna bo angin chhiar tur a ni a, Clause 7.6.4 hnuaiah thlak tur a ni.

7.9.6 **Leidip paih.** Leidip laih chhuah chu setback chhungah, bund chungah (bund tihchakna phalna pek lo chuan) emaw tuilian kawng reng rengah dah loh tur a ni. Leidip bawlhhlawh hmuh chu Mizoram Pollution Control Board (MPCB) thupek angin paih tur a ni.

7.9.7 **Inlet enkawl.** Khawpui ruahtui luang dawng dil siam ṭhatna tin chuan inlet tinah leidip leh bawlhhlawh lian thununna a telh tur a ni: sediment forebay (leidip dawnna dil tê), constructed wetland inlet zone, emaw gross pollutant trap (Bung 8), siam ṭhat khawlna chu leidipin a khat leh loh nan.

7.9.8 **Hun.** Leidip laih chhuah chu kum tin **March ni 31** hmain zawh tur a ni a, tui awmna chu tihhim tur a ni (Bung 10).

Hrilhfiahna. Fûr hma drain, lui emaw dil tihfai ni ruattu Mizoram order hmuh a ni lo; master plan chuan "monsoon a lo thlen hmain kum tin drain-te tihfai a ngai" ("drains need to be cleaned every year before the onset of monsoon") tih chauh a sawi a, Aizawl drain-te chu "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") a hmu a, "khua 8% chauhin drain hawng enkawl reng nei an ni a, 40%-in hun bi neiin enkawlna an nei" ("8% of the villages have open drains with regular maintenance

> and 40% with periodic maintenance") a ziak a, 52%-in engmah an nei lo. Tlang chhip khawpuiah paih chhuah tur chu leidip ang bawkin leimin bal leh bawlhhlawh a ni: master plan chuan Aizawl ward W-I-a 33%-ah tui "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") a tlin chu kawng sir drain-a bawlhhlawh avangin a ti. He Kaihhruaina Bu-a March ni 31 hi he Kaihhruaina Bu-in a ruat a ni, a hun April ni 1-a a ṭan hmain, Mizoram ruahpui ni chhinchhiah nei thihna thlen nasa berte May-ah a lo thleng a, April ni 27–28, 2026-ah district panga aṭanga pakua thlengah school chawlh tir ruahpui a lo thleng a nih avangin (chanchin tlangzarh angin); May-a mite zinga hmasa ber, Laipuitlang lungpui tlak, May ni 11, 2013-ah a lo thleng a nih avangin, drain, rack, inlet leh check-dam pool-te chu April ni 30 hmain tihfai leh a ni a, hun tawp hnu November ni 15 hmain, October aṭanga December thlenga cyclone hun tam zawk hmain (Bung 10). "Tui zat tihpun" ("increase capacity") nana laihna chu Clause 7.9.3-in a thunun. A bed-a tuikhur-in tui a pek dil-ah, tihthuk chuan tuikhur a sat thei a, tui vawngtu leidip leh clay a tichhe thei; he Kaihhruaina Bu hian tuikhur tui dawng dil emaw tuikhur tank reng reng a bed hmasa hnuaia tihthuk emaw a bed lined emaw cement-a chhuah emaw a phal lo va, Ramsar site Palak Dil-ah he clause hnuaiah hna engmah a phal lo, wetland authority leh District Council-in an phal loh chuan. March ni 31 tawpna hi Bung 10-a fûr hma endikna ni nen a inmil. Tihthuk khapnate hi he Kaihhruaina Bu-in a ruat a ni. "Tui zat tihpun" ("increase capacity") nana dil tihthuk hi a tlanglawn a, mahse dil-a tui vawngtu leidip leh clay layer a tichhe thei a, khawpui tui bawlhhlawh aquifer-ah a luh tir thei a, tuifinriat kam lam pan tui al a hip thei a, sluice sill hnuaiah engtik lai mahin ruak ngai lo, tuilian tan ṭangkaina nei lo khawlna a siam. Khur thuk a sir chho tak takte hi tuia pil hlauhawm an ni bawk. Clause 7.9.4-a tlang pang leh bench value-te hi dil himna tihdan tlanglawn aṭanga siam rem a ni; Mizoram-ah entawn tur an nei lo.

7.10 Supply channel, surplus course, inlet leh outlet

7.10.1 **Tui luanna system lian peng.** Supply channel leh surplus course-te chu tui luanna system lian (major drainage system) peng an ni (Bung 6). Tui awmna angin, Clause 7.4 hnuaia Zone 1 leh Zone 2 setback nen humhalh tur an ni.

7.10.2 **Dal emaw khuh phal a ni lo.** Supply channel emaw surplus course reng reng chu dal, vur, luan kawng tihdanglam, khuh, a sei zawng zawha culvert-a dah, emaw kawng emaw drain khuh-a chantir loh tur a ni, a 1% AEP tui luan theih zat leh enkawlna kawng vawng emaw tihpungtu, enkawltu-in phalna a pek design hnuaiah lo chuan.

7.10.3 **Kaltlanna.** Tui awmna, supply channel emaw surplus course kaltlang kawng, rail, utility emaw lutna kaltlanna tin chuan:

- (a) 1% AEP tui luang (climate factor nen), emaw a MWL-a chunglam dil surplus, a lian zawk zawk chu, Bung 9-in a phut freeboard nen a paltlang tir tur a ni;
- (b) kaltlannaah tui luanna zau zawng chu Revenue record-a channel zau zawng pumpui emaw survey ang, a zau zawk zawk aiin a tihtlem loh tur a ni;
- (c) channel bed sang zawng leh grade a vawng tur a ni; leh
- (d) 1% AEP tui sang zawng chu Clause 7.6.2-a khapna aia tamin a tihsan loh tur a ni.

7.10.4 **Tui luan theih zat.** Surplus course design tui luan theih zat chu MWL-a surplus weir tui luang leh amah catchment aṭanga 1% AEP tui luang zinga lian zawk a ni tur a ni, cascade model (Clause 7.7.2)-in a lantir angin belh khawm.

7.10.5 **Structure-a venhimna.** Surplus weir leh sluice outlet-te, leh tui awmna-a drain outfall-te chuan Bung 9 hnuaia design energy dissipation leh scour protection (tui chak avanga lei kaih chhiatna venna) an nei tur a ni, an aṭanga tui luang chhuak chuan bund, kam emaw channel bed a khawih chhiat loh nan.

7.10.6 **Tui awmna-a drain outfall.** Dil, channel emaw wetland-a ruahtui drain outfall chuan:

- (a) a invert (tui luanna hniam ber) chu tui dawngtu tui awmna tui sang zawng pangngai emaw a chunglamah a awm tur a ni, Bung 5 hnuaia outfall tui hnuaia awm (submerged outfall) atana design drain a nih loh chuan;
- (b) dil bund a sat loh nan leh a tihchhiat loh nan a awmna leh a kalna ruat tur a ni;
- (c) gross pollutant trap leh first-flush (ruah tlak hmasa ber tui bal) enkawlna a nei tur a ni (Bung 8); leh

- (d) ek tui emaw ruah sur lohna hun tui luang (DWF) a phur loh tur a ni (Bung 8).

> **Hrilhfiahna.** He Kaihhruaina Bu hian supply channel leh surplus course-te chu tui luanna system lian peng angin a humhalh. Khawpui ramah an bo hmasa ber fo. Surplus course-te chu culvert leh compound wall-in an tizim a, supply channel-te chu khuh leh kawng-a chantir an ni a, chu chuan dil chu a tui hnar aṭangin a then emaw a surplus kal tur awm lovin a hnutchhiah emaw. Mizoram-ah Corporation huam chhunga drain leh luite chu Corporation thuneihnaah a awm: "vantlang dil, lui, reservoir leh tuikhur zawng zawng" ("all public tanks, streams, reservoirs, and wells") leh "kawng reng reng chhunga, a sir zawha emaw a hnuaia vantlang sewer leh drain channel, tunnel, culvert leh tui luanna kawng zawng zawng" ("all public sewers and drains channels, tunnels, culverts and watercourses in, alongside, or under, any street") (Mizoram Municipalities Act, 2007, s.80(b) leh (d)), leh "public drain zawng zawng, leh public kawngpui chhungah, a bulah emaw a hnuaiah emaw drain zawng zawng, Municipal Fund aṭanga siam emaw siam lo emaw" ("All public drains, and all drains in, alongside, or under any public street, whether made out of Municipal Fund or otherwise") (s.289(1)). Municipality chuan "tui luanna emaw sewerage system leh outfall him leh tawk a siam leh enkawl tur a ni" ("shall provide and maintain a system of drainage or sewerage as well as a safe and sufficient outfall") (s.288); drain zawng zawng, mimal emaw vantlang, chu "Board of Councillors survey leh thunun hnuaiah" ("under the survey and control of the Board of Councillors") an awm (s.290); ziaka remtihna lovin drain reng reng municipal drain emaw "tui luan kawng reng reng" ("any water-course")-ah luh phal a ni lo (s.296); Municipality thuneihnaa awm "municipal drain, culvert emaw gutter emaw sewage works emaw ruahtui channel bed, kam emaw embankment reng reng chungah" ("over any municipal drain, culvert or gutter or bed, bank or embankment of any sewage works or storm water channel") in, bang, daidanna emaw structure dang sak phal a ni lo (s.300). Kawng-te chu Corporation hnenah hlan a ni ngai lo (CAG, 2025), chuvangin State kawng drain-te chu PWD-in hman takah a sa a, a enkawl, dan-ah erawh chung drain-te bawk chu Corporation thuneihnaah a awm; he Kaihhruaina Bu hian chu inpawlhna chu a sawi a, a chinfel lo. Municipality pawnah "Tihfaina leh tui luanna" ("Sanitation and drainages") hi Village Council hnena pek theih mawhphurhna a ni (Mizoram (Village Councils) Act, 2025, s.15(1)(q)); Autonomous District Council huamah drain-te chu District Council-te leh an Village Council-te ta an ni [TBC]. Lui leh municipal drain ṭhenna rule emaw order hmuh a ni lo; Bung 6-ah he Kaihhruaina Bu hnathawhna ṭhenna leh khawpui tin drain register a awm. Aizawl record chuan network tam zawk siam loh leh lui-a luang lut a lantir: "Aizawl Urban Area 67% hi kutcha drain a ni a, 18% hi tui luanna system reng reng a nei lo. Hmun 15% chauhin pucca drain a nei" ("67% of Aizawl Urban Area is having kutcha drains and 18% are without any drainage system at all. Only 15% of the area is provided with pucca drains") (master plan), plan chuan "khawpui chhunga drainage kalna awm sa chu nghet taka siam a, tui luanna pianphung system pawh siam ṭhat leh outfall hmunah enkawlna hmanraw nena humhalh" ("existing drainage alignment within urban area be made permanent and also the natural drainage system be improved and protected with treatment facilities at the outfall points") a rawt. Heng zinga pakhat mahin lui chu lined, pipe-a dah, khuh, a chunga sak, emaw bal emaw bawlhhlawh-in a khat hnuah a zau zawng ziakah a vawng lo, chu chu Clause 7.10.2 leh 7.10.3-in a veng tura ziak chhiatna a ni. Clause 7.10.3(b) chuan kaltlanna chuan channel chu a tunlai zau zawng, luah hneh tawh, thlengin a tihzim a khap.

7.11 Fee-in-lieu leh bial dil khawlna

7.11.1 Basin plan notify a nih a, Authority-in Policy Supplement (Clause 1.7)-a alternative S-5 a pawm chuan, hmasawnna chuan Bung 4 hnuaia site-a detention aiah fee a pe thei. Fee chu basin inangah dil, dil tê emaw regional facility-a khawlna siam ṭhat emaw siam thar nan hman tur a ni.

7.11.2 Fee-in-lieu sum-a khawlna dil chuan:

- (a) chhiar a nih hmain Clause 7.7.1 a pumin a zawm tur a ni;
- (b) a sum petu hmasawnna hnuailam leh a venhim tur tuilian hlauhawm hmun chunglamah a awm tur a ni;
- (c) a ṭanpui hmasawnna-a mi an luah hmain, emaw basin plan-in a ruat hun chhungin, siam emaw siam mek a ni tur a ni; leh

- (d) Clause 10.17 register-ah a sum petu hmasawnnate nen ziah tur a ni, tui zat inang vawi hnih hralh a nih loh nan.

7.11.3 Fee-in-lieu hian heng hi a thlak lo:

- (a) Bung 4-a retention phutna, site-ah zawm reng; emaw
- (b) Bung 8-a tui ṭhatna phutna, site-ah emaw dil a thlen hmaa ruahtui luang inang enkawltu regional facility-ah zawm.

> Hrilhfiahna. Bung 4 chuan master plan nei basin-ah dil lian emaw dil (tank) khawlna siam ṭhat tan fee-in-lieu a siam. Malaysia-a 2008 DID checklist chuan site tê tan chauh site-a detention a phal a, hmun lian zawk tan khawtlang dil a phut (DID, 2008). Mizoram-ah regulation-te-in khawlna inhmang tlang a phut lo: 2012 Building Regulations regulation 33 chuan in zawng zawngah "ruahtui khawl khawmna ṭha tak" ("a suitable rain water harvesting facility") a phut a, tui zat erawh a ruat lo; 2025-a green-building bung chuan ruahtui khawl khawm chu fakna (incentive) a siam a, regulation pakhat mahin detention, peak-flow emaw design-storm dan a nei lo (Bung 4). Aizawl lui tana plan-te chu tui luan tirna leh check dam tan a ni a, regional khawlna tan a ni lo: master plan chuan drain kalna nghet, "outfall hmunah tihfaina facility" ("treatment facilities at the outfall points") leh check dam pariat a rawt a, Aizawl tana Smart City, AMRUT emaw ADB programme ruahtui drain project hmuh a ni lo. Tlang chhip khawpuiah regional dil siam theihna ram zawl a tlem a, Clause 4.11-in infiltration a khapna tlang pangah siam phal a ni lo; chutah regional facility chu tank lined emaw detention structure lined a ni a, dil tê a ni lo va, dil tih a ni ngai lo. Heng zinga pakhat mahin khawlna chhiar dan technical standard a siam lo. Clause 7.11.2(b) hi a pawimawh, tuilian hlauhawm hmun hnuailama dil chuan engmah a venhim lo a nih avangin. Clause 7.11.3 chuan retention chu site-ah a vawng: he Kaihhruaina Bu-a tui zat thununna layer a ni a, regional dil chuan hmasawnna site hnuaia aquifer a tipung thei lo.

7.12 Wetland, marsh leh estuary

7.12.1 **Huam chin.** He clause hi marsh, swamp, backwater, estuary, leh tidal creek leh lagoon-te tan a ni, heng tiamin:

- (a) Wetlands (Conservation and Management) Rules, 2017 hnuaia notify wetland emaw chung Rules-in a ruat State Wetlands Authority-in a tarlan (Mizoram tan dinna notification hmuh a ni lo [TBC]);
- (b) 2017 Rules hnuaia notify wetland reng reng, a notify ramri thlengin (Mizoram-ah notify a nih hmuh a ni lo), leh Palak Dil, Siaha district-a Pala wetland, Ramsar site (no. 2484), Ramsar site ramri thlengin;
- (c) Tam Dil leh dil dangte, Tuirial leh Serlui B reservoir an drawdown zone nen, tuikhur hnuaia tui chiar hmun, leh phai-a marsh emaw tui chiah hmun reng reng, Champhai phai ang, tui a dah hmunah, Clause 7.3.4-a 1% AEP zau zawng chhungah (luipui, lui emaw reservoir ngei chu he bung bang zawng hnuaiah tui awmna a ni); leh
- (d) dil, marsh emaw wetland dang reng reng, Authority-in a notify, wetland authority-in a tarlan, emaw Gauhati High Court, National Green Tribunal emaw Supreme Court-in humhalh turin thupek a siam.

7.12.2 **Wetland tihro phal a ni lo.** Wetland authority-in phalna a pek plan hnuaiah lo chuan, drain, channel, laih emaw pump reng reng wetland tihro, a tui sang zawng pangngai tihhniam, emaw a hnawng hun tihtawi nan design loh tur a ni.

7.12.3 **Tui luang lut.** Clause 7.12.1-a wetland-a tui luan lut tir drain tin chuan:

- (a) Clause 7.10.6 a zawm tur a ni;
- (b) wetland a luh hmain a catchment WQv tan tui ṭhatna enkawlna (Bung 8) a paltlang tur a ni; leh
- (c) a theih chuan, hmun khatah luan chhuah tir aiin hlobet kam zau takah a tui a pharh tur a ni.

7.12.4 **Hydraulic inzawmna.** Wetland kaltlang emaw a zawh kawng, embankment leh utility corridor-te chuan heng kawngka (opening)-te hi an nei tur a ni:

- (a) 1% AEP tui sang zawng Clause 7.6.2-a khapna aia tama tihsan lova 1% AEP tui luang paltlang tir; leh
- (b) wetland tui inthlak pangngai, estuary-a tidal inthlak tiamin, vawng, kaltlannaah kawngka darh zarin, wetland hmun reng reng then hran a nih loh nan.

7.12.5 **Basin scale-ah chauh khawlna chhiar.** Wetland khawlna chu basin leh regional model-ah telh tur a ni. Hmasawnna mal tan detention angin chhiar loh tur a ni.

7.12.6 **Tidal wetland leh estuary.** Estuary leh tidal wetland tan:

- (a) tailwater chu Bung 5 (Clause 2.12 joint case) aṭanga lak tur a ni;
- (b) hna-te chuan Coastal Regulation Zone Notification hman mek pawh an zawm tur a ni; leh
- (c) kawngka hawnna hna, training wall leh dredging chu he Kaihhruaina Bu huam pawnah a ni a, an study bik an mamawh.

7.12.7 **Paih phal a ni lo.** Wetland emaw a setback-ah bawlhhlawh, sakna bal emaw dredging-a lak chhuah thil dah loh tur a ni.

> Hrilhfiahna. Mizoram-a Ramsar site awm chhun chu **Palak Dil**, Siaha district-a Pala wetland, Mara Autonomous District Council huamah a ni: Ramsar site no. 2484, a Ramsar Information Sheet ang chuan August ni 31, 2021-ah thlan a ni a (thu hnar ang chauhin hmuh), July ni 26, 2022-ah puangchhuah a ni (chanchin tlangzarh angin), ha 1,850 vel site, kum 1998-a Pala Wetland Reserve Forest nen a inang, tui awmna ha 135 vel leh a thuk zawng chanchhuah 20 m vel (thu hnar ang leh chanchin tlangzarh angin). Information Sheet kimchang chhiar a ni lo [TBC]. **Tam Dil**, Saitual aṭanga 6 km vela awm, chu Fisheries Department-in sangha vulhna reservoir atan a siam ṭhat (chanchin tlangzarh angin); a zau zawng leh dinhmun hmuh a ni lo [TBC]. Mizoram tan State Wetlands Authority dinna notification leh Wetlands (Conservation and Management) Rules, 2017 rule 4 hnuaia notify wetland hmuh a ni lo [TBC]. Master plan chuan luipui, lui, tuikhur, dil tê, dil lian, wetland leh "tui luan khawmna hmun" ("Water catchment area") chu a "W" use zone-ah a dah a, tui awmna-a bawlhhlawh paih leh lei vur tihtawp a rawt; luipui, lui leh tui awmnate chu ha 585, plan area 3.83%, a pe. Tuikhur hi State-a tui awmna hman nasa ber an ni a, spring-shed hna ṭan a ni tawh: GIZ ṭanpuina nena tuikhur 20 zirchianna, tuikhur 100 pilot tana Forest Department nodal agency leh hydrogeology tana technical partner-te nen, leh sawrkar ni lo programme-in Serchhip leh Lunglei district-a tuikhur ruk tihharh leh (a zavaia chanchin tlangzarh angin); Aizawl tuikhur zat hmuh a ni lo [TBC]. Chuvangin Palak Dil, notify wetland emaw ramngaw ram chhunga emaw a bula drain outfall, leidip laih chhuah, luan kawng tihdanglam emaw gate kalpui chuan, he bung zawm bakah, wetland authority, EF&CC emaw District Council ngaihdan emaw phalna a mamawh, an huam thlen apiangah; rule-in a thlen loh dil, tuikhur leh marsh-te tan chuan he bung leh 2024 Act hnuaia Water Resources Committee-te mawhphurhna chauh thununna an ni. Clause 7.12.2 hian hlauhawm bik a tum: marsh bula tuilian tihziaawm nana drain siam chuan marsh ngei a tihro thei a, a ro veleh luah hneh a ni ṭhin. Ek tui chu drain kaltlangin Mizoram lui leh luipui-ah a thleng (Clause 8.9, Hrilhfiahna). State-ah ek tui 51.81 MLD laka 10 MLD enkawlna, "Aizawl khawpui tan chauh" ("only for Aizawl city"), a awm a, CPCB-in 2025 list-ah Chite leh Tuikual lui chu Priority II-ah, Lawibual lui Priority III-ah leh Tuipui Priority V-ah a dah. Chuvangin Clause 7.10.6(d) leh 7.12.3 hi Aizawl-a outfall awm sa tam zawk chuan an zawm thei rih lo. Mizoram-ah outfall thar tin-ah a pumin hman a ni a, CPCB list-a lui, dil emaw tuikhur catchment chhunga outfall awm sa tin chu ruah sur lohna hun tui luang (DWF) phur angin ngaih a ni a, a hnarte paih a nih hma chu Clause 8.9.4 leh 8.9.5-a kumtin survey leh interception hnuaiah a awm. Dil catchment-ah, tui-a lut drain tin chu leidip dawnna leh bawlhhlawh dawnna a paltlang hmasa bawk (Milem 7.3; Clause 6.3.6), dil hi tlang pang tui luanna tawpna a ni a, leidip leh bawlhhlawh hloh dan dang a neih loh avangin; tuikhur aṭanga 15 m chhungah drain reng reng a luang chhuak lo (Clause 8.8.1).

7.13 Luah hnehna nena inzawmna

7.13.1 **Ramri.** He Kaihhruaina Bu hnuaia design tan, tui awmna ramri chu Clause 7.3.3-a ang zelin, a Revenue record ramri leh a FTL survey (emaw kam chhip) zinga zau zawk a ni. Setback-te chu chu ramri aṭangin teh a ni.

7.13.2 **Luah hneh ram rinchhan loh tur.** Design reng reng chuan:

- (a) tui awmna ramri chhunga luah hnehnain a luah ram chu khawlna emaw tui luan tirna angin a chhiar loh tur a ni, a paih chhuah thupek leh sum ruat a nih loh chuan; emaw
- (b) channel luah hneh zau zawng chu a design zau zawng angin a ngaih loh tur a ni.

7.13.3 **Luah hneh lui chhunga sawrkar hna.** Sawrkar tui luanna hna-in luah hneh lui chhung a kaltlang chuan:

- (a) tui awmna zau zawng pumpui (Clause 7.13.1) atan design tur a ni;
- (b) hna sak hmaa zau zawng pumpui tihfihlim theih a nih loh chuan, design report-in a tihfihlim hma chu interim tui luan theih zat leh tuilian hlauhawmna a sawi tur a ni; leh
- (c) hna chu sa thar ngai lova nakina zau zawng pumpui siam leh theih turin sak tur a ni.

7.13.4 **Ramri chhinchhiah.** Tui awmna bula hmasawnna tin chuan, completion certificate hmain:

- (a) Zone 1 pawn kam chu leiah survey chhinchhiahna nghet, 30 m aia hla lo inkar zelah leh kawng inthlakna tinah, a chhinchhiah tur a ni; leh
- (b) setback zone-te chu layout plan phalna pek-ah leh setback ram tel plot tin hralhna lehkhaah a lantir tur a ni.

7.13.5 **Retaining wall.** Tui awmna kam zawhah, Zone 1 chhungah, ram venhim emaw ram lak let nan retaining wall, bund emaw embankment sak loh tur a ni, enkawltu phalna nena vantlang infrastructure awm sa venhim nan lo chuan.

> Hrilhfiahna. Mizoram lui sir leh tlang panga in sak thununnate hi ṭhenkhat chu court aṭanga lo chhuak an ni. INTACH Mizoram Chapter lehkha thawn chungchanga suo motu public interest litigation-ah, Gauhati High Court (Aizawl Bench) chuan July 2024-ah "tun aṭang hian Bawngkawn – Durtlang [Leitan] kawng sir lehlam zawngah sak thar reng reng phal a ni tawh lo vang" ("no new construction activity shall henceforth be allowed on either side of the Bawngkawn – Durtlang [Leitan] road") tiin thupek a siam a, Corporation-in floor khatna chunglama phalna a pekte chu a tihtawp rih a, leimin dan nana retaining wall sak chu a hlihsak a, master plan-a "36 degree aia chim tlang pangah development chu nasa takin tihtlem a ṭha" ("development on slope more than 36 degree should be strongly discouraged") tih chu a tarlang; 2020-a petition-ah November ni 23, 2023-a single-bench order chuan UD&PA, Revenue Department leh Corporation chu chu kawngah sakna phal tur nge tih ngaihtuah turin a ngen (a zavaia chanchin tlangzarh angin; case number hmuh a ni lo [TBC]). Luipui chungchangah, High Court chuan land pass neitute petition-ah January ni 27, 2021-ah kum 1965-a riverine reserved forest notification a tihbo a, State writ appeal (W.A. 8 of 2021) chu November ni 9, 2022-ah lak kir a nih avangin paih a ni a, Supreme Court chuan April 2024-ah riverine reserved forest-a hna chungchangah State leh NHIDCL hnenah notice a chhuah (a zavaia chanchin tlangzarh angin). National Green Tribunal hmaah, O.A. 593/2017 leh O.A. 673/2018-ah, MPCB chuan December ni 5, 2018-a din leh May ni 12, 2020-a din tharleh River Rejuvenation Committee, Chief Secretary hnuaia State Level Monitoring Committee (No. C.18013/2/2020-I&WR/243, July ni 21, 2020), State-a lui bawlhhlawhte tana action plan, leh May ni 5, 2020-a pawm chhawrna (compensation) kalphung, "tun thlengin chhawrna engmah chawi a la ni lo" ("no compensation has been levied till date") tih a report (MPCB report, February 2021). Corporation huamah municipal drain emaw ruahtui channel chungah structure reng reng sak phal a ni lo (Mizoram Municipalities Act, 2007, s.300), Ward Committee-te chuan "dan lova sakna, municipal leh vantlang thil neih luah hnehna" ("illegal construction, encroachments on municipal and public properties") an hmuh chhuah tur a ni (Ward Committee and Local Council Rules, 2010); master plan chuan tui awmna-a bawlhhlawh paih leh lei vur tihtawp a rawt. Lui, dil emaw tuikhur reng reng luah hnehna record hmuh a ni lo [TBC]. He Kaihhruaina Bu hian tumah a hnawtchhuak thei lo. Design-in luah hnehna chu nghet angin a ngaih a dang thei

(Clause 7.13.2), sawrkar hna chu zau zawng pumpui-a siam leh theih turin a siam tir thei (Clause 7.13.3), setback chu leiah leh ram lehkhaah a lan tir thei, ram lei thartute-in a awm tih an hriat nan (Clause 7.13.4). 30 m chhinchhiahna inkar hi he Kaihhruaina Bu-in a ruat a ni.

7.14 Dil bund leh embankment himna

7.14.1 **Dam Safety Act endikna.** Dil tin, leh he Kaihhruaina Bu hnuaia embankment sak emaw tihdanglam tin tan, designer (design siamtu) chuan Dam Safety Act, 2021 hnuaia "specified dam" a ni em tih a zawn chhuah tur a ni. Act hnuaiah, specified dam chu heng ang dam hi a ni:

- (a) general foundation area hmun hniam ber aṭanga dam chhip thlenga teh, 15 m aia sang; emaw
- (b) 10 m leh 15 m inkar sang, a crest sei zawng 500 m aia tlem lo a nih chuan, emaw reservoir tui dah theih zat maktaduai khat m^3 aia tlem lo a nih chuan, emaw dam-in a paltlang tir tuilian tui luang sang ber 2,000 m^3/s aia tlem lo a nih chuan, emaw dam-in foundation harsatna bik a neih chuan, emaw dam design danglam bik a nih chuan.

Specified dam a nih chuan, he Kaihhruaina Bu bakah, Act leh State Dam Safety Organisation phutnate chuan a thunun.

7.14.2 **Hazard class.** Specified dam ni lo dil bund leh detention embankment tin chu hazard class (hlauhawm dan chin) pek tur a ni:

- **Hlauhawm sang (high hazard):** a chhiat (breach) chuan chenna in, school, damdawi in, kawng pui (arterial road) emaw infrastructure pawimawh-ah tuilian a thlen tir thei.
- **Hlauhawm hniam (low hazard):** a dang zawng zawng.

7.14.3 **Hlauhawm sang embankment.** Hlauhawm sang dil bund leh embankment tan:

- (a) surplus weir emaw spillway chuan MWL-ah 1% AEP tui luang lut chu Clause 7.7.4(b)-a freeboard nen a paltlang tir tur a ni a, bund chung luang lovin 0.2% AEP (kum 500) tui luang lut tan endik tur a ni (Bung 4-a detention basin tan ang);
- (b) breach analysis chuan MWL-a chhiatna avanga tuilianin a chim ram a map tur a ni;
- (c) emergency action plan, chhiatna hmun tana warning leh mi sawn chhuah ruahmanna nen, buatsaih tur a ni; leh
- (d) design chu Clause 10.6 hnuaiah certify leh pawl hranin endik tur a ni.

7.14.4 **Endikna.** Clause 7.7 hnuaia khawlna chhiar dil tin, leh hlauhawm sang embankment tin chu fûr hmain (March ni 31 hmain) leh ruahpui tin hnuah (Bung 10) tui chiar (seepage), tlu, kek, ramsa khur, bund chunga thing, leh weir leh sluice tihtawp (blockage) tan endik tur a ni.

7.14.5 **Phalna lova sat loh tur.** Tuilian laiin enkawltu emergency kalphung hnuaiah lo chuan tumahin dil bund emaw surplus weir an sat, an tihhniam emaw an tihchhiat (breach) loh tur a ni.

Hrilhfiahna. Specified dam hrilhfiahna hi Dam Safety Act, 2021 (Act 41 of 2021) aṭanga lak a ni. Act chuan "dam" ("dam") chu luipui emaw a peng kalh tlanga tui khuah emaw luan kawng tihdanglam nana siam barrier a ti. Tuilian embankment, dike leh guide bund a telh lo. Mizoram-ah specified dam nih theih tawk bund sang nei dil hmuh a ni lo, Tam Dil leh dil dangte bund leh outlet-te he Kaihhruaina Bu tan survey an ni lo nain [TBC]; outlet hna, bund leh check dam tin chu Clause 7.14.1 hnuaiah endik tur a ni a, master plan-in Aizawl tana a rawt check dam pariat zinga pakhat mah sang zawng hriat a ni lo [TBC]. Tuirial leh Serlui B reservoir dam-te chu Act hnuaiah luipui kalh tlang dam an ni: Tuirial dam, zoned earth-fill dam sang 75 m (CERC), leh Serlui B dam, sang 51.3 m tih a ni (chanchin tlangzarh angin), an pahnih hian Clause 7.14.1(a)-a 15 m an pel. Dil, check-dam pool emaw reservoir khawlna Clause 7.7 hnuaia chhiar a nih chuan, a bund, outlet hna emaw dam chu Act a nghet loh chuan Clause

7.14.2 tan dil bund a ni. Luipui emaw a peng kalh tlang ni lo dil bund chu Act hnuaiah "dam" a ni em tih a thu aṭangin a chiang lo. Mizoram-ah khawpui leh khuate tana embankment pawimawhte chu Tuirial leh Serlui B reservoir dam-te an ni a, an hnuaia hlauhawm chu tui chhuah tir leh chhiatna (breach) a ni. Tuirial dam dam-break study chuan "lui inkawpna bulah" ("near the confluence") 3,035.34 m³/s sang ber a route nia sawi a ni (2025-a IAHR abstract, chanchin tlangzarh angin); a tui chim map, NEEPCO emergency action plan, leh dam pahnih tana tui chhuah tir hun ruat emaw warning kalphung reng reng he Kaihhruaina Bu tan chhiar a ni lo [TBC]. Bund chhia emaw a chung luang chuan a hnuaia ram a tilian a, hrilh lova tui chhuah tir pawhin a tilian bawk, chuvangin Clause 7.14.3 chuan hlauhawm sang embankment tan breach map leh emergency action plan a phut a, Tuirial dam hnuaia tui chhuah tir lui chhung chu tuilian hlauhawm catchment a ni a (Bung 1), Bung 5 chuan tui chhuah tir lui chhung tin chu tuilian hlauhawm outfall angin a ngai (Clause 5.8.5(e)). Hazard class, breach analysis leh hlauhawm sang dil tana emergency action plan hi he Kaihhruaina Bu-in a ruat a ni. Bung 4-a detention basin phutna (outlet tihtawp nena 1% AEP spillway, hlauhawm sang basin tan 0.2% AEP) chu design khawlna anga chhiar dil-te thlengin a pharh.

7.15 Thehluh tur mamawhte

Clause 7.1.2 hnuaia hmasawnna emaw hna tana drainage report tin-ah heng hi telh tur a ni:

1. Clause 7.3.2 hnuaia **Tui Awmna Sheet (Form 7-1)**, setback zone-te leh an innghahna (map-a zau zawng, hydraulic study emaw zau zawng nghet) nen;
2. Clause 7.3.4-in a phut chuan, 1% AEP zau zawng leh floodway hydraulic study;
3. flood fringe-a lei vur rawt a nih chuan, sanzawng band zelin **Compensatory Storage Chhutna (Form 7-3)**;
4. dil khawlna chhiar reng reng tan: Clause 7.7.1-a survey, stage–storage curve, kalpui dan, cascade model result leh enkawltu inremna nen **Dil Khawlna Credit Sheet (Form 7-2)**;
5. Zone 1-a kaltlanna, outfall emaw hna reng reng tan: enkawltu NOC leh Clause 7.6.2 emaw 7.10.3-a hydraulic analysis;
6. siam ṭhatna emaw leidip laih chhuah tan: Clause 7.9-a hna hmaa survey, leidip test leh hydrogeological report; leh
7. embankment reng reng tan: Clause 7.14-a Dam Safety Act endikna leh hazard class.

7.16 Endikna leh siam thar

7.16.1 He bung hi Kaihhruaina Bu bang zawng nen endik tur a ni (Bung 1). Clause 7.4.6-a table zau zawng nghet chu Authority-in a huam chhung tana 1% AEP tuilian map a pawm aṭanga kum 2 chhungin endik bawk tur a ni.

7.16.2 Authority-in 1% AEP tuilian map thar a pawm chuan, Authority-in thil dang a notify loh chuan, a pawm hnu **thla 6**-ah thehluh thar tan hman a ni ang.

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Belhchian leh Form

Belhchian / Form	A chhunga thu
7A	State pum tui awmna GIS layer leh inventory field-te
7B	Setback zau zawng nghet table (alternative S-3, Belhchian 1C nen)

Belhchian / Form	A chhunga thu
7C	Dil kalpui dan entawn tur (template), flood cushion nen
7D	Leidip laih chhuah leh siam ṭhatna specification
7E	Mizo tui awmna thumal leh bial hrang hranga an danglamna (regional variant) thumal awmzia
Form 7-1	Tui Awmna Sheet
Form 7-2	Dil Khawlna Credit Sheet
Form 7-3	Compensatory Storage Chhutna (sanzawng band zelin)

BUNG 8

Tui Ṭhatna leh Recharge

8.1 Tum leh a huam chin

8.1.1 He Bung hian site emaw vantlang tui luanna system emaw aṭanga chhuak ruahtui (stormwater) ṭhat zawng tur leh leihnuai tui recharge (leihnuai tui tihpun) tana phut turte a ruat. Heng hi a huam:

- (a) tui ṭhatna tui zat (water quality volume, WQv) leh tui ṭhatna design tui luang zat (water quality design flow);
- (b) treatment train (tihfaina kalphung indawt), leh best management practice (BMP, ruahtui tihfaina hmanrua leh kalphung) thlan dan leh design dan;
- (c) infiltration (lei-a tui luh) leh recharge tana tehna (criteria);
- (d) ruahtui drain (tui luanna)-ah ek tui leh ruah sur lohna hun tui luang (DWF) luh tir loh dan;
- (e) gross pollutant trap (bawlhhlawh dawnna, GPT), first flush (ruah tlak hmasa ber tui bal) tihfaina leh tui awmna (waterbody) pana outfall (drain tui luan chhuahna)-a screen-te;
- (f) ruahtui khawl khawm (RWH) hi retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) leh detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) nen a inrem dan;
- (g) sak lai erosion (lei khawh bo) leh bal (sediment) thunun dan; leh
- (h) enfiah reng (monitoring).

8.1.2 He Bung hi Bung 4 a huam hmasawnna hna (development) leh vantlang hnathawh (public work) zawng zawngah hman a ni (Bung 1). Clause 8.9 (ek tui) leh 8.12 (sak lai erosion leh bal thunun) hi building permit emaw layout phalna emaw mamawh hmasawnna hna zawng zawngah leh vantlang tui luanna hnathawh zawng zawngah, a lian leh tê eng pawh ni se, hman a ni.

8.1.3 Bung 4 hnuaia retention hi tui ṭhatna thununna kawng hmasa ber leh duh zawk ber a ni. Site-a khawl ruahtui luang (runoff) chu a zavaiin tihfai a ni. He Bung dang zawng hi WQv zinga khawl loh zawng chungah hman a ni.

> **Hrilhfiahna.** CPHEEO (2019) hi ruahtui ṭhatna chipchiar taka sawi India manual awm chhun a ni. A Chapter 9 chuan US event mean concentration-te a tarlang chhawng a, mahse "India-ah chuan value-te hi a sang zawk hle ang" ("in an Indian context the values would be much higher") tiin a hrilh fimkhur a, drain-te hian mihring ek, zun leh chaw bal an dawn avangin; India tan numeric criteria a ruat lo (CPHEEO 2019, Part A §9.5). A Chapter 10 chuan water-sensitive urban design, LID leh SuDS treatment train-te a sawi (CPHEEO 2019, Part A Ch. 10). He Bung hian chu inkaihhruaina chu phut tur (requirement)-ah a chantir. MARC/APWA BMP Manual (2012), tunah APWA 5600 (2025.01)-a telh, tihfaina kalphung a zui a, Malaysia-a thla 3 ARI tui ṭhatna ruahpui (MSMA 2, 2012) leh Georgia tui ṭhatna tui zat (GSMM, 2016) chu tropical leh US tehkhinna atan a hmang.

8.2 Thumal awmzia

Thumal	He Kaihhruaina Bu-a a awmzia
Tui ṭhatna tui zat (water quality volume, WQv)	Tui ṭhatna ruahtui tlak zat (Clause 8.4) aṭanga, khawl emaw tihfai emaw ngei ngei tur ruahtui luang tui zat.
Tui ṭhatna ruahtui tlak zat (P_wq)	Retention zat (Belhchian 2E, Clause 2.10) leh darkar 24 thla 3 ARI zat (Belhchian 8A) zinga a sang zawk.
Thla 3 ARI zat	Ni khat record rei tak partial-duration series aṭanga, kum khatah a chawhrualin vawi li a tluk emaw a pel emaw darkar 24 ruahtui tlak zat.
Tui ṭhatna design tui luang zat (Q_wq)	Thla 3 ARI ruahpui aṭanga tui luang zat sang ber, flow-through device (tui kal tlang hmanrua) leh diversion structure (tui peng tirna) lian zawng ruat nan hman (Clause 8.4.5).
WQv tana runoff coefficient (Rv)	Ruahpui tê tana volumetric runoff coefficient, Rv = 0.05 + 0.009·I.
BMP	Best management practice: bawlhhlawh zat (pollutant load) emaw ruahtui luang tui zat emaw tihtlemtu structure siam emaw structure ni lo hmanrua.
Treatment train	BMP pahnih emaw a aia tam indawt, a bul (source) aṭanga site leh region huap thleng (Clause 8.5).
Pretreatment	Ruahtui luang chu filter emaw infiltration BMP emaw a thlen hmaa bal lian, bawlhhlawh leh hriak la chhuaktu BMP.
First flush	Ruahtui luang ṭan tirh lam, bal, bawlhhlawh leh hriak a tam ber ṭhinna.
Gross pollutant trap (GPT)	Bawlhhlawh, plastic, thing leh hnim, leh bal lian, a tlangpuiin 5 mm vel aia lian, dawntu hmanrua.
Ruah sur lohna hun tui luang (DWF)	Darkar 72 tal ruah a sur loh hnua ruahtui drain-a tui luang. Ruahtui system hranah chuan DWF hi ek tui, in chhunga tui bal (sullage), leihnuai tui luh emaw dan lova tui bal luan lut tir (illicit discharge) emaw finfiahna a ni.
Cross-connection	Ek tui emaw sullage (chaw suangna, inbualna leh silfaina aṭanga tui bal) emaw ruahtui drain-a luh tirtu pipe, tui kawng emaw kawng kua reng reng.
Infiltration facility	Ruahtui luang chu lei hnuaiah emaw hmun hniamah emaw khawl a, leiah a luh tir tura design hmanrua: infiltration trench leh basin, lined loh bioretention, a hnuai inhawng permeable pavement, soakaway, recharge pit leh recharge well.
Hun bik-a leihnuai tui sang ber	Clause 3.10.2-a hrilhfiah angin: fûr hun chhunga a sang zawng sang ber.
Hotspot	Thil leih chhuak emaw ruahtui luang bawlhhlawh emaw hlauhawmna sang nei ram hman dan (Clause 8.8.8).
Level of Service (LoS) / Value Rating (VR)	MARC/APWA BMP Manual (2012) aṭanga Clause 8.6-a mark pekna kalphung.

8.3 Tum leh pollutant pawimawhte

8.3.1 He Kaihhruaina Bu hnuaia ruahtui tihfaina hian heng hi a tum tur a ni:

- (a) bawlhhlawh, plastic leh gross pollutant dangte chu tui awmna an thlen hmaa la chhuah;
- (b) tui chhunga bal lang (suspended sediment) leh a chunga metal, nutrient leh hriak la chhuah;
- (c) ek tui leh sullage chu ruahtui drain leh tui awmnaah luh tir loh;
- (d) lei leh leihnuai tui thuk zawng a phal hmunah leihnuai tui recharge, tibawlhhlawh lovin; leh
- (e) sak lai erosion leh bal luan chhuah veng.

8.3.2 Design chuan site tin tan heng pollutant-te hi a ngaihtuah tur a ni a, a huam hmunah Clause 8.8.8 hotspot pollutant-te pawh:

Table 8.1 — Pollutant pawimawhte, an hnar leh thununna ber

Pollutant	Mizoram khawpuia a hnar ber	Thununna ber
Gross pollutant (plastic, bawlhhlawh, thing leh hnim)	Kawngte, bazar, drain-a bawlhhlawh paih	A hnarah khawn khawm; GPT leh screen (Clause 8.10)
Tui chhunga bal lang	Sakna site, kawng chhuah loh leh kawng sir, kawng chhiat, drain leidip	Erosion leh bal thunun (Clause 8.12); pretreatment; filtration (tihthianghlimna)
Hriak, grease leh fuel	Kawngte, motor dahna, fuel station, workshop, bus depot	Hotspot-ah oil-grit separator; bioretention
Natna hrik (pathogen) leh organic load (BOD)	Ek tui leh sullage cross-connection, ran ek	Luh tir loh leh DWF interception (Clause 8.9)
Nutrient (N, P)	Ek tui, lei thlo (fertiliser), chaw bal, detergent	Luh tir loh; bioretention; wetland
Heavy metal	Kawngte, in chung, industry hmun	Filtration; sedimentation (bal tihtlak)

> **Hrilhfiahna.** Gross pollutant leh ek tui hi Clause 8.3-ah a hmasa berah dah an ni, Mizoram khawpui tui awmna tihbawlhhlawhnaah an lian ber avang leh, la chhuah an nih loh chuan tihfaina BMP reng reng a rei thei loh avangin. CPHEEO (2019) chuan India drain-te hian mihring ek, zun leh chaw bal an hruai tih a tarlang (Part A §9.5). A WSUD kalphungah TSS, nitrogen zawng zawng, phosphorus zawng zawng leh gross pollutant-te chu pollutant pawimawh ber atan a tarlang (Part A Ch. 10). AMRUT 2.0 chuan "ruahtui drain hmangin tui awmna (ek tui/effluent dawng lo)-ah" ("through storm water drains into water body (which is not receiving sewage/effluent)") ruahtui khawl khawmna a ṭanpui (Lok Sabha unstarred question AU1419), chu chu ek tui chu drain-te aṭanga a hmaa dan chhuah a nih chauhin a hlawhtling.

8.4 Tui ṭhatna tui zat leh design tui luang zat

8.4.1 **Tui ṭhatna ruahtui tlak zat.** Tui ṭhatna ruahtui tlak zat chu:

$$P_{wq} = \max(P_{ret}, P_{3m})$$

chutah:

- P_{ret} = site zone tana retention zat (Belhchian 2E, Clause 2.10), mm; leh
- P_{3m} = site zone tana darkar 24 thla 3 ARI zat (Belhchian 8A), mm.

8.4.2 **Tui ṭhatna tui zat.** WQv chu heti hian chhut tur a ni:

$$WQv = (P_{wq} / 1000) \times Rv \times A$$

chutah:

- WQv hi m^3-in a ni;

- A = tui luan khawm area, m²;
- Rv = 0.05 + 0.009·I; leh
- I = tui luan khawm area-a tui luh theih lohna hmun (impervious) percentage (0–100), Clause 3.9 connectivity dan hman hnua mi.

A chunga Rv chhutna hi ha 0.5 aia tê site-ah leh Tier B kalphung awlsam (Clause 4.14) hnuaiah chauh hman phal a ni. Hei hi retention tui zat (Clause 4.4.2) tana ri inang a ni. Site dang zawng zawng tan WQv chu retention tui zat ang bawkin SCS-CN kalphung hmangin chhut tur a ni: WQv (m³) = 10 × Q_wq × A, chutah Q_wq (mm) hi sub-area tin tana P_wq aṭanga SCS-CN ruahtui luang a ni a, A hi ha-in a ni.

8.4.3 **Climate factor.** Clause 2.8 climate factor chu P_wq-ah hman loh tur a ni. P_ret leh P_3m hi ruah pangngai frequency statistics an ni a, AEP design zat an ni lo.

8.4.4 **Retention-in WQv a tihkim.** Bung 4 hnuaia site-a khawl tui zat chu WQv-ah a zavaiin chhiar a ni. Khawl tui zat chu WQv a tluk emaw a pel emaw chuan, chu area tan tihfaina dang a ngai lo, heng bak chu:

- (a) retention hmanrua tina luang lut tui pretreatment (Clause 8.5.3);
- (b) hotspot thununna (Clause 8.8.8); leh
- (c) site tui chu tui awmnaah a luan chhuah chuan, Clause 8.10 outfall phut turte.

8.4.5 **Tui ṭhatna design tui luang zat.** Flow-through device (swale, filter strip, oil-grit separator, GPT) leh off-line BMP tana diversion weir-te chu Q_wq tan lian zawng ruat tur a ni. Q_wq chu tui luan khawm area time of concentration-a thla 3 ARI intensity aṭanga chhut tur a ni:

- (a) Rational Method hmangin, Bung 3-in a phalna hmunah (element pakhat, ha 16 aia tam lo tui luan chhuah tir); emaw
- (b) thla 3 ARI darkar 24 zat, Clause 2.9.1 alternating-block pattern nen, hmanga hydrograph kalphung peak angin.

8.4.6 **Bypass.** Q_wq aia tam tui luang chuan flow-through leh off-line tihfaina hmanrua-te chu an dawn tawh thil hruai chhuak lovin a kal pelh tur a ni. Bypass hi tui luanna system tenau (minor) emaw lian (major) emaw (Bung 6) zinga mi a ni tur a ni.

8.4.7 **Drawdown.** WQv hi extended-detention BMP (wet pond, constructed wetland emaw dry extended-detention basin)-ah khawl a nih chuan, **darkar 24–48** chhungin chhuah tur a ni (Bung 4).

> **Hrilhfiahna.** WQv zat hi thla 3 ARI ruahpui aṭanga ruahtui luang emaw retention zat emaw, a sang zawk zawk a ni. Thla 3 ARI hi Malaysia tui ṭhatna design ruahpui a ni (MSMA 2, 2012). Malaysia 2008 checklist chuan a zat chu 40 mm vel tiin a pe a, darkar 24 ruahpui ruahtui luang tui zat 90% emaw a aia tam a dawn tih a sawi (DID, 2008). Mizoram value chu chhut ngei ngei tur a ni (Belhchian 8A). Georgia chuan a WQv chu inch 1.2 (30 mm vel), kum pangngaia ruahpui 85% huamtu zat, aṭanga ruahtui luang angin a ruat a, hmasawnna hnu lam (post-development) TSS load kumtin chawhrual 80% la chhuah a phut (GSMM 2016, Vol 1, Standard #4). Kansas City tui ṭhatna ruahpui chu inch 1.37 (35 mm vel) thil thleng, kum khata darkar 24 ruahpui zawng zawng ruahtui luang 90% thleng siamtu a ni (MARC BMP Manual, 2012).
>
> Rv formula hi MARC/APWA BMP Manual (2012) aṭanga lak a ni a, chu chuan WQv = P × Rv, Rv = 0.05 + 0.009·I nen, a chhut. SCS curve number aiah Rv hman a ni, CN kalphung hian tui luh theihna hmun (pervious) chunga ruahpui tê aṭanga ruahtui luang a tlem lutuk zawngin a chhut avangin. Climate factor hman loh (Clause 8.4.3) hi entirna hmasa chiang a awm lo; he Kaihhruaina Bu hian P_wq chu retention zat angin, ruah pangngai statistic angin a ngaih avangin a ti a ni. Tui luang lian zawk bypass leh darkar 24–48 drawdown hi Bung 4 a zui; MARC (2012) chuan WQv extended detention darkar 40 tal a phut.
>
> **Entirna chauh — design value a ni lo.** Site ha 1.0, tui luh theih lohna hmun 80% leh P_wq 50 mm ngaih tan:
>
> - Rv = 0.05 + 0.009 × 80 = 0.77

- WQv = (50 / 1000) × 0.77 × 10,000 = 385 m³

8.5 Treatment train leh pretreatment

8.5.1 **Treatment train.** Tui ṭhatna thununna chu treatment train angin, Milem 8.1-a lantir indawt dan angin design tur a ni:

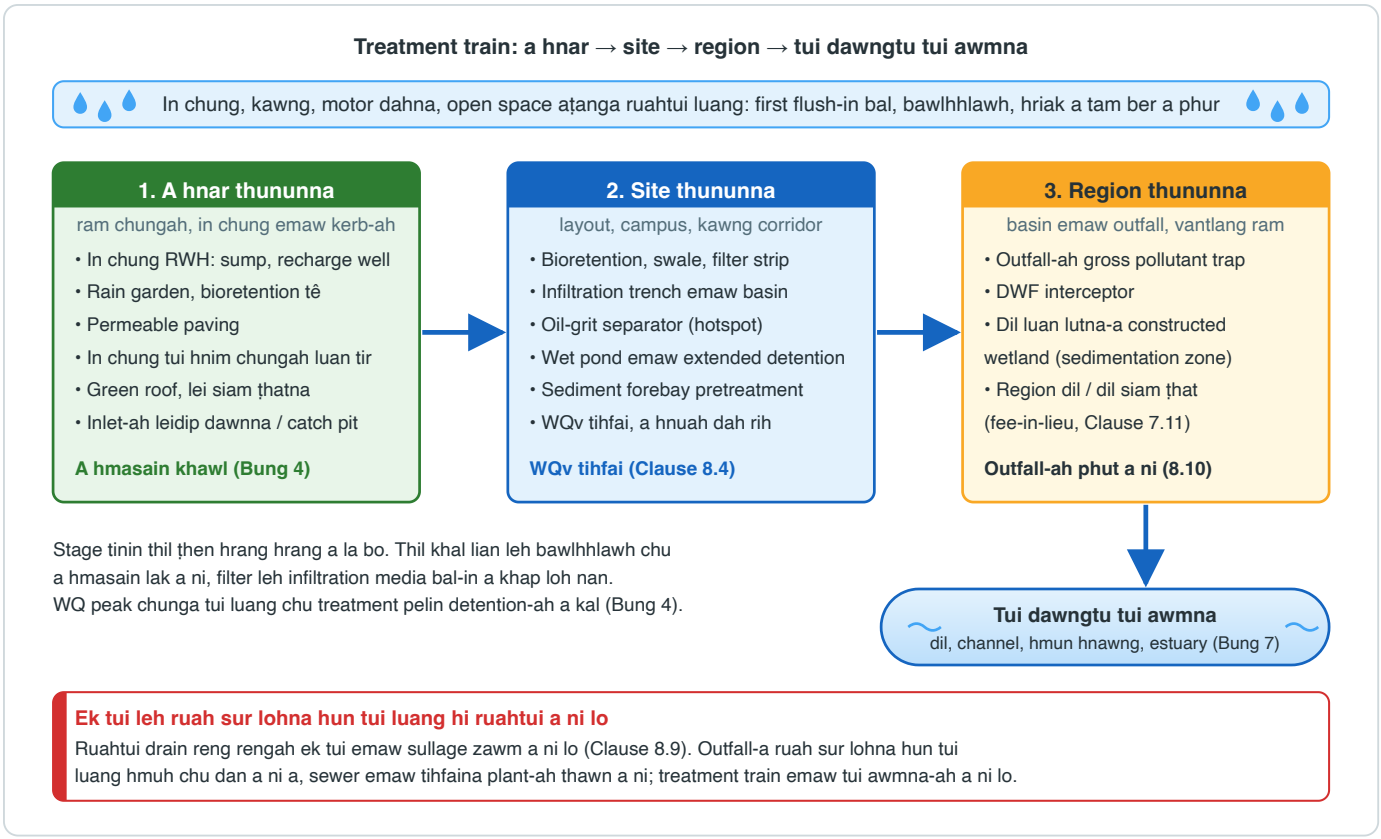
- (a) ram (plot) chunga **a hnar thununna (source control)**: in chung ruahtui luang chu RWH-ah, rain garden, permeable paving, tui luh theih lohna hmun inzawmna tihchat (disconnection), leh inlet-a leidip dawnna (silt trap);
- (b) **site thununna**: bioretention, swale, filter strip, infiltration, hotspot-a oil-grit separator, wet pond leh extended detention; leh
- (c) vantlang tui luanna tan **region thununna**: outfall-a GPT leh DWF interceptor, dil (tank) luan lutna-a constructed wetland, leh region dil.

8.5.2 Hmasawnna hna chuan WQv chu site-ah, (a) leh (b) hmangin, a tihkim tur a ni. (c) hnuaia region thununna chu notify a nih basin plan (Clause 7.11) hnuaia ruahtui luang inang tihfaitu regional facility sak a nih tawh chauhin hmasawnna hna WQv-ah chhiar phal a ni.

8.5.3 **Pretreatment.** Bioretention cell, infiltration facility, run-on (hmun dang aṭanga luang lut tui) dawng permeable pavement, wet pond leh constructed wetland tinin luan lutna ṭhenkhawm (concentrated inflow) tinah pretreatment an nei tur a ni. Pretreatment chu sediment forebay (leidip dawnna dil tê), hnim filter strip, leidip dawnna emaw proprietary device (company hmanrua) emaw, a tui luan khawm area **WQv 10%** tal khawl thei, emaw flow-through device tan Q_wq tana lian zawng ruat a ni tur a ni.

8.5.4 Pretreatment chu BMP ber luh emaw tihbuai emaw ngai lovin tihfai theih turin hman theih a ni tur a ni.

> Hrilhfiahna. Treatment train hian CPHEEO (2019, Part A §10.2.3, SuDS treatment train) leh CIRIA C753 *The SuDS Manual* (2015) a zui. He Kaihhruaina Bu thil pawimawh indawt dan pawh a ni: humhalh, khawl, dah rih, luan tir (Bung 1). Forebay tui zat 10% hi India entirna hmasa a awm lo; US manual-ah forebay lian zawng ruatna dan tlangpui a ni. Mizoram-ah kawng sir chhuah loh, sakna site leh drain leidip-in bal tam tak an thlen. Pretreatment nei lo bioretention leh infiltration facility-te chu an tawp ṭhin, kum khat emaw kum hnih chhungin.



Milem 8.1 — Treatment train: tui dawngtu tui awmna hmaa a hnar, site leh region thununna, ek tui leh ruah sur lohna hun tui luang chu system-a luh tir lovin. He Kaihhruaina Bu tana milem siam thar, CIRIA, The SuDS Manual (C753), 2015, leh MARC/APWA, Manual of Best Management Practices for Stormwater Quality, 2012 aṭanga siam danglam.

8.6 BMP thlan dan: Level of Service leh Value Rating

8.6.1 **Kalphung.** Tier A area-ah site tin tana BMP-te chu he Clause-a Level of Service (LoS) kalphung hmangin thlan tur a ni. Tier B area-ah Clause 8.6.5 kawng awlsam hman phal a ni.

8.6.2 **Level of Service mamawh.** Siam ṭhatna (redevelopment) ni lo site tan, LoS mamawh chu hmasawnna hma aṭanga hmasawnna hnu thlenga curve number inthlak zat (ΔCN) (Bung 3) a zir:

Table 8.2 — Siam ṭhatna ni lo site tana Level of Service mamawh

ΔCN	Nghawng	LoS mamawh
17 emaw a aia tam	Sang	8
7 aṭanga 16 thleng	Laihawl	7
4 aṭanga 6 thleng	Hniam	6
1 aṭanga 3 thleng	Tlem ber	5

Siam ṭhatna (site-a tui luh theih lohna hmun awm sa 20% emaw a aia tam) tan, LoS mamawh chu Belhchian 8B aṭanga lak tur a ni.

8.6.3 **Value Rating.** WQv tihfaitu BMP tinin Table 8.3 aṭangin Value Rating (VR) an nei. Site composite VR chu site hmun tin ṭanpuitu BMP-te VR area-weighted average (area zat anga chawhrual) a ni. Treatment train-te chuan Belhchian 8B hnuaiah composite VR an nei. Composite VR chu LoS mamawh a tluk emaw a pel emaw a ni tur a ni.

8.6.4 **Value Rating hmuh theihna dinhmun.** BMP chuan heng a tlin chauhin a VR a hmu:

- (a) a tana chhiar area WQv (emaw flow-through device tan Q_wq) tan lian zawng ruat a ni;
- (b) Clause 8.7 design phut turte, leh infiltration tan Clause 8.8, a tlin; leh
- (c) Clause 8.5.3 hnuaiah pretreatment a nei.

8.6.5 **Tier B kawng awlsam.** Tier B area-ah, site WQv zawng zawng chu heng zinga pakhatin a nih chuan Clause 8.6.3 phut tur chu tlin angin ngaih a ni:

- (a) Bung 4 hnuaiah site-a khawl; emaw
- (b) Clause 8.7 leh 8.8 hnuaia design bioretention cell, rain garden emaw infiltration facility emaw, pretreatment nen, hmanga tihfai.

Table 8.3 — BMP Value Rating leh Mizoram-a a inhmeh dan

BMP	VR (MARC 2012)	Pollutant ber la chhuah	Tui zat tihtlem / recharge	Phai alluvium leh lui kam zawl	Laterite / lung khauh	Tlang pang 10° chung, shale, colluvium leh lei vur / leihnuai tui sang	Mizoram hriat tur
Thing leh hnim pianphung (humhalh)	9.25	A zavai	Sang	A inhmeh	A inhmeh	A inhmeh	Humhalh, tihbuai loh area chauh chhiar
Rain garden / infiltration	9.0	Bal, metal, hriak, nutrient	Sang	Inkar 1.0 m a tlin chuan a inhmeh	Dinhmun azirin (test)	A inhmeh lo	Thosi thunun: darkar 48 chhungin tui tihkang
Bioretention	8.5	Bal, metal, hriak, nutrient	Laihawl–sang (lined loh); hniam (lined)	A inhmeh	Underdrain nen a inhmeh	Lined, underdrain nen	Media hnar leh a phosphorus zat tarlan tur
Permeable pavement	7.5	Bal, metal, hriak	Laihawl–sang	A inhmeh	Dinhmun azirin	Lined chauh	Run-on-in leidip tam a hruaina hmunah ni lo
Extended detention wetland	7.0	Bal, nutrient, metal	Hniam	Dinhmun azirin (tui balance)	A inhmeh	A inhmeh	Dil luan lutnaah a ṭha (Clause 7.9.7)
Media / sand filter	6.0	Bal, metal	Hniam	A inhmeh	A inhmeh	A inhmeh (lined)	Tihfai fo a ngai
Extended wet detention (wet pond)	5.0	Bal, metal, nutrient ṭhenkhat	Hniam	Dinhmun azirin (tui balance)	A inhmeh	A inhmeh	Thal tui balance (Clause 8.7.8)
Hnim filter strip	5.0	Bal	Hniam–laihawl	A inhmeh	A inhmeh	A inhmeh	Pretreatment atan ber
Hnim pianphung swale	4.0	Bal, hriak	Hniam–laihawl	A inhmeh	A inhmeh	A inhmeh	Q_wq chakna sanna hmunah ni lo
Extended dry detention	4.0	Bal lian	Hniam	A inhmeh	A inhmeh	A inhmeh	Detention nen kawp (Bung 4)
Proprietary / hydrodynamic device	3.0–5.0	Bal lian, hriak, bawlhhlawh	A awm lo	A inhmeh	A inhmeh	A inhmeh	Test data finfiah aṭanga VR chauh

BMP	VR (MARC 2012)	Pollutant ber la chhuah	Tui zat tihtlem / recharge	Phai alluvium leh lui kam zawl	Laterite / lung khauh	Tlang pang 10° chung, shale, colluvium leh lei vur / leihnuai tui sang	Mizoram hriat tur
Signage (vantlang zirtirna)	+0.25	—	—	—	—	—	Composite VR-ah belh

VR column hi MARC/APWA BMP Manual (2012), Table 4.4 aṭanga lak a ni. A inhmeh dan column leh hriat turte hi entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni.

> **Hrilhfiahna.** LoS leh VR kalphung hi MARC/APWA Manual of Best Management Practices for Stormwater Quality (2012), Table 4.2 leh 4.4 aṭanga lak a ni. VR-te hian International Stormwater BMP Database-a effluent TSS concentration innghat tui ṭhatna mark chu tui zat tihtlem, khawsik zawng (temperature), leh hriak leh tui chunga lang thil (floatables) mark-te nen a kawp. Kalphung hi chhan pahnih avangin Mizoram tan a inhmeh. Tui zat tihtlem leh humhalhna, recharge pawh ṭanpuitu, a fak. Tui ṭhatna model tel lovin endiktu (reviewer)-in a endik thei bawk. A chak lohna chu mark-te hi US data aṭanga lak an ni. Mizoram ruahtui hian mark-te innghahna US ruahtui luang aiin bawlhhlawh leh ek tui a tam zawk a keng a (CPHEEO 2019, §9.5), chuvangin he Kaihhruaina Bu hian GPT leh DWF luh tir loh chu hrang takin a phut a (Clause 8.9 leh 8.10), VR-in an aiah a ding a phal lo.

8.7 BMP design tawi

8.7.1 **Tlangpui.** BMP tin chu a hnuaia phut turte leh Belhchian 8D (BMP design sheet) angin design tur a ni. Zau zawng tarlante hi chhinchhiah a nih hmunah **ṭanna value rawt** an ni; designer chuan kalsan reng reng a chhan a sawi tur a ni. BMP tin chu Q_wq aia tam tui luang him taka a kal theihna turin design tur a ni a (Clause 8.4.6), enkawlna atan luh theihna (access) a nei tur a ni (Bung 10).

8.7.2 **Bioretention leh rain garden** (Milem 8.2).

- (a) Chung lama tui tlin (ponding) thuk zawng chu mulch chungah **300 mm** aia tam lo, tui tlin sang ber level-ah overflow (tui luan liamna) nen.
- (b) Chung lama tui tlin chu **darkar 48** chhungin tihkang.
- (c) Filter media 600–900 mm thuk: fines leh phosphorus tlem engineered sandy loam (Belhchian 8D), 50–75 mm mulch nen.
- (d) Media hnuaiah transition (choker) layer leh gravel drainage layer.
- (e) Lei pianphung design infiltration rate (Clause 8.8.4) chu (b) tlin nana mamawh rate aia a hniam chuan, emaw cell chu lined a nih chuan, perforated underdrain (a hnuaia tui luanna pipe kua nei).
- (f) Lined loh cell-te chuan Clause 8.8 infiltration tehna an tlin tur a ni. Tling thei lo cell-te leh hotspot-a cell-te chu lined tur a ni.
- (g) Thlai: tui chiah leh thal rei tak pawh tuar thei, ram pianphung emaw ram chhunga ṭo nghet tawh chi.

8.7.3 **Hnim swale.**

- (a) Trapezoidal emaw parabolic cross-section, a sir tlang pang chu 1V:3H aia chho lo.
- (b) A dung lam awn zawng 0.5% aṭanga 4% thleng, a chhoh zawk hmunah check dam nen.
- (c) Q_wq-a tui luang thuk zawng chu hnim sang zawng aia tam lo, Q_wq-a chakna (velocity) 0.3 m/s aia tam lo.
- (d) 1% AEP tui luang (emaw bypass) chuan swale a khawh bo loh tur a ni (Bung 9 chakna phal).
- (e) A dung lam awn zawng 1% aia a hniam hmunah emaw lei hnuai lam tui a luang chhuak ṭha lo hmunah emaw, filter media nen underdrained ("dry") swale.

8.7.4 **Hnim filter strip.**

- (a) Sheet flow (lei chunga zau taka luang) chauh dawng, tui luang ṭhenkhawm a lo thlenna hmunah level spreader nen.
- (b) Tui luan lam dung zawng 5 m tal, awn zawng 1% aṭanga 8% thleng.
- (c) Bioretention, infiltration leh swale tan pretreatment atan ber hman.

8.7.5 **Permeable pavement.**

- (a) Tui luh theih lohna hmun aṭanga run-on chu permeable area let hnih aia tam lo, chhuah loh emaw khawh bo mek emaw area aṭanga run-on reng reng awm lo.
- (b) Lung tê fai, open-graded aggregate base reservoir, a kua chhungah WQv a chan khawl thei tura lian zawng ruat.
- (c) Clause 8.8 a tlin hmunah chauh base inhawng (infiltrating); a nih loh chuan underdrain nen lined, chutichuan filtration angin chauh chhiar.
- (d) Kawng authority standard angin traffic load tana structure design.
- (e) Hotspot-ah ni lo, chung lam chu tui luh theih loh thil hmanga siam thar a nih tur hmunah ni lo.

8.7.6 **Infiltration trench leh basin** (Milem 8.3).

- (a) Dinhmun tinah Clause 8.5.3 hnuaia pretreatment.
- (b) Trench-te chu lung tê sil fai, test-in a finfiah void ratio nei, hmanga tihkhat, a sir leh a chungah geotextile-a tuam, sand base chungah.
- (c) Trench tin hnuai thleng observation well.
- (d) Khawl tui zat = kua chhunga WQv (emaw Bung 4 retention tui zat, a lian zawk chuan); design infiltration rate-ah darkar 72 chhungin tihruak.
- (e) Lei chung level-ah tui luanna system tenau emaw lian emaw pana overflow.
- (f) Tui luan khawm area chu tihnghet (stabilise) a nih hma chu hman ṭan loh (Bung 10).

8.7.7 **Wet pond (extended wet detention).**

- (a) WQv tal permanent pool (tui reng dil), leh pool chunga WQv extended detention, darkar 24–48 chhunga chhuah.
- (b) Inlet tinah sediment forebay (Clause 8.5.3).
- (c) Tui luan kawng dung leh zau ratio 3:1 tal, short-circuiting (tui kal tlang thut) awm lo.
- (d) Permanent pool thuk zawng 1.0–2.5 m, safety bench nen (Clause 7.9.4).
- (e) Thal tui balance (Clause 8.7.8).
- (f) Bung 4 detention khawlna chu extended detention level chungah a awm thei.

8.7.8 **Permanent pool tana tui balance.** Wet pond leh wetland-te chuan IMD ruahtui tlak leh pan evaporation (tui kang zat) hmanga thla tin tui balance-in, kum 10 zinga kum ro ber chhungin permanent pool tui zat 50% tal (emaw wetland thuk zawng hniam ber) an vawng thei tih lantir tur a ni. Leihnuai tui, in tur tui emaw ek tui emaw hmangin tihkhat belh loh tur a ni. Balance a hlawhchham chuan, a aiah dry extended-detention basin emaw permanent pool tê zawk nei constructed wetland emaw hman tur a ni.

8.7.9 **Constructed wetland.**

- (a) Inlet sedimentation pond (forebay), a hnuaiah hnim tui hnuai lam macrophyte zone thuk lo nen.
- (b) Tui level pangngai chunga WQv extended detention, darkar 24–48 chhunga chhuah, extended detention thuk zawng 0.5 m aia tam lo.
- (c) Tui luan kawng dung leh zau ratio 3:1 tal, tui luang darh nan tui luan kawng kal tlanga hmun thuk nen.
- (d) Tuilianin macrophyte zone a khawh loh nan high-flow bypass.
- (e) Dil (tank) luan lutnaah sak a nih chuan, wetland chu dil setback (tui kam aṭanga hmun kalhlen tur) chhungah, mahse a tui zau zawng (waterspread) pawnah a awm tur a ni a, a khawlna chu dil khawlna angin chhiar loh tur a ni.

8.7.10 **Gross pollutant trap.**

- (a) Q_wq tihfai tura lian zawng ruat, 1% AEP thleng tui luang zawng zawng chu dawn tawh thil hruai chhuak lova kal tlang thei.
- (b) 5 mm vel thleng gross pollutant dawn.
- (c) Drain hydraulic grade line (Bung 9)-ah head loss tel, screen chu **50% tihtawp (blockage)** ngaih nen.
- (d) Dawn thil khawlna chu O&M plan tihfai inkar hun tan lian zawng ruat, Bung 10-a thla 3 zela tihfaina aia tlem lo.
- (e) Hip chhuah (suction) emaw grab emaw hmanga tihfai nan motor luh theihna.

8.7.11 **Oil-grit separator.**

- (a) Fuel emaw hriak emaw tel Clause 8.8.8 hotspot-ah mamawh: fuel station, motor workshop leh silfaina hmun, bus leh truck depot, leh motor dahna 50 aia tam nei parking area.
- (b) Q_wq tan lian zawng ruat, high-flow bypass nen.
- (c) Tihfaina awm chhun atan hman loh tur: site-in VR 5 aia sang a mamawh chuan a hnuaiah filtering BMP a awm tur a ni.

8.7.12 **Leidip dawnna leh catch pit.**

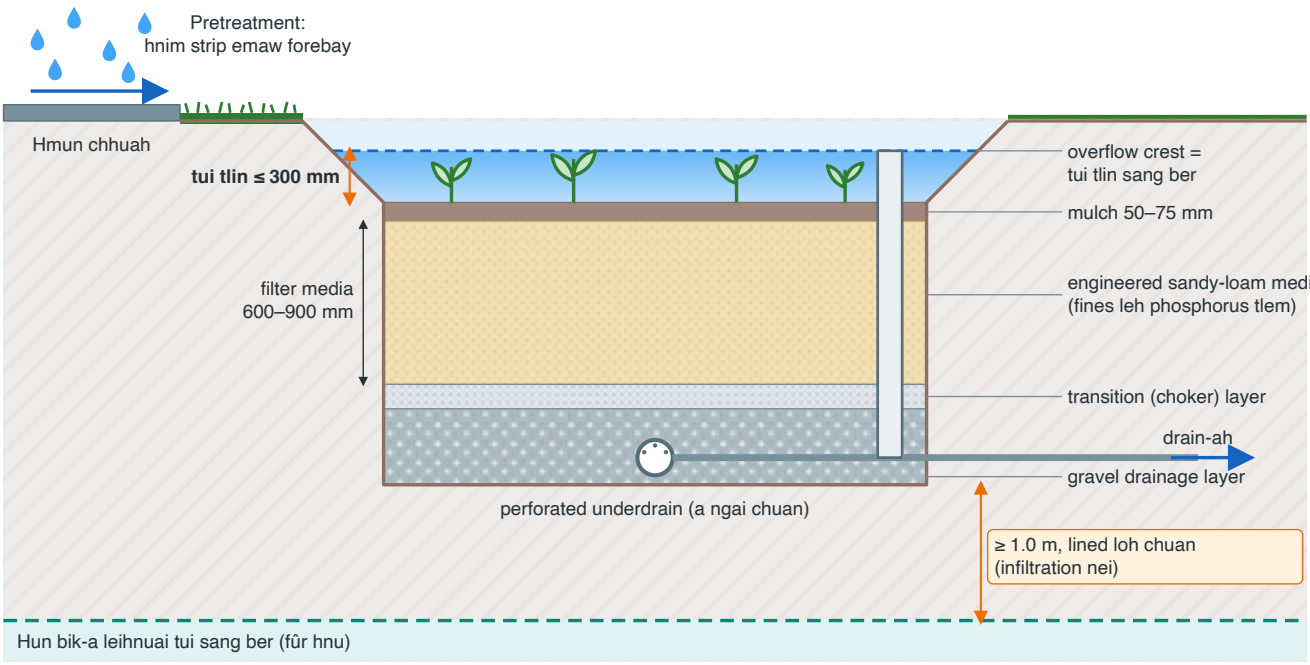
- (a) Lei chhuah loh aṭanga ruahtui luang dawng inlet tinah, leh BMP emaw tui awmna emaw-a luang chhuak drain tin inletah.
- (b) Outlet invert (tui luanna hniam ber) hnuai lamah 300 mm tal thuk sump.
- (c) Leidip dawnna hi pretreatment chauh a ni a, VR a hmu lo.

> **Hrilhfiahna.** Design tawite hi MARC/APWA BMP Manual (2012), Georgia Stormwater Management Manual (2016, Vol 2), CIRIA C753 *The SuDS Manual* (2015) leh PUB Singapore ABC Waters Design Guidelines aṭanga lak an ni. Zau zawngte hi chung manual-te tlangpui an ni a, mahse Mizoram-ah calibrate a la ni lo. Hmun chhunga thil pathumin thu hnar manual aṭanga danglamna an thlen:
>
> - **Thosi.** Mizoram-ah dengue a awm reng. Bioretention leh rain garden-a chung lama tui tlin chu darkar 48 chhungin a kang ngei ngei tur a ni (Clause 8.7.2(b)), thosi no (larvae) a lo puitlin hun chhung aia rang fe. Hei hi Clause 8.4.7-a darkar 24–48 WQv drawdown nen a inmil.
> - **Thal.** Mizoram ruah tam zawk hi April ni 1 aṭanga October ni 31 thleng fûr hunah a sur: CGWB chuan "May aṭanga September tawp lam thleng ruahpui" ("heavy rainfall during May to late September") a chhinchhiah a (Lunglei), kum ruah zinga hlawm lian ber, 16.8%, chu August-in a keng a, a tê ber, 0.4%, chu January-in (Lallawmzuali and Muniyan, 2024), chuvangin November aṭanga March thlenga thla-te hi an ro deuh vek (NEER chhiar dan). Chung thlaah tuikhur-te chuan January aṭanga March thleng "ni khatah liter 3,000 aṭanga 20,000 thleng" ("3,000 to 20,000 liters per day") an la pe (CGWB, Lunglei); Aizawl Urban Area chhungkaw 27.16% chuan ruahtui an hmang a, 1.01% chuan tuikhur tui (master plan), chuvangin in chunga ruahtui khawl leh tuikhur-te hian thal thlaah khawpuite an chawm. Khawpuiah thal thlaa drain, lui emaw dil emaw tui hi ek tui a ni fo, drain-te hian an hruai avangin (Clause 8.9, Hrilhfiahna). Wet pond emaw constructed wetland emaw, a tui balance (Clause 8.7.8)-in a catchment (ruahtui luan khawmna hmun) ngei ruahtui luang hmangin thal thlaah a permanent pool a vawng thei lo chu hman loh tur a ni; tlang chhip khawpuiah, Clause 4.11-in tlang pang leh shale-ah infiltration a khap a, ram zawl a tlem hmunah chuan, a hman theih dan chu underdrain nei lined bioretention, ram awn zawi hmuna swale, hman tura khawlna, leh lined extended dry detention a ni. Clause 8.7.8 hi BMP-te chungah hman a ni a, chungte chu ek tui emaw tuikhur tui emaw hmangin tihkhat belh loh tur a ni; dil, tuikhur, reservoir (tui khuah) leh wetland-te hi Bung 7 hnuaia tui awmna an ni a, hmasawnna hna tana tihfaina atan hman loh tur an ni. Wet pond ro chu tui ding bawlhhlawh dilah a chang emaw bawlhhlawh paihna atan hman a ni emaw ṭhin. Clause 8.7.8 chuan tui balance a phut a, ek tui hmanga tihkhat belh a khap, chu chu khawpui dil "khat" ("full") reng nana tih ṭhin a ni.

- **Bawlhhlawh leh leidip.** GPT leh leidip dawnna hi ngai ngei tur angin ngaih an ni, duh thlan mai ni lovin, Mizoram drain-te hian bawlhhlawh leh leidip tam tak an hruai avangin. Screen tana 50% blockage factor hi Bung 6 grate clogging factor nen a inmil.

Oil-grit separator tana motor dahna 50 threshold, GPT dawn lian zawng 5 mm, swale chakna 0.3 m/s leh he Clause-a zau zawng dangte hi entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni.

Bioretention cell (rain garden): cross-section, scale ang a ni lo



Lined version (infiltration a awm lo): gravel layer hnuaiah impermeable liner. Pollution hotspot-ah phut a ni a, fûr hun leihnuai tui sang ber thleng inkar 1.0 m tlin theih loh hmun apiangah pawh.

Lenzawng chu Clause 8.7.2-a ruat angin.

Milem 8.2 — Bioretention cell (rain garden) cross-section: pretreatment, chung lama tui tlin, filter media, transition leh gravel layer, underdrain, overflow, leh lined loh cell tan hun bik-a leihnuai tui sang ber thleng inkar 1.0 m. He Kaihhruaina Bu tana milem siam thar, MARC/APWA, Manual of Best Management Practices for Stormwater Quality, 2012, leh CIRIA, The SuDS Manual (C753), 2015 aṭanga siam danglam.

8.8 Infiltration leh recharge tehna

8.8.1 **Leihnuai tui inkar.** Infiltration facility chu **hun bik-a leihnuai tui sang ber chu facility hnuai aṭanga 1.0 m tal hnuaia a awm** hmunah chauh phal a ni. Mizoram-ah hei hian bihlam (exception) a nei lo, tuifinriat kam sand area a awm loh avangin (Clause 8.8.9). He Clause tan hun bik-a leihnuai tui sang ber chu April aṭanga November thlenga level sang ber hmuh a ni a, chu chuan April ni 1 aṭanga October ni 31 thleng hun leh a hnu thla khat a huam (Clause 3.10.2). Mizoram-ah hetah Clause 4.11 dan pahnih leh he Kaihhruaina Bu tuikhur dan a ngai a, Clause 8.8.1 hi heng nen hman a ni. **(i) Tlang ramah infiltration a awm lo (Clause 4.11, tlang dan: hill rule).** Infiltration kalphung tum taka siam (soakaway, soak emaw percolation pit, recharge pit, shaft emaw well, infiltration trench, lined loh bioretention, emaw a hnuai tui chhuak thei permeable paving) reng reng hi 10° aia awn ram pianphung chungah; Surma group shale, siltstone emaw mudstone chungah, awn zawng eng pawh ni se; colluvium, lei vur, lei laih bal emaw leimin bal (slide debris) chungah, awn zawng eng pawh ni se; map-a lang Moderate, High emaw Very High leimin hlauhawm zone-ah; emaw lei laih pang (cut slope) emaw retaining wall emaw chung lamah, cut emaw wall emaw sang zawng let hnih chhungah sak emaw

chhiar emaw loh tur a ni — thiamna nei geotechnical engineer emaw engineering geologist emaw geotechnical certificate-in tui belh chuan tlang pang a tihnghet lo loh tih a lantir loh chuan; High emaw Very High leimin hlauhawm zone-ah chuan certificate eng pawh pe se, engtikah mah phal a ni lo. Bokabil leh Bhuban unit tlang chhipte hi "tui luh theihna leh infiltration hniam" ("characterized by low permeability and infiltration") a, "ruahtui luang chhuahna zone" ("run off zone") angin an awm (CGWB), "shale leh siltstone awmna lithological unit-te hi sandstone unit khauh leh nghet aiin leimin a tlak theih zawk" ("Lithological units comprising shale and siltstone are more susceptible to landslide than the hard and compact sandstone unit") (MIRSAC). Chutiang site-ah chuan in chung ruahtui luang chu Bung 4 hnuaia chhiar ruahtui khawlnaah a kal a, a luan liam leh ruahtui luang dang zawng zawng chu lined drain hmangin, leidip dawnna leh energy dissipator (tui chakna tihnemna) kal tlangin, lui kawng pianphung nghetah a kal a, tlang pang veng loah engtikah mah a kal lo; Clause 8.11.3(c)-a in chung tui bihlam chu hetah hman a ni lo, retention emaw WQv emaw-ah infiltration reng reng chhiar a ni lo. A innghahna chu Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 tum sawina clause, "tlang panga leihnuai tui lut zat tihpun, leh sewerage leh tui luanna chu thunun ṭha lova tlang pangah paih" ("increasing the amount of groundwater penetrating into slopes, and disposing of sewerage and drainage onto slopes in a poorly controlled manner") chu "tlang pang nghet lohna a tipung nasa thei" ("can greatly increase slope instability") mihring thiltihte zinga a tarlanna, a regulation 27 (lei hnuai tui luanna "nghetna atana a ngai angin" ("as necessary for stability")) leh regulation 26 ("leihnuai tui, tuikhur ang chi" ("subsurface water, such as springs") thununna), leh Roadmap to Stability (2014), "Aizawl City chhunga septic tank, leach field leh soak pit zawng zawng" ("all septic tanks, leach fields and soak pits within Aizawl City") paih bo tura ngentu, an ni. Aizawl Municipal Corporation Building Regulations, 2012 regulation 33 chuan water closet tin tan "septic tank a tawk zawng soak pit nen" ("a septic tank of appropriate capacity with soak pit") a phut a, chu chu hlauhawm tlang pangah Roadmap-in paih bo a duh kalphung a ni: he Kaihhruaina Bu hian soak pit-ah ruahtui a dah lut lo a, chu chu a sawi chiang; regulation 33 chu a thlak lo. **(ii) Phai alluvium leh lui kam zawl test tawhah chauh recharge (Clause 4.11, recharge dan: recharge rule).** Mizoram-ah recharge hi design tum a ni lo: State hian 2011-ah a leihnuai tui 3.52% a hmang a (CGWB), 2024 chhutnaah 3.95%, unit 26 chhut zawng zawng Safe an ni (thu hnar ang), "leihnuai tui hmasawnna thunun tura notify area" ("Areas Notified for Regulation of ground water development") chu "a awm lo" ("NIL") a ni (CGWB). Recharge tum taka siam chu phai alluvium leh lui kam zawl test tawh (Champhai phai, leh Tlabung, Bairabi leh Vairengte-a leh Tlawng kama lui kam zawlte) chungah chauh, tlang pang aṭanga hla, 1% AEP tuilian sang zawng chunga 10° emaw a aia hniam ram zawlah, pretreatment, Clause 8.8.3 field test, lei chung aṭanga 2.0 m tal hnuaia hun bik-a leihnuai tui sang ber leh he Clause inkar nen phal a ni; 1% AEP tuilian sang zawng hnuaia phai ramah, dil Zone 1 emaw Zone 2 emaw-ah (Bung 7), tuikhur aṭanga 15 m chhungah, emaw leihnuai tui chu lei chung aṭanga 2.0 m chhunga a awmna hmunah engtikah mah phal a ni lo, CGWB-in tui "lei chung aṭanga 2.0 m hnuai chhungah" ("within 2.0 m below ground level") a hmuhna phai dil tê-ah ang hian (Lunglei). Mizoram Water Resources (Management and Regulation) Act, 2024 chuan IWRD chu "leihnuai tui recharge tihpun nan ruahtui khawl khawm tihchak" ("promote rain water harvesting to augment ground water recharge") tur a ti a (s.14(1)(b)(viii)), WARDMA chu "ruahtui khawl khawm telin tui humhalh leh leihnuai tui recharge" ("water conservation and groundwater recharge, including rain water harvesting") thupek turin a phal (s.16(2)(ix)); tlang ramah he Kaihhruaina Bu hian a pahnih hi recharge ni lovin khawl leh hman nawn angin a chhiar a, chu chu a sawi chiang. **(iii) Tuikhur: tuikhur dan (spring rule).** Ruahtui outfall, soakaway emaw drain tui chhuahna reng reng tuikhur aṭanga 15 m chhungah a awm lo; ruahtui chu tuikhur-ah emaw a chung lam tlang pang hnaih berah emaw kal tir a ni lo; drain, lei laih emaw lei vur emaw reng rengin tuihna lam tui luang a dang lo, a chhuahna a phum lo emaw a kal tlang lo; leh tui lakna hmun chunga tuihna catchment, hydrogeologist-in a map angin, chu humhalh catchment a ni a, chutah chuan kal nan chauh lo chu chhuah a awm lo, kawng ruahtui luang leiah luh tir a ni lo, soak pit emaw septic tank emaw dah a ni lo. 15 m hi regulation 33-in septic tank emaw soak pit emaw leh "tui hnar" ("a water source") inkara a vawn 15 m chungah he Kaihhruaina Bu-in a ruat a ni; a innghahna chu 2024 Act hnuaia Village leh Local Water Resources Committee-te mawhphurhna "tui hnar hriat tawhte bawlhhlawh laka veng" ("Prevent pollution of identified water sources"), a "khawtlang tui hnar" ("community water resources")-ah tuikhur a tel (s.2(1)(i)), leh Village Council-te mawhphurhna "khaw chhunga tui hnar humhalh" ("Conserve water resources within the village area") (Mizoram (Village Councils) Act, 2025, s.14(6)) an ni. **(iv) Ṭhat zawng.** Lung laihna (quarry), lung laihna bal, industry hmun emaw motor kal nasa kawng emaw aṭanga ruahtui luang reng reng recharge structure-ah luh tir a ni lo, phai alluvium chunga recharge well emaw shaft emaw chu in chung tui emaw filtering BMP kal tlang tawh ruahtui luang emaw tan chauh hman a ni, hydrogeologist report-in tui thuk zawng, tui dawngtu zone, leh m 30 chhunga in tur tui well, tuikhur emaw tui lakna emaw a tichhe lo tur tih a finfiah hnuah. 10° threshold, shale dinhmun, wall sang zawng let hnih hlat zawng, 2.0 m ri, tuikhur dan leh heng dinhmunte hi he Kaihhruaina Bu-in a ruat a ni; Mizoram dan reng rengin

infiltration khapna awn zawng emaw lei emaw a ruat lo (Site Development and Slope Modification Regulations, 2017-a 24° chuan engineered site development a thlen tir a, infiltration ri a ni lo). Hun bik-a leihnuai tui sang ber chu Clause 3.10.2 hnuaiah ruat tur a ni.

8.8.2 **Inkar dang.** Infiltration facility hnuai chu lung bul (bedrock) emaw tui luh theih loh layer reng reng emaw chungah 1.0 m tal a ni bawk tur a ni, facility chu Clause 8.8.10 hnuaiah lung keh emaw lung tawih (fractured or weathered rock) aquifer recharge tura design a nih loh chuan.

8.8.3 **Infiltration test.** Infiltration rate chu facility hnuai level rawtah teh tur a ni:

- (a) basin, bioretention leh permeable pavement tan double-ring infiltrometer test (ASTM D3385) hmangin;
- (b) trench, soakaway, recharge pit leh recharge well tan falling-head borehole emaw trial-pit soakage test (entirnan BRE Digest 365) hmangin;
- (c) **facility tinah test 2** tal, leh infiltration hnuai area m² 100 tinah emaw trench dung m 50 tinah emaw test 1 tal; leh
- (d) geotechnical test thiam mi-in, a rah chhuah chu Infiltration Test Record (Form 8-2)-ah report.

Thal laia test chu test hun laia leihnuai tui level leh Clause 8.8.1 fûr hun level sang ber nen report tur a ni.

8.8.4 **Design infiltration rate.** Design infiltration rate chu teh rate chu safety factor-a ṭhen a ni:

- (a) test-te chuan Clause 8.8.3(c) an tlin a, a rah chhuahte chu factor 2 aia an danglam loh chuan **2.0**; leh
- (b) a nih loh chuan **3.0**.

8.8.5 **Rate hniam ber.**

- (a) Design rate chu **13 mm/h** tal a nih chauhin infiltration kim (underdrain tel lo).
- (b) Design rate chu 3 mm/h aṭanga 13 mm/h thleng a nih chuan, underdrain nen, infiltration ṭhenkhat. Darkar 72 chhunga lei-a lut tui zat chauh retention angin chhiar a ni.
- (c) Design rate chu 3 mm/h aia a hniam chuan infiltration chhiar a ni lo.

8.8.6 **Infiltration facility tana setback.** Kawng, motor dahna emaw hmun chhuah dang aṭanga ruahtui luang dawng infiltration facility-te chu heng tal an ni tur a ni:

- (a) in bul (foundation) aṭanga **3 m**, leh basement aṭanga **5 m**;
- (b) ram ri aṭanga **1.5 m**, a ṭhenawm-in ziaka a remtih loh chuan;
- (c) in tur tui well emaw borewell aṭanga **30 m**;
- (d) septic tank emaw soak pit aṭanga **15 m**; leh
- (e) 1V:3H aia chho tlang pang chhip aṭanga **6 m**, geotechnical report-in tlang pang a nghet reng tih a lantir loh chuan.

In chung ruahtui luang chauh recharge structure-a kal chu (a) leh (b) chauh leh Clause 8.11.3 hnuaiah a awm.

8.8.7 **Drawdown leh finfiahna.** Infiltration facility tin chu design rate-ah **darkar 72** chhungin a ruak tur a ni (Bung 4), sak zawh hnuah test tur a ni (Clause 10.9.3).

8.8.8 **Hotspot.** Heng aṭanga ruahtui luang hi tihfai lovin lei-a luh tir loh tur a ni a, (d) emaw (e) emaw a huam hmunah engtikah mah lei-a luh tir loh tur a ni:

- (a) fuel station;
- (b) motor workshop, silfaina hmun, leh bus leh truck depot;
- (c) thil hlauhawm hman emaw dahna industry hmun leh thil phurh chhuahna hmun;
- (d) bawlhhlawh sawn chhuahna station leh landfill area; leh
- (e) tihbawlhhlawh tawh nia hriat emaw rinhlelh emaw ram.

(a) aṭanga (c) thleng tana tihfaina chuan infiltration reng reng hmaah oil-grit separator leh lined filtering BMP a tel tur a ni.

8.8.9 **Tuifinriat kam sand aquifer.** He Clause hi tuifinriat kam sand aquifer chungah chauh hman a ni. Mizoram-ah pakhat mah a awm lo, chuvangin State-ah he Clause hian nghawng a nei lo; Clause number-te a danglam loh nan chauh vawn a ni. Champhai phai alluvium leh Tlabung, Bairabi leh Vairengte-a leh Tlawng kama lui kam zawlte hi tuifinriat kam sand area an ni lo: chutah chuan Clause 8.8.1 hi a zavaiin, Clause 4.11 recharge dan nen, hman a ni a, item (d)-a inkar tihtlem chu hman a ni lo. Tuifinriat kam sand area-ah:

- (a) Clause 8.8.1 a tlin hmun apiangah infiltration hi retention leh WQv tihkimna kawng duh zawk ber a ni;
- (b) ruahtui drain-te hi leihnuai tui sang zawng tihhniam tura design loh tur a ni: hun bik-a leihnuai tui sang ber hnuaia invert-te chu tui put chhuak thei lo (watertight) an ni tur a ni, leihnuai tui outfall-a chhuahtu weep hole emaw subsoil drain emaw nei lovin, hydrogeological report-in tui thianghlim aquifer a tichhe lo tih a lantir loh chuan;
- (c) leihnuai tui ruahtui drain-a hun rei tak pump luh (entirnan basement tui pump chhuah) reng reng phalna pek loh tur a ni; leh
- (d) notify a nih tuifinriat kam sand area-ah, **in chung ruahtui luang chauh** chu hun bik-a leihnuai tui sang ber thleng **0.5 m** aia tlem lo inkar nen lei-a luh tir phal a ni, groundwater mounding check-in mound chu facility hnuai aṭanga 0.3 m tal hnuaiah a awm reng a, a bula in bul emaw basement emaw a thleng lo tih a lantir chuan. Ruahtui luang dang reng reng hian he inkar tihtlem hi hman phal a ni lo;
- (e) inkar 1.0 m emaw clause (d) emaw tlin theih a nih loh chuan, site chuan lei hnuaia lut lo leilung chung retention (entirnan hnim nei hmun hniam thuk lo, in chung tui hnim chunga luan tir, leh hman nawn) leh Bung 4 hnuaia detention a hmang tur a ni.

8.8.10 **Laterite leh lung khauh area.** Laterite leh lung khauh ramah (entirnan Surma group sandstone khauh leh nghet leh tlang chhipte Barail sandstone, leihnuai tui chu lung keh, lineament leh lung tawih zone-ah awm a, tuikhur angin a chhuahna (CGWB); heng area-a tlang pang reng rengah Clause 8.8.1 hnuaiah Clause 4.11 tlang dan hi a hmasain hman a ni, chuvangin he Clause hian tlang pang aṭanga hla, test tawh ram zawlah chauh nghawng a nei):

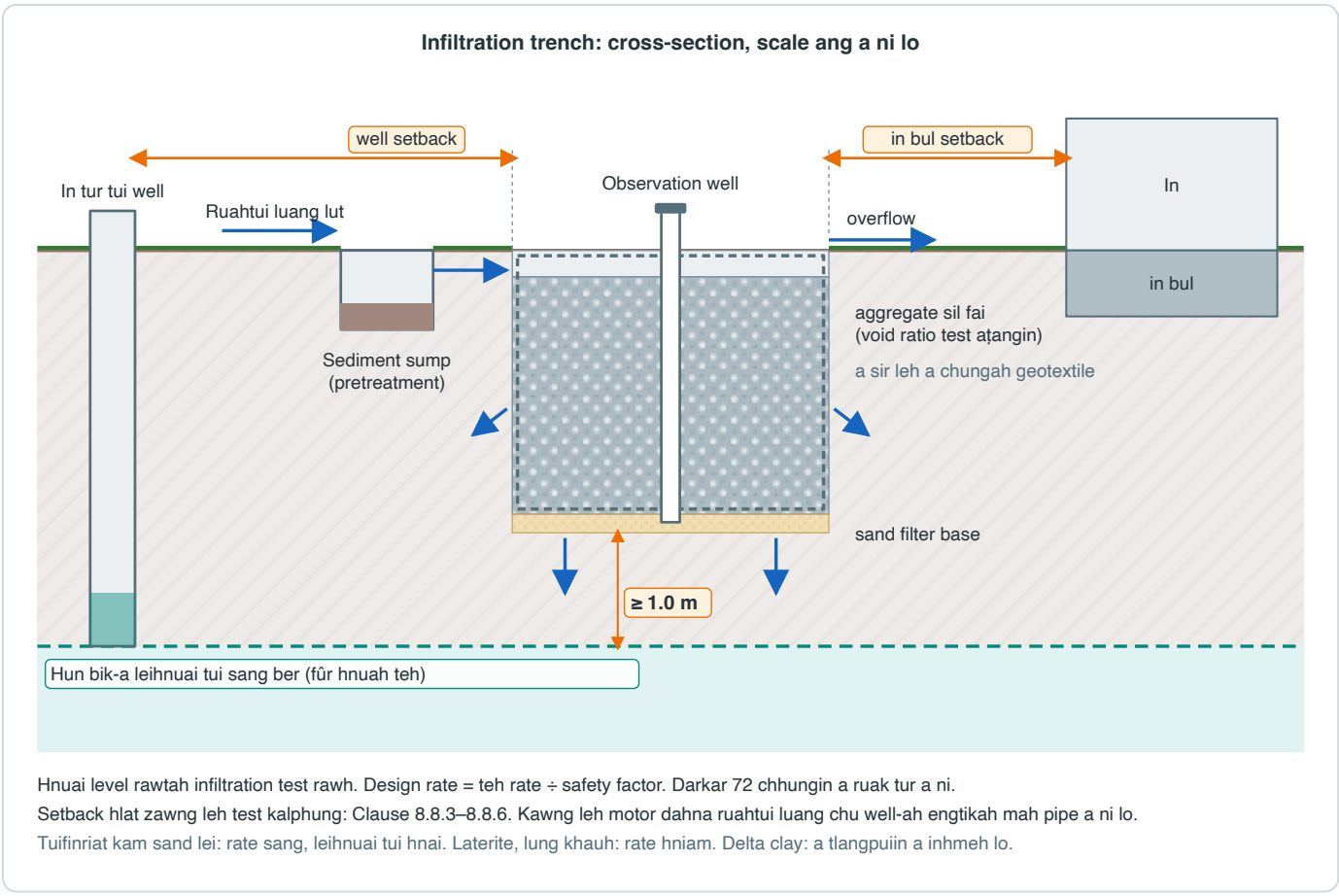
- (a) test-te chu facility hnuaiah, chung lama lei khauh (crust emaw hardpan) hnuaiah tih tur a ni;
- (b) lung tawih emaw lung keh-a recharge chu in chung ruahtui luang emaw filtering BMP kal tlang tawh ruahtui luang emaw tan chauh phal a ni, lung keh hian tihfaina tlem te chauh a pek avangin; leh
- (c) tlang pang chunga emaw a chung lama infiltration chu tlang pang nghet dan endik tur a ni.

8.8.11 **Delta clay leh black cotton soil.** Surma group Bokabil leh Bhuban unit-te shale, siltstone leh mudstone-ah, CGWB-in "tui luh theihna leh infiltration hniam lutuk" ("very low permeability and infiltration") nei a tih, dil leidip khat chhungte, reservoir kamte, leh tlang ram colluvium, lei vur, lei laih bal leh leimin bal leidip tamte-ah, leh black cotton soil pawng thei (expansive)-ah:

- (a) infiltration facility-te hi Clause 8.8.5 an tling lo fo ang a, soil survey (Bung 3)-in HSG D a lantir hmunah test a ngai lo; leh
- (b) lei pawng thei chunga in bula infiltration hman a nih chuan, Clause 8.8.6(a) setback chu let hnih a ni tur a ni.

> Hrilhfiahna. Leihnuai tui inkar 1.0 m hi he Kaihhruaina Bu phut tur bul ber a ni. He Clause-a value dangte (lung bul inkar 1.0 m, test zat, safety factor, rate hniam ber leh setback) hi US leh UK hmanna tlangpui an ni a, Mizoram entirna hmasa an nei lo. Clause 8.8.6(c)-a well setback hi hmun chhuah aṭanga ruahtui luang chungah hman a ni a, in chung tui chungah a ni lo. Mizoram RWH hmanna chuan in chung tui chu well inhawng leh recharge well-ah a luan tir a, Clause 8.11 chuan chu hmanna chu a vawng.
>
> Mizoram tan hydrologic soil group map, infiltration rate teh, emaw State hmun reng renga curve-number calibration emaw hmuh a ni lo [TBC]. "Geology lamah chuan, State hi Tertiary hun lai sedimentary lung, anticline leh syncline inzawm zela tihkawi nghet tawh chungah a innghat" ("Geologically, the State is underlain by sedimentary rocks of Tertiary age, which have been tightly folded in a series of anticlines and synclines") (CGWB, State profile): Surma group shale, siltstone leh sandstone, hmun ṭhenkhatah Barail sandstone nen. Bokabil shale "tlang chhip hniam dung" ("low linear ridges") hi "tui luh theihna leh infiltration hniam an ni. Ruahtui luang chhuahna zone angin a awm" ("characterized by low permeability and infiltration. It acts as run off zone"), leh

Lunglei "district deuh zawng zawng luahtu tlang chhip sang laihawl dung" ("moderate linear ridges which occupy almost the entire district"), Bhuban group inthlak chhawngte, hian "tui luh theihna leh infiltration hniam lutuk an nei a, ruahtui luang chhuahna zone angin a awm" ("very low permeability and infiltration and acts as run off zone"); tlang lei chu "tlang pang chhoh tak zawha colluvial lei" ("colluvial soil, formed along the steep side slopes") a ni a, "ruahtui tam ber chu lei chunga ruahtui luang angin a luang chhuak" ("Most of the rain water flows out as surface run-off") (CGWB, Lunglei booklet). Leihnuai tui hi tuikhur aṭanga lak a ni deuh vek: "Mizoram hi tuikhur awmna a ni" ("Mizoram is an abode of springs") (CGWB), chungte chu "lung ṭhenna, lineament leh lung chhe bal ang zone chak lo" ("weak zones such as fractures, lineaments and weathered residuum") aṭanga lo chhuak a, January aṭanga March thleng "ni khatah liter 3,000 aṭanga 20,000 thleng" ("3,000 to 20,000 liters per day") an pe (CGWB, Lunglei). State hian 2011-ah a leihnuai tui 3.52% a hmang a (CGWB), 2024 chhutnaah 3.95%, unit 26 chhut zawng zawng Safe an ni (thu hnar ang), Lunglei-ah "leihnuai tui hi in tur atan chauh hman a ni" ("Ground water is used for drinking purpose only"), "leihnuai tui lak chhuah a tlem avangin" ("due to lack of ground water abstraction") tui level inthlak dan hmuh theih a ni lo (CGWB, Lunglei). Lei-a dah lut tui hi hlauhawmna a ni a, thil ṭangkai a ni bawk: tlang chhipah Aizawl-a 30° aṭanga 45° thleng tlang pangah lei leh shale tawih chhunga tui nekna a tisang a (NEER chhiar dan), Serchhip khawpui 89% vel hi 30° aiin a chho zawk (MIRSAC, NEER chhutna); SD&SM 2017 tum sawina clause chuan "tlang panga leihnuai tui lut zat tihpun" ("increasing the amount of groundwater penetrating into slopes") hi nghet lohna chhan zingah a tarlang a, Directorate of Geology and Mining chuan 2022-23-a leimin lian a zirchian ṭhena thum ṭhena hnih chu "tui luanna ṭha lo" ("improper drainage") avangin a ti (chanchin tlangzarh angin). He Kaihhruaina Bu soil group hman rih turte hi heng aṭanga lo chhuak an ni: shale, siltstone leh mudstone tlang chhip D, sandstone tlang chhip C (tawih loh hmunah D), colluvium a hydraulics-ah C mahse a nghet lo, phai alluvium leh lui kam zawl B aṭanga C thleng, leh khawpui lei vur leh lei laih bal D (Bung 3), a pakhat zelin site test hmanga finfiah tur. **Chuvangin State hian dan pakhat ni lovin dan pahnih leh tuikhur dan a mamawh** (Clause 4.11; Clause 8.8.1). Phai alluvium leh lui kam zawl test tawhah chuan, pretreatment nen, recharge phal a ni, mawhphurhna ni lovin duh thlan angin, leihnuai tui a tlakchham loh avangin. Tlang ramah, shale-ah, colluvium leh lei vur-ah leh leimin hlauhawm zone-ah chuan, tlang dan hnuaiah, tum takin lei-a tui dah lut a ni lo. Tuikhur tin vel leh a catchment-ah, tuikhur dan hnuaiah, ruahtui chhuah a ni lo. Hmun tinah, kawng leh ram ruak aṭanga ruahtui luang chu leilung chung system-ah a kal a, recharge well, borewell emaw shaft emaw-ah direct-in engtikah mah a kal lo (Clause 8.11.3(b)). Clause 8.8.9 hian Mizoram-ah nghawng a nei lo, tuifinriat kam a awm loh avangin.



Milem 8.3 — Infiltration trench cross-section: pretreatment sump, geotextile-a tuam aggregate-a tihkhat trench, observation well, overflow, hun bik-a leihnuai tui sang ber thleng inkar hniam ber 1.0 m, leh well leh in bul ạtanga setback. He Kaihhruaina Bu tana milem siam thar, Georgia Stormwater Management Manual, 2016 (Vol 2), leh CIRIA, The SuDS Manual (C753), 2015 ạtanga siam danglam.

8.9 Ek tui cross-connection leh ruah sur lohna hun tui luang

8.9.1 **Ruahtui drain-ah ek tui a awm lo.** Ek tui emaw sullage (chaw suangna, inbualna leh silfaina ạtanga tui bal) emaw, septic tank tui chhuak emaw, sumdawnna tui bal (trade effluent) emaw chu pipe, tui kawng emaw kawng kua reng reng hmangin ruahtui drain reng rengah zawm emaw luan tir emaw loh tur a ni.

8.9.2 **Phalna dinhmun.** Completion certificate hmaah, dilna thehluhtu (applicant) chuan Authority emaw sewerage agency emaw-in an hmuh laia dye emaw meikhu emaw test hmangin, site-a ek tui leh sullage chhuahna tin chu sewer emaw site-a system phalna pek emaw-ah a luang a, pakhat mah ruahtui drain-ah a luang lo tih a lantir tur a ni. Site-a cross-connection awm sa reng reng chu phalna dinhmun angin paih tur a ni, siam ṭhatna leh in awm sa belhnaah pawh.

8.9.3 **Sewer a awm lohna hmunah.** Sewer a awm loh chuan, ek tui leh sullage chu site-a emaw decentralised emaw tihfaina system phalna pekah a kal tur a ni. Chutiang system tihfai tawh tui chhuak chu Mizoram Pollution Control Board (MPCB) leh drain neitu ziaka remtihna nen chauh ruahtui drain-ah luan tir phal a ni.

8.9.4 **Vantlang drain: DWF survey.** Tier A area-a ULB tinin tui awmna pana an ruahtui drain outfall-te chu kumtin vawi khat tal, fûr hma (pre-monsoon)-ah, ruah sur lohna hun tui luang tan survey tur a ni a, heng hi chhinchhiah tur a ni:

- (a) DWF nei outfall-te;
- (b) DWF rate chhut; leh
- (c) tracing, CCTV, dye emaw meikhu test hmanga chung lama hnar hmuhte.

A rah chhuahte chu Clause 10.17 register-ah tlangzarh tur a ni.

8.9.5 **DWF interception.** Hnarte paih an nih hma chu, DWF hruai tui awmna pana outfall tinin heng DWF interceptor hi an nei tur a ni:

- (a) DWF chu sewer emaw tihfaina plant emaw-ah a peng tir;
- (b) thil thleng tenau emaw lian emaw (Bung 6) tan ruahtui drain tui luan tir theihna a tihtlem lo, a weir emaw diversion head loss-te chu hydraulic design (Bung 9)-ah tel;
- (c) diversion hmaah screen a nei; leh
- (d) hnar zawmnate paih aiah a ding lo.

8.9.6 **Ek tui luan liam (overflow).** Ek tui overflow thar, emergency bypass emaw pumping station overflow emaw reng reng ruahtui drain emaw tui awmna emaw-a luang chhuak tura design loh tur a ni, sewerage agency-in kawng dang a awm lo tih a lantir loh chuan, chutichuan screening nen leh overflow lo thlen fo zat tarlan nen chauh.

> Hrilhfiahna. Ek tui zawmna khapna leh phalna dinhmun anga cross-connection awm sa paihna hi he Kaihhruaina Bu phut tur bul an ni a, Clause 1.10.3 chuan variance a phal lo. Ruahtui drain-a ek tui hi Mizoram khawpui tui luanna tui ṭhatna harsatna lian ber a ni. He Bung-a hmalakna dang zawng zawng a tihlawhchham: ruahtui tana design BMP-te an phur rit lutuk a, GPT-te bal hnawngin an khat a, tui dawngtu dil leh tui kawngte ek tui dil an chang. CPHEEO (2019) chuan India drain-te hian mihring ek leh zun an hruai tih a tarlang (Part A §9.5). DWF interception (Clause 8.9.5) hi hmalakna hman rih tur a ni. Hnarte zawn chhuah leh paih an nih laiin tui awmna a veng a, mahse hnar hna tih a nih loh chuan a nghet reng thei a, chu vang chuan Clause 8.9.4 kumtin survey leh tlangzarhna phut a ni. Kumtin survey hi he Kaihhruaina Bu-in a ruat a ni.
>
> Mizoram-ah ruahtui drain-te hi sewer an ni. "Sewerage system a awm loh avangin, mipuiin septic tank leh soak pit an hmang. Hmun tam takah ek tui chu tihfai lovin drain khuh lo-ah luan tir a ni a, a tawpah luipui-ah a luang lut" ("In absence of sewerage system, people are using septic tanks and soak pits. In most of the places sewage is discharged into open drains without any treatment, which ultimately gets discharged to rivers"); "sullage (chaw suangna leh inbualna tui bal) chu drain-ah luan tir a ni a, chu chuan a tawpah tui thianghlim hnarte a tibawlhhlawh" ("the sullage (i.e. kitchen and bathroom waste) is discharged into drains which ultimately pollutes the fresh water sources"); leh septic tui chhuak chu "drain leh cross drain hmangin tui pekna hnar luipuiah" ("through drains and cross drains to the rivers, which are the sources of water supply") a thleng (Master Plan for Aizawl: Vision 2030). State hian a ek tui chu 51.81 MLD (khawpui 31.37 MLD leh khaw lam 20.44 MLD) a ti a, chu zinga 16.34 MLD chu Aizawl district khawpui ek tui a ni a, "Tihfaina hmanrua awm sa" ("Existing Treatment Facilities") 10 MLD "Aizawl khawpui tan chauh" ("only for Aizawl city") nen khaikhin chuan (O.A. 606/2018-ah National Green Tribunal hnena Mizoram sawrkar report, August ni 31, 2025 dinhmun anga table): Chite (Bethlehem Vengthlang)-a 10 MLD sequencing batch reactor plant pakhat, SIPMIU-in a sak, a trial run February ni 6, 2021-a ṭan, chhungkua 3,033 zawm nen (O.A. 593/2017 leh 673/2018-a MPCB report). Plant hian catchment pakhat a ṭanpui: chhungkaw zawmna 5,207 leh sewer km 45.95 report a ni (2025 report aṭanga thu hnar ang); PHED bio-digester (3.35 MLD) leh khawtlang soak pit (3.2 MLD)-in a dang ṭhenkhat an la; SBM-U hnuaiah sewage treatment plant 23 (27 MLD) leh faecal sludge treatment plant 23 (0.33 MLD) ruahman a ni a, AMRUT 2.0 sewerage leh septage project ₹39.22 vbc (chhiar a ni) report a ni; leh "tlang ram topography danglam avangin, Grey Water tihfai hi harsatna lian tak a la ni" ("Due to peculiar topography of the hilly regions, treatment of Grey Water remains a huge challenge") (O.A. 606/2018 report). CPCB 2025 list chuan Mizoram lui chhung pali chu tihbawlhhlawh luipui zingah a tarlang: Chite lui "SIPMIU STP bul aṭanga Armed Veng thleng" ("near SIPMIU's STP to Armed Veng") Priority II-ah, BOD 29 mg/L nen; Reiek Kai-a Tuikual lui Priority II-ah, chunglamah 29.1 mg/L leh PHE water-treatment plant bula hnuailamah 5.5 mg/L nen; Lawibual lui Priority III-ah (14.3 mg/L); leh Tuipui Priority V-ah (5.6 mg/L); 2018 list-a Tlawng, Tiau, Tuivawl, Mat, Saikah leh Tuirial lui chhungte chu paih an ni (CPCB, 2025). CPCB "Tuikual stream" hi master plan-in Aizawl "lui tichhe nasa ber" ("worst destructive streams") zinga a chhiar Tuikual lui a ni em tih hi NEER chhiar dan, finfiah tur a ni. Site dan-te chuan ek tui leh ruahtui an kawp tlang: Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 regulation 27 chuan "lei chunga ruahtui luang, ek tui, in chhunga tui bal leh septic system aṭanga tui zuang thunun theihna" ("that provide for control of surface runoff, sewage, sullage and seepage from septic systems") drainage

> plan a phut a, hnuai lama site siam chuan "chung lama site bul aṭanga tui luanna, ek tui emaw tui chiar emaw a luan tir tur a ni" ("shall convey drainage, sewage or seepage from the adjacent site uphill"); he Kaihhruaina Bu hian a ṭhen hrang. Dan anga innghahna chu Mizoram Municipalities Act, 2007 section 298 a ni a, chu hnuaiah Municipality chuan "ruahtui leh lei hnuaia tui bawlhhlawh lo dang aṭanga hran takin drainage emaw ek tui leh thil bawlhhlawh dang tan ruahmanna hran siam" ("require separate provisions to be made for drainage or sewage and other offensive matters as distinct from rain-water and other unpolluted sub-soil water") a phut thei. Chuvangin Mizoram-ah: **(i)** CPCB list-a lui (Chite, Tuikual leh Lawibual lui leh Tuipui) pana, dil pana, emaw tuikhur catchment chhunga ruahtui drain outfall tin chu Clause 8.9.4 survey-in a hruai lo tih a lantir hma chu ruah sur lohna hun tui luang hruai angin ngaih a ni a, tui a thlen hmaah, leh detention emaw infiltration emaw hmanrua reng reng hmaah, Clause 8.9.5 hnuaia DWF interceptor leh screen a nei; **(ii)** he Kaihhruaina Bu hnuaia phalna pek site tinah ruahtui leh sullage chu hrang takin khawn khawm a ni a, a pakhat zelin ram riah an inspection chamber hnuhnung ber an nei, chutichuan ruahtui drain hran sak a nih hunah hna nawn lovin site chu zawm theih a ni a, septic tank overflow, soak-pit overflow emaw sullage pipe emaw reng reng ruahtui drain-ah zawm a ni lo (Clause 6.3.6(a), 8.9.1 leh 8.9.2), Act section 298 innghahna nen; **(iii)** Moderate, High emaw Very High leimin hlauhawm ramah, 10° aia chho tlang pangah emaw shale-ah emaw sullage emaw in chung tui emaw lei-a dah lut a ni lo (Clause 4.11, tlang dan), ruahtui outfall, soakaway emaw drain tui chhuahna reng reng tuikhur aṭanga 15 m chhungah a awm lo (tuikhur dan, Clause 8.8.1); leh **(iv)** sewer a awm hma chu, khaw pakhat drain-te drain dawngtu emaw lui emaw chu tui kawng kawp (combined channel) angin design a ni: ruahtui luang tan ang bawkin thal hunah bal hnawng a che reng theihna chakna tan, a zawh zelah tihfai nan luh theihna nen, leh in bula a kal tlanna hmunah khuhna emaw screen emaw nen, rim leh hriselna hlauhawmna avangin (Clause 6.3.6(d)). Interceptor tin chu a drain ruah sur lohna hun tui luang teh aṭangin lian zawng ruat a ni a, thil thleng tenau leh lian tana drain tui luan tir theihna a tihtlem lo (Clause 8.9.5(b)), a theihna chunga ruahtui luang chu drain-ah a luan tir zel; tuilian laia lungpui leh leimin bal hruai lui chhuk takah chuan, amah leh a chamber chu lui 1% AEP level chungah dah a ni emaw, chu tuilian khawhna leh bal laka veng a ni emaw (Bung 9). Heng dinhmunte hi he Kaihhruaina Bu-in a ruat a ni.

8.10 Tui awmna pana outfall: first flush, gross pollutant trap leh screen

8.10.1 **Phut tur.** Tui awmna pana ruahtui drain outfall thar tin, leh drain siam thar, tihzau emaw tihsei emaw chunga outfall awm sa tin chuan heng hi an nei tur a ni:

- (a) Clause 8.7.10 hnuaia design GPT; leh
- (b) first-flush tihfaina: tui luan khawm catchment WQv (emaw Q_wq) chu Clause 8.7 BMP-te hmangin, tui luan khawm site-ah emaw outfall-ah emaw tihfai.

8.10.2 **Outfall-a tihfai theih loh hmunah.** Vantlang outfall-ah ram a awm loh chuan, first-flush tihfaina chu heng hmangin pek phal a ni:

- (a) Q_wq tana lian zawng ruat proprietary first-flush emaw hydrodynamic device; emaw
- (b) tui awmna setback (Clause 7.5.1(b)) chhunga, tui zau zawng (waterspread) pawna treatment wetland emaw forebay.

8.10.3 **Screen leh trash rack.** Outfall, culvert inlet leh pump sump-a screen-te chu:

- (a) hydraulic theihna tan **50% tihtawp** nen design tur a ni;
- (b) screen tawp vek chuan ram (property)-ah tuilian a thlen loh nan overflow emaw bypass kawng emaw an nei tur a ni;
- (c) hlauhawmna azira bar inkar thlan an nei tur a ni: bawlhhlawh dawn nan inkar zim zawk, tihtawpna-in tuilian a thlen theihna hmunah inkar zau zawk; leh
- (d) platform him tak aṭanga tihfai theih an ni tur a ni, motor luh theihna nen.

8.10.4 **Outfall awm sa.** ULB tinin tui awmna pana an outfall awm sa-te chu GPT leh DWF interceptor bun tur ruahmanna (programme) an siam tur a ni a, in tur tui pekna atana hman dil leh notify a nih wetland (Clause 7.12) pana outfall aṭanga ṭanin, Clause 10.17 register-ah hmasawnna an report tur a ni.

> **Hrilhfiahna.** He Kaihhruaina Bu hian tui awmna pana outfall-ah first-flush tihfaina leh gross pollutant trap a phut. Gross pollutant hi Mizoram tui awmna tihbawlhhlawhna hmuh theih ber a ni a, plastic-in drain leh culvert a tawp tir bawk a, chu chuan tui ṭhatna leh tuilian a inzawm tir. Screen 50% tihtawp hi Bung 6 grate clogging factor nen a inmil. Clause 8.10.3(c) chuan drain lian chunga screen zim a hrilh fimkhur a, chungte chu ruahpui darkar hmasa berah an tawp a, an tum ang tuilian chu an thlen tir ṭhin.

8.11 Ruahtui khawl khawm inrem dan

8.11.1 **RWH phut hman zel.** Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017-in a phut ruahtui khawl khawm (2012 Regulations regulation 33, chu hnuaiah "in zawng zawngah ruahtui khawl khawmna facility ṭha tak siam bawk tur a ni" ("A suitable rain water harvesting facility shall also be provided in all buildings"), leh regulation 5(6)(ix), chu hnuaiah plan-te chuan "ruahtui khawl khawmna facility ṭha tak siam tur a tel tur a ni" ("include provision for a suitable rain water harvesting facility"); 2025-a dah lut green building leh sustainability bung (Chapter VIIIA) chuan m² 100 aia lian ram (plot) tan ruahtui khawl khawm leh "hardscape tihtlem" ("Reduction of Hardscape") chu incentive (fakna) atan a siam a, phut tur atan a ni lo; pakhatin mah tui zat a ruat lo, 2017 Regulations chuan khawl khawm a phut lo) chu hman zel a ni, Clause 8.8.1 ri hnuaiah: Mizoram-ah 10° aia chho tlang pang tinah leh shale-ah khawl khawm hi recharge ni lovin hman tura khawl a ni (Clause 4.11, tlang dan), leh Mizoram Water Resources (Management and Regulation) Act, 2024 section 14(1)(b)(viii) emaw 16(2)(ix) emaw-in leihnuai tui recharge tana ruahtui khawl khawm a sawi hmunah, he Kaihhruaina Bu hian tlang ramah khawl leh hman nawn angin a chhiar a, an inkalhna a sawi a, Act chu a thlak lo (Bung 1). He Clause hian he Kaihhruaina Bu hnuaia RWH structure-te chhiar dan a ruat.

8.11.2 **Hna hrang pathum.** Designer chuan drawing leh chhutnaah heng hi a ṭhen hrang tur a ni:

- (a) **khawl khawm (harvesting)**: hman tura khawlna (sump leh tank);
- (b) **recharge**: lei-a tui dah luttu recharge pit, trench, shaft leh well; leh
- (c) **detention**: ruahpui ṭan laia ruak, orifice outlet nei khawlna (Bung 4).

8.11.3 **Recharge structure.**

- (a) In chung ruahtui luang chu filter emaw settling chamber emaw hnuah recharge well, well inhawng, recharge pit leh shaft-ah luan tir phal a ni.
- (b) Kawng, motor dahna leh hmun chhuah dang aṭanga ruahtui luang chu well, borewell emaw recharge shaft emaw reng rengah direct-in luan tir loh tur a ni. Clause 8.8 tling infiltration facility, pretreatment nen, kal tlangin chauh recharge phal a ni.
- (c) Recharge structure-te chuan pit hnuai emaw filter media hnuai ber emaw aṭanga teh Clause 8.8.1 leihnuai tui inkar an tlin tur a ni, in chung tui tihfai tawh chauh dawng recharge well chu a bang.

8.11.4 **Retention leh WQv-a chhiar.** Recharge structure chu heng a tlin chauhin Bung 4 retention tui zat leh WQv-ah chhiar a ni:

- (a) a infiltration rate chu Clause 8.8.3 hnuaiah test a ni tawh;
- (b) design rate-ah darkar 72 chhungin a ruak; leh
- (c) pretreatment a nei.

Khawl khawmna sump chu a chhunga tui chu darkar 72 chhungin, drainage report-a tarlan mamawh angin, hman a nih chauhin retention-ah chhiar a ni (Bung 4).

8.11.5 **Detention angin chhiar a ni lo.** RWH khawlna hi ruahpui a lo thlen laia ruak, outlet nei, a tana bik tui zat a nih loh chuan detention angin chhiar a ni lo. RWH sump-te hi fûr (April–October) design ruahpui tin ṭan lai-ah **khat** angin ngaih a ni (Bung 4).

8.11.6 **Overflow.** RWH structure tinin site tui luanna-ah lei chung level-a luang chhuak overflow an nei tur a ni, ṭhenawm ram chungah emaw sewer-ah emaw engtikah mah ni lovin.

8.11.7 **Vantlang hmuna leilung chung ruahtui luang recharge.** Kawng, median, park leh vantlang hmun dang-a recharge trench, shaft leh percolation pit-te chuan Clause 8.8 chu a zavaiin, motor kal nasa kawng tana hotspot dan tiamin, an tlin tur a ni a, inlet tinah GPT emaw leidip dawnna emaw an nei tur a ni.

> **Hrilhfiahna.** RWH khawlna hi detention angin chhiar a ni lo tih dan hi Bung 4-ah ruat a ni. Mizoram-ah ruahtui khawl khawm hi tui pekna a hmasa ber a ni. Aizawl Urban Area-ah chhungkaw 27.16% chuan ruahtui an hmang a, 1.01% chuan tuikhur tui (master plan, Table 8.2); PHED tui pek chu "44 lpcd" tia report a ni a, tui 35% chhiar theih loh nen (chanchin tlangzarh angin; ni ruat a ni lo); CGWB chuan in chung ruahtui khawl khawmna structure 300 leh tuikhur siam ṭhatna 200 chu State-a recharge leh humhalhna hna tih theihte zingah a tarlang. Regulation-te chuan khawl khawm an phut ngei a, mahse tui zat emaw detention dan emaw an ruat lo: "in zawng zawngah ruahtui khawl khawmna facility ṭha tak siam bawk tur a ni" ("A suitable rain water harvesting facility shall also be provided in all buildings") (AMCBR reg. 33), leh plan-te chuan "ruahtui khawl khawmna facility ṭha tak siam tur a tel tur a ni" ("include provision for a suitable rain water harvesting facility") (reg. 5(6)(ix)); 2025 aṭang khan ruahtui khawl khawm leh "hardscape tihtlem" ("Reduction of Hardscape") hi m² 100 aia lian ram, "green norms zawm thei" ("may comply with the green norms") tan incentive an ni a, floor area belh emaw fee ngaihdam emaw hmangin fak a ni (Chapter VIIIA); leh master plan chuan khawl khawm hi "vantlang in zawng zawngah … phut ngei ngei" ("mandatory … in all public buildings") a rawt a, rawtna a ni. Site Development and Slope Modification Regulations, 2017 chuan pakhat mah a phut lo. Mizoram Water Resources (Management and Regulation) Act, 2024 chuan IWRD chu "leihnuai tui recharge tihpun nan ruahtui khawl khawm tihchak" ("promote rain water harvesting to augment ground water recharge") tur a ti a (s.14(1)(b)(viii)), WARDMA chu "ruahtui khawl khawm telin tui humhalh leh leihnuai tui recharge" ("water conservation and groundwater recharge, including rain water harvesting") thupek turin a phal (s.16(2)(ix)); tlang ramah he Kaihhruaina Bu hian a pahnih hi recharge ni lovin khawl leh hman nawn angin a chhiar a, chu chu a sawi chiang. Heng zinga pakhatin mah in chung m² tin tana liter, tank tui zat, recharge rate, recharge pit test emaw tlang panga soak pit ri emaw an pe lo a, sak tawh endikna (audit) hmuh a ni lo. He Kaihhruaina Bu hian in chung m² tin tan liter 25 tal khawlna (Clause 4.11), he series-a North-East edition-te value, chu hman nawn kal tlangin chauh retention angin a chhiar a, fûr design ruahpui tin ṭan lai-ah khat angin a ngai a, detention angin engtikah mah a chhiar lo. Phai alluvium leh lui kam zawl test tawhah chuan, Clause 8.8.1-in a phalna hmunah, recharge hi khawl khawm hna pakhat a ni thei (Clause 8.11.2(b)); tlang ramah, shale-ah, colluvium leh lei vur-ah leh leimin hlauhawm zone-ah chuan khawl khawm hi khawl leh hman tan chauh a ni a, a luan liam chu lined drain-ah a kal. RWH hian tui pekna leh recharge a ṭanpui. June 2018 laihawl ruahpui ang chi June aṭanga August thleng fûr ruahpui chu kar tam tak ruah sur hnua a lo thlen hunah, a tlangpuiin a khat tawh emaw a lei a hnawng vek tawh emaw ṭhin, chu vang chuan detention angin chhiar theih a ni lo.
>
> Clause 8.11.3(b) hi entirna hmasa chiang a awm lo; kawng ruahtui luang hian hriak, metal leh natna hrik a hruai avangin he Kaihhruaina Bu hian a ruat a ni. Recharge shaft emaw borewell emaw chuan a tihthianghlim tur lei chu a kal pelh a, a bula well-te tui petu aquifer-ah direct-in a thlen. CGWB *Manual on Artificial Recharge of Ground Water* (2007) chuan recharge structure chi leh filter design a pe a; he Kaihhruaina Bu hian tui hnar khapna a belh.

8.12 Sak lai erosion leh bal thunun

8.12.1 **ESC plan. Ha 0.1** emaw a aia tam lei tihbuai (land disturbance) nei hmasawnna hna tin leh vantlang tui luanna emaw kawng hnathawh tin chuan Erosion and Sediment Control (ESC) plan, drainage report nena phalna pek, an nei tur a ni. Heng hi a lantir tur a ni:

- (a) hmun tihfai, lei hnathawh leh tihnghet indawt dan;
- (b) stage tina area inhawng;
- (c) Clause 8.12.3 hmalaknate, an awmna leh lian zawng nen;
- (d) infiltration leh retention area venna (Bung 10);
- (e) thil chhawp khawmna, concrete silna leh fuel dahna hmunte; leh
- (f) endikna leh enkawlna hun ruat.

8.12.2 **Fûr hun hun ruat.** Lei hnathawh chu heti hian ruahman tur a ni:

- (a) fûr hun (April aṭanga October) chhunga area inhawng chu a theih chin chinin a tê ber;
- (b) lei hnathawh zawh zawng zawng chu **March ni 31** hmaah thing leh hnim, mulch, matting emaw chhuahna emaw hmangin tihnghet; leh
- (c) April ni 1 leh October ni 31 inkara area inhawng reng reng chu tihfai a nih hmaah bal thununna a nei tawh.

8.12.3 **Hmalakna.**

- (a) Sheet flow dawng area tihbuai hnuai lam kamah **silt fence** (leidip dangna), fence tin pana tui luang area chu Belhchian 8E-a ruat angin tihtlem.
- (b) Ha 2 thleng area tihbuai aṭanga tui luang ṭhenkhawm tan **sediment trap**.
- (c) Ha 2 aia lian area tihbuai tan **sediment basin**. Outlet hnuaia khawl tui zat chu 50% AEP (kum 2) darkar 24 ruahpui ruahtui luang leh tui luan khawm area hectare khatah **m³ 250** zinga a lian zawk tal a ni tur a ni, chung lam aṭanga tui la chhuak dewatering outlet nen.
- (d) Site aṭanga ruahtui luang dawng drain inlet awm sa tinah **inlet venna**.
- (e) **Construction exit tihnghet**, motor-in vantlang kawng a luhna hmunah wheel silna nen.
- (f) Tui awmna setback (Bung 7) Zone 1 pawnah, drain reng reng aṭanga 10 m tal hla, fûr hunah khuh **thil chhawp khawm (stockpile)**.
- (g) **Dewatering** tui chhuak chu sediment basin, settling tank emaw filter bag emaw kal tlang, drain emaw tui awmna emaw-ah direct-in pump luh engtikah mah ni lo.
- (h) **Concrete silna** chu lined pit-ah, drain-ah engtikah mah ni lo.

8.12.4 **Hnathawh hman rih tana design ruahpui.** ESC hmalakna hman rih turte chuan Bung 2 ruahtui tlak chu climate factor 1.0 (Clause 2.8.2) nen an hmang.

8.12.5 **Endikna.** ESC hmalaknate chu kar tin leh ruahpui thil thleng (Bung 10-a hrilhfiah angin) tin hnua darkar 24 chhungin endik tur a ni a, darkar 48 chhungin siam ṭhat tur a ni a, bal-in a chanve a khat hunah tihfai tur a ni.

8.12.6 **Paih.** Hmalakna hman rih turte chu an pana tui luang area tihnghet a nih hnuah chauh paih tur a ni. Bal thununna atana hman facility nghet reng rengah, a as-built survey (Bung 10) hmaah bal la chhuah tur a ni.

> Hrilhfiahna. Ha 0.1 threshold hi Bung 1 huam chin threshold a ni. Sediment basin tui zat 250 m³/ha hi US EPA Construction General Permit-a tui luan khawm acre khatah ft³ 3,600 hniam ber, SI-a thlak a ni (US EPA, 2022 CGP); CGP chuan kum 2, darkar 24 ruahtui luang chu thlan dang angin a phal. He Kaihhruaina Bu hian a pahnih zinga a lian zawk a phut, Mizoram kum 2 darkar 24 zat a sang a, sakna site-te chu fûr hun chhungin inhawng renga dah a ni fo avangin. Trap leh basin inṭhenna ha 2, March ni 31 tihnghet ni, thil chhawp khawm hlat zawng 10 m leh endik fo zat hi entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. March ni 31 hi Bung 10-a fûr hma hnathawh tawp ni nen a inmil. Sakna bal hi pollutant a ni a, tuilian hlauhawmna direct a ni bawk: drain, culvert leh dil a tikhat a, Mizoram-ah leimin bal, lung laihna bal leh bawlhhlawh hi bal nen an luang tlang: master plan chuan Aizawl drain-te hi "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to

insufficiency in the hydraulic design") a ti a, ward W-I ṭhena thum ṭhena khat tui chiahna chu kawng sir drain-a bawlhhlawh avangin a ti, leh May ni 28, 2024-a Cyclone Remal-a Melthum leh Hlimen inkara lung laihna hman tawh loh chim leh August ni 9, 1992-a South Hlimen lung laihna chim chuan heng tlang pangah lung laihna hmai leh bal-in eng nge an tih theih a lantir (a hmasa chu chanchin tlangzarh angin, a pahnihna chu *Senhri Journal*-ah; Bung 1). Regulation-te hian a ṭhenkhat an phut tawh. Lei vur chu benching tel lovin 2:1 aia chho tlang pang pianphung chungah dah a ni lo, "lei vur ke pawn lam area chu sheet overflow tan awn tir tur a ni emaw drain chhuah siam tur a ni. Chutiang drain chu energy dissipater nen sak tur a ni a, area phalna pekah a luang chhuak tur a ni" ("The area beyond the toe of the fill shall be sloped for sheet overflow or a paved drain shall be provided. Such drains shall be constructed with energy dissipaters and shall discharge into an approved area") (SD&SM reg. 25); lui pianphung bula ram tan "site aṭanga thil emaw bal emaw lui emaw riverine reserve-a a khawh luh loh nan hmalakna lak tur a ni" ("measures shall be taken to prevent erosion of materials or sediment from the site into the stream or riverine reserve") (reg. 28); laih chhuah thil chu "tui luan kawng emaw riverine reserve" ("drainage courses or riverine reserves") aṭanga hla takah dah a ni a, Corporation-in phalna a pek hmunah paih a ni (reg. 29); leh 2025 aṭang khan vantlang kawng aṭanga thil tam lutuk paih a nih a, vantlang thil chhiat siam ṭhat a nih hnuah chauh Occupancy Certificate pek a ni (AMCBR, 2025-a siam ṭhat angin). Lian zawng, ni emaw endikna emaw an pe lo a, chu chu Clause 8.12-in a pe. March ni 31 tihnghet ni hi he Kaihhruaina Bu-in a ruat a ni, a hun April ni 1-a a ṭan hmaah, Mizoram ruah thil thleng ni tarlan nei hlauhawm berte chu May thlaah an lo thlen a, ruahpui-te April tawp lamah an lo thlen avangin (Bung 2). Basin tui zat lian zawk tana chhan a chunga sawi, kum 2 darkar 24 zat a sang tih hi Mizoram-ah a dik: kum 2 darkar 24 design zat hi floor hman rih tur 85 mm (Clause 2.3.6(c)) aiin a hniam ngai lo, NIH-DHAARA chuan hmar leh chhim lamah (Kolasib, Bairabi, Vairengte, Lunglei, Tlabung, Siaha) 107 aṭanga 131 mm thleng a pe a, sub-area MZ-A leh MZ-A1-ah 130 mm hi floor a ni; group D tlang lei chunga sakna site ruakah May ni 1 aṭanga hman AMC III (Bung 3) nen, 85 mm chuan ruahtui luang 70 mm vel, hectare khatah m³ 700 vel a pe a, chuvangin kum 2 ruahtui luang hian hectare khatah m³ 250 chungah thu a nei (NEER chhutna), Clause 8.12.3(c) dan chu thlak lovin vawn a ni. Mizoram-ah Clause 8.12 hnuaia sediment basin emaw trap emaw outlet chu lined drain emaw energy dissipator nei tui kawng nghet emaw-ah a luang chhuak a, tlang pang veng loah engtikah mah a luang lo; Clause 4.11-in infiltration a khapna hmunah, 10° aia chho tlang pang tin leh shale zawng zawng tiamin, sediment basin emaw trap emaw lei-a tui luh tir tura design a ni lo; site aṭanga lei laih bal, bal emaw bawlhhlawh emaw, lung laihna aṭanga lei laih bal emaw reng reng lui emaw dil emaw-ah, a Zone 1 chhungah, site hnuai lama tlang pangah emaw tuikhur catchment-ah emaw dah a ni lo, lui chunga lung laihna hmai chuan a chhip zawhah cut-off drain a nei; leh dil emaw tuikhur emaw catchment-a sakna site chuan tui thlengtu drain zawng zawng aṭangin a bal a dang.

8.13 Enfiah reng

8.13.1 **Outfall enfiah reng.** Tier A authority tinin tui awmna pana an outfall entirna set-ah tui ṭhatna an enfiah reng tur a ni, in tur tui dil emaw notify a nih wetland emaw pana outfall tin tiamin. Enfiah renna chuan heng a tel tur a ni:

- (a) ruah sur lohna hun sample lak (Clause 8.9.4), kumtin vawi khat tal fûr hmaah; leh
- (b) index outfall set-ah fûr tinah thil thleng pathum tal ruah sur lai sample lak.

8.13.2 **Parameter.** A tlem berah: TSS, BOD, COD, faecal coliform, nitrogen zawng zawng, phosphorus zawng zawng, hriak leh grease, leh industry catchment tan heavy metal. A rah chhuahte chu tui dawngtu tui awmna hman ṭhat ber ruat (designated best use) tana CPCB tui ṭhatna tehna nen khaikhin tur a ni.

8.13.3 **Gross pollutant record.** Tihfai tinah GPT leh screen tin aṭanga thil la chhuah rit zawng emaw tui zat emaw chu O&M record (Bung 10)-ah chhinchhiah tur a ni.

8.13.4 **BMP hnathawh ṭhat zawng enfiah reng.** State Stormwater Technical Committee chuan BMP hnathawh ṭhat zawng calibration programme a kalpui tur a ni a, a rah chhuah aṭangin Table 8.3 leh Belhchian 8C a siam ṭha tur a ni.

8.13.5 **Tlangzarhna.** Enfiah renna rah chhuahte chu Clause 10.17 register-ah tlangzarh tur a ni.

> **Hrilhfiahna.** He Kaihhruaina Bu zirchianna hunah Mizoram ruahtui ṭhatna enfiah renna programme hmuh a ni lo, CPHEEO (2019) pawhin India tan target a ruat lo. Clause 8.13-a enfiah renna hi Table 8.3 calibrate nan leh DWF interception leh hnar paihna a hlawhtling em tih lantir nana mamawh tlem ber a ni. Parameter list hian CPHEEO WSUD kalphung-a pollutant pawimawh tarlante (TSS, nitrogen, phosphorus leh gross pollutant) a zui a, ek tui tihbawlhhlawhna avangin BOD leh faecal coliform belh a ni. Enfiah reng fo zat hi he Kaihhruaina Bu-in a ruat a ni.

8.14 Thehluh tur

He Bung hnuaia drainage report tin chuan heng hi a tel tur a ni:

1. **Tui Ṭhatna Sheet (Form 8-1)**: P_ret, P_3m leh P_wq; tui luanna area tin tana WQv leh Q_wq; Bung 4 hnuaia khawl tui zat; leh area tin ṭanpuitu BMP;
2. Tier A tan: LoS chhutna (ΔCN, LoS mamawh) leh composite VR (Clause 8.6);
3. Clause 8.7 leh Belhchian 8D anga BMP tin design, pretreatment nen;
4. infiltration leh recharge tan: **Infiltration Test Record (Form 8-2)**, fûr hun leihnuai tui level sang ber leh a hnar, design rate, drawdown hun, leh Clause 8.8.6 setback-te;
5. ek tui leh sullage zawmna plan leh Clause 8.9.2 dye emaw meikhu test record;
6. tui awmna pana outfall reng reng tana GPT leh first-flush design (Clause 8.10);
7. khawl khawm, recharge leh detention ṭhen hrang RWH layout (Clause 8.11); leh
8. ESC plan (Clause 8.12).

8.15 Endikna leh siam thar

8.15.1 He Bung hi Kaihhruaina Bu dang zawng nen endik tur a ni (Bung 1). Clause 8.13.4 calibration programme-in a report hunah pawh Table 8.3 endik tur a ni a, engpawh ni se notification (Gazette-a tarlan) hnu kum 5 chhungin.

Thu hnar (bung)

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- Government of Mizoram, Urban Development and Poverty Alleviation Department. *Aizawl Municipal Corporation Building Regulations, 2012*, regs. 5(6)(ix), 26, 33 leh 37, 2025-a siam ṭhat angin (Chapter VIIIA, Occupancy Certificate thute leh Annexure B-I); leh *Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017*, regs. 1, 25–29 (Bung 7 thu hnar).
- Government of Mizoram. *Mizoram Municipalities Act, 2007*, s.298; *Mizoram Water Resources (Management and Regulation) Act, 2024*, ss.2(1)(i), 9–12, 14(1)(b)(viii) leh 16(2)(ix); *Mizoram (Village Councils) Act, 2025*, s.14(6) (Bung 7 thu hnar).
- Aizawl Development Authority. *Master Plan for Aizawl: Vision 2030*, §8.3 (tui luanna, sewerage leh sullage) leh Table 8.2 (Bung 7 thu hnar).
- Landslide Policy Committee for Aizawl City (2014). *Roadmap to Stability: Actions to Reduce the Landslide Risk in Aizawl* (Bung 7 thu hnar).
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Belhchian leh Form

Belhchian / Form	A chhunga thu
8A	Zone zela thla 3 ARI darkar 24 zat leh IDF
8B	Siam ṭhatna LoS table leh treatment-train composite VR
8C	Mizoram BMP hnathawh ṭhat zawng calibration
8D	BMP design sheet, media specification, thlai list
8E	Erosion leh bal thununna standard detail
Form 8-1	Tui Ṭhatna Sheet
Form 8-2	Infiltration Test Record

BUNG 9

Structure-te Hydraulic Design

9.1 Tum leh a huam chin

9.1.1 He bung hian tui luanna system tenau (minor system) leh tui luanna system lian (major system) (Bung 6), retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) leh detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) facility (Bung 4), outfall (drain tui luan chhuahna) (Bung 5) leh tui awmna (waterbody) (Bung 7)-a structure hman tur hydraulic design kalphung-te a ruat. A huamte chu:

- (a) pipe leh box drain (Clause 9.3);
- (b) culvert (kawng hnuaia tui kalna) (Clause 9.4);
- (c) channel khuh lo (open channel) (Clause 9.5);
- (d) energy dissipator (tui chakna tihnemna), outlet humhalhna leh drop structure (tui tlak thlakna structure) (Clause 9.6);
- (e) detention outlet structure (Clause 9.7);
- (f) trash rack (bal dangna) leh screen (Clause 9.8);
- (g) pump leh sump (pump tui khawlna khur) (Clause 9.9);
- (h) tide gate (tuifinriat tui kir leh dangtu gate; Mizoram-ah a awm lo), flap gate leh non-return valve (tui kir leh dangtu valve) (Clause 9.10);
- (i) inlet (luan lutna) leh grating (Clause 9.11);
- (j) manhole, junction chamber leh luhna kawng (access) (Clause 9.12); leh
- (k) siamna thil leh a nghet rei dan (durability), coastal (tuifinriat kam, Mizoram-ah a awm lo) leh tui al (saline) dinhmun tiamin (Clause 9.13).

9.1.2 **Structural design hi he Kaihhruaina Bu huam chin a ni lo.** Structure-te chu Indian Standard leh IRC code hman tlak ang zelin structural design siam tur a ni, entirnan IS 456 (concrete pangngai leh reinforced concrete), IS 458 (concrete pipe), IRC:SP:13 (bridge tê leh culvert) leh IRC bridge code-te. He bung hian structural standard a kawh chuan, durability (Clause 9.13) emaw hydraulic hnathawh ṭhatna emaw tan chauh a kawh a ni.

9.1.3 Design tui luang, design AEP leh level-of-service tehna-te chu Bung 2 aṭanga 7 thleng-ah a awm. He bung hian a thlak danglam lo.

> **Hrilhfiahna.** APWA Section 5600 hian structure hydraulics tam zawk chu inlet leh manhole (5604), pipe system khuh (5606), engineered channel (5607) leh detention (5608) chungchang section-ah a dah. CPHEEO (2019) chuan Chapter 5, 6, 8 leh 11-ah a darh. He bung hian hmun khatah a khawm a, Indian code-te-in a kimchang taka an sawi loh kalphung tan US Federal Highway Administration (FHWA) hydraulic circular-te a kawhhmuh: culvert tan HDS-5, energy dissipator tan HEC-14, inlet leh access hole tan HEC-22, leh pump station tan HEC-24. FHWA edition tarlante hi October 2026-a FHWA hydraulics library-a tarlan ang an ni.

9.2 Mamawh tlangpui

9.2.1 **Tailwater.** Outfall invert (tui luanna hniam ber) aia sang thei tui sang zawng nei luipui, lui, dil emaw reservoir (tui khuah)-a luang chhuak structure tin chu Bung 5-a tailwater (outfall hnuailama tui sang zawng) dinhmun hmangin zirchian tur a ni: tui luanna system tenau leh lian design tan Clause 5.6-a non-tidal tailwater; Clause 5.8-a luipui backwater, luanna chunglama dam (tui khuahna) aṭanga tuilian chhuah tir tiamin, Tuirial luia NEEPCO Tuirial dam leh Serlui-a Serlui B dam (Clause 5.8.5(e)); leh tui dawngtu chu outfall invert aia a sang thei apiangah Clause 5.10-a outfall khar endikna. Hei hi Sairang leh Bairabi-a Tlawng-ah, Vairengte, Chawngte leh Champhai phai-a luipui-te-ah outfall nei phai (valley floor) leh lui kam zawl (river terrace) drain (tui luanna)-te (Clause 5.8.5(c)) leh, Khawthlangtuipui-a outfall nei Tlabung drain-te (Clause 5.8.5(d)) dinhmun a ni. State-a outfall tam zawk, tlang chhip khawpui-te leh Aizawl-a outfall-te pawh tiamin, luipui tailwater awm lovin lui chhuk nasa takah an tla thla mai (Clause 5.8.5(a) leh (b)); chungte tan chuan tailwater chu outfall-a lui chhunga 1% AEP tuilian sang zawng a ni a, Bung 6-a leidip (sediment), bal (debris) leh bawlhhlawh (garbage) allowance-te (Clause 6.3.6) hmanga chhut leh survey-a tuilian chhinchhiahna (flood mark) nena endik a ni a, outfall invert chu survey-a lui hnuai (bed) sang ber aia 0.5 m tal a sang tur a ni a, tui dawngtu lui chu a lui inkawpna (confluence) dawt thlengin a tui phur theihna leh a nghet dan endik a ni tur a ni. Reservoir-a outfall tan chuan, tailwater chu a maximum water level, emaw Bung 5-in a ruat angin a full reservoir level leh design tuilian-a surcharge (tui khat luat a nek chhuahna) belh, emaw, pahnih mah tlangzarh a nih loh chuan, full reservoir level leh 0.5 m (he Kaihhruaina Bu-in a ruat) a ni: Tuirial reservoir tan, NEEPCO full reservoir level 90.5 m (minimum drawdown level 68.0 m; full load-a tailwater level pangngai 30.7 m; CERC, Petition No. 125/MP/2021), a maximum water level hmuh a ni lo [TBC]; Serlui B tan, a full leh maximum water level hmuh a ni lo a, State power department-in datum hming tarlan nena a sawi level [TBC]. Dil-a outfall tan chuan, tailwater chu survey-a a tui luan liamna sang zawng (spill level) a ni; CWC site nei lo luipui chhung (reach) tan, chu lui chhung tuilian chhinchhiahna profile; leh outfall hnuailama check dam, weir, flap gate emaw pumping station-in a dan drain tan, chu thununtu chu gate hawn loh lai level, a weir crest emaw a pump-te ṭan level-ah; dinhmun tinah Clause 2.12-a joint case nen. Mizoram-a CWC site reng reng hian warning level emaw danger level a nei lo a, pakhatin mah tuilian a forecast lo; CWC hian hmun pasarihah tui sang zawng a enfiah a, panga chu hman lo (inactive) an ni a, pakhat chauhin high flood level tlangzarh a nei, Tuirial-a Turial-ah 149.0 m (June ni 17, 1995) (SANDRP-in a ziah chhawn angin CWC level, chanchin tlangzarh angin; pakhat mah datum tarlan a ni lo [TBC]); chu level leh Tuirial reservoir level-te inzawmna sawi a ni lo a, ngaihtuah chhuah tur a ni lo [TBC]. State ri hnuaia Tlawng, Tuirial leh Tuivai lui chhungte chu Assam edition-in a thununna Barak phai-ah a awm a, Khawthlangtuipui, Chhimtuipui leh Tiau chu designer-in a hmuh theih tur luanna hnuailam gauge emaw level awm lovin India an chhuahsan (Clause 5.8.5(f)). Thuziak hmuh reng reng hian Mizoram-a outfall reng rengah design luipui, reservoir, dil emaw lui level a ruat lo a, flood zone, flood plain emaw flood hazard area reng reng thlan a ni lo; pakhat thlan a nih hma chu, Bung 5-a level-te an huam.

9.2.2 **Climate factor.** Design tui luang-ah Clause 2.8-a climate factor a tel tur a ni.

9.2.3 **Enkawlna atana luhna kawng.** Structure tin chu Clause 9.12 leh Bung 10-a kalphung hmangin endik leh tihfai theih a ni tur a ni, tih theih apiangah hmun khuh zim (confined space)-a mihring lut lovin.

9.2.4 **Design life.** Approving authority (phalna petu Authority)-in a dang a remtih loh chuan, concrete leh lung hnathawh (masonry) tan kum 50 tal, mechanical leh electrical hmanrua tan kum 25 tal hman rei theih (service life) atan structure-te design tur a ni.

9.2.5 **Tihtawp (blockage).** Structure chu bal-in a tihtawp theih chuan, he bunga sawi tihtawp dinhmun (blocked condition)-ah endik tur a ni a, chu dinhmun tan tui luan liamna kawng him (safe overflow route) a awm tur a ni (Bung 6, Clause 6.3.2).

> **Hrilhfiahna.** Clause 9.2.4-a design-life value-te hi a entirna hmasa chiang a awm lo; climate factor a huam hun thlan nan a ṭul avangin he Kaihhruaina Bu-in a ruat a ni (Clause 2.8.2 hian design life kum 25 aia rei element-te-ah a hmang).

9.3 Pipe leh box drain

9.3.1 **Theihna leh a nalh lohna (roughness).** Pipe leh box-drain tui phur theihna (capacity) chu Bung 6, Table 6.6-a design n hmangin Manning's equation-in chhut tur a ni. Precast emaw hmuna siam (cast-in-situ) RCC box drain tan, design n chu 0.015 tal a ni tur a ni.

9.3.2 **Tui khat lo luanna (partly full flow).** Pipe kual tui khat lo-a tui thuk zawng, a chakna (velocity) leh tui luang zat chu pipe kual cross-section tana hydraulic-element inzawmna hmangin chhut tur a ni (entirnan CPHEEO 2019, Table 5.5). Clause 6.7.3-a velocity hniam ber chu design tui luang-ah a huam.

9.3.3 **Pressure flow.** Pipe chu a khat emaw surcharge a nih chuan, HGL chu Bung 6, Clause 6.8 hnuaiah, friction leh structure loss nen chhut tur a ni.

9.3.4 **Pipe chhuk nasa.** Pipe-a design tui luang chu supercritical (Froude number 1 aia sang) a nih chuan, designer (design siamtu) chuan:

- (a) hydraulic jump awmna hmun a hmu chhuak tur a ni a, pipe run-ah ni lovin, a dawn tura design structure chhungah a thleng tih a lantir tur a ni;
- (b) jump-in pipe a hup thei hmunah boruak chhuahna (air venting) a siam tur a ni; leh
- (c) Clause 6.7.3(b)-a velocity sang ber a zawm tur a ni.

9.3.5 **Size leh kawng thlak danglamna.**

- (a) Pipe size chu luanna hnuailam (downstream) panah a tlem loh tur a ni.
- (b) Pipe-te chu manhole emaw junction chamber-ah chauh an inzawm tur a ni, mahse inlet inzawmna chu factory-a siam junction hmangin 1,200 mm emaw a aia lian pipe-ah a inzawm phal a ni.
- (c) Structure pakhatah 90° aia tam kawng thlak danglamna phal a ni lo.

9.3.6 **Flotation.** Leihnuai tui sang hmuna pipe leh box drain-te chu flotation (tui-in a chawi chhoh theihna) endik tur a ni (Bung 6, Clause 6.7.7).

> Hrilhfiahna. Box drain tana design n 0.015 hi Table 6.6-a "fair" concrete value nen inmil turin he Kaihhruaina Bu-in a ruat a ni. Clause 9.3.4 leh 9.3.5 hi FHWA HEC-22 leh manual dangte-a hmanna pangngai zuina a ni. Pipe run chhunga jump hian pressure surge a siam a, manhole khuh a thlak chhuak thei.

9.4 Culvert

9.4.1 **Kalphung.** Culvert-te chu FHWA *Hydraulic Design of Highway Culverts*, HDS-5, 3rd edition (2012) kalphung-te hmangin, emaw chung kalphung hmang software (entirnan FHWA HY-8) hmangin design tur a ni. Design headwater (culvert luhna lama tui sang zawng) chu inlet control hnuaia headwater (HWi) leh outlet control hnuaia headwater (HWo) zinga **lian zawk** hi a ni.

9.4.2 **Inlet control.** HWi chu barrel pianphung, a siamna thil leh inlet kam dinhmun siam tak tak tana HDS-5 inlet-control equation emaw nomograph hmangin chhut tur a ni.

9.4.3 **Outlet control.** HWo chu hetiang hian chhut tur a ni:

> $HWo = ho + H - L \cdot S$

> H = [1 + ke + (19.63 n² L) / R^1.33] · V² / 2g (SI units, barrel khat)

> ho = TW leh (dc + D)/2 zinga lian zawk

chutah ho chu control atana outlet tui thuk zawng (m), H chu barrel kal tlanga head loss zawng zawng (m), L chu barrel sei zawng (m), S chu barrel slope (m/m), ke chu entrance loss coefficient (Table 9.1), n chu barrel roughness, R chu hydraulic radius (m), V chu barrel velocity (m/s), TW chu outlet invert chunga tailwater thuk zawng (m), dc chu critical depth (m) leh D chu barrel sang zawng (rise) (m) a ni. Outlet control hnuaia barrel tui khat lo-te chu HDS-5-a sawi angin backwater chhutna hmangin zirchian tur a ni.

Table 9.1 — Entrance loss coefficient ke (outlet control, a khat emaw a khat lo)

Barrel leh inlet	ke
Concrete pipe, lei vur (fill) aṭanga chhuak, socket (groove) end	0.2
Concrete pipe, lei vur aṭanga chhuak, square-cut end	0.5
Concrete pipe, headwall emaw wingwall nei headwall, socket end	0.2
Concrete pipe, headwall emaw wingwall nei headwall, kam square	0.5
Concrete pipe, headwall, luhna kual (radius = D/12)	0.2
Concrete pipe, lei vur slope ang zela tan (mitred)	0.7
Concrete pipe, kam bevel	0.2
Corrugated metal pipe, lei vur aṭanga chhuak	0.9
RCC box, embankment nena parallel headwall, sir thuma kam square	0.5
RCC box, embankment nena parallel headwall, kam thum kual emaw bevel	0.2
RCC box, barrel nena 30°–75° wingwall, crown kam square	0.4
RCC box, barrel nena 10°–25° wingwall, crown kam square	0.5
RCC box, wingwall parallel (sir chhunzawm), crown kam square	0.7

Thu lakna: FHWA HDS-5 (2012), entrance loss coefficient table (Appendix C).

9.4.4 **Tailwater.** TW chu heng zinga sang zawk hi a ni tur a ni:

- (a) design tui luang-a luanna hnuailam channel-a normal emaw backwater thuk zawng; leh
- (b) tidal emaw luipui backwater lui chhung (reach) chhunga culvert tan, Clause 9.2.1-a tailwater level.

9.4.5 **Headwater tehna.** Bung 6, Table 6.1-a design AEP-ah:

- (a) HW/D chu 1.2 a pel loh tur a ni;
- (b) headwater chu luanna chunglam hmai (upstream face)-a kawng shoulder kam aia 0.3 m tal a hniam tur a ni; leh
- (c) headwater hian luanna chunglama building emaw ram ri reng rengah tui sang zawng chu Bung 6, Clause 6.12.2(d)-a tehna aiin a tihsan loh tur a ni.

9.4.6 **Kawng chunga tui kal (road overtopping).** Check leh 1% AEP ruahpui-ah kawng chunga tui luang chu broad-crested weir equation hmangin chhut tur a ni:

> Qr = Cd · L · h^1.5

chutah Qr chu kawng chunga tui luang (m³/s), L chu tui kal tlanna hmun sei zawng (m) leh h chu kawng chhip (road crest) chunga headwater thuk zawng (m) a ni. Cd chu kawng chung leh h leh kawng zau zawng ratio tan HDS-5 aṭanga lak tur a ni a, 1.66 (SI) a pel loh tur a ni. Culvert leh kawng chunga tui luang chu headwater inang-ah inbuktlak (balance) tur a ni. Kawng chunga tui thuk zawng leh hlauhawmna chuan Bung 6, Clause 6.12 a zawm tur a ni.

9.4.7 **Outlet velocity.** Design AEP leh 1% AEP-a outlet velocity chu chhut tur a ni a, outlet chu Clause 9.6 hnuaiah humhalh tur a ni.

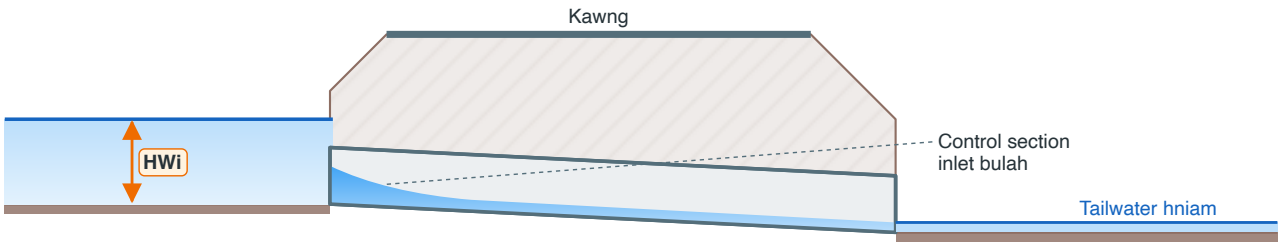
9.4.8 **Barrel leh bal.**

- (a) Bal tam theihna khawpui drain-ah multi-barrel culvert hman loh tur a ni. Hman a nih chuan, barrel pakhatin ruah sur lohna hun tui luang (DWF) a phur tur a ni a, inlet-ah debris fin emaw deflector (bal pial tirtu) a awm tur a ni.
- (b) Culvert-te chuan Bung 6, Clause 6.12.4 leh 6.12.5-a size tlem ber leh tihtawp endikna a zawm tur a ni.
- (c) Culvert invert chu drain hnuai (bed) nen a inmil tur a ni. Bed aia sangin dah loh tur a ni, chu chuan luanna chunglamah leidip leh tui a khawl tir ṭhin.

9.4.9 **Headwall leh cut-off.** Inlet leh outlet-ah piping (tui put chhuak avanga lei kal bo) leh undermining (hnuai lam lei kal bo) dang tura design headwall, wingwall leh cut-off wall a awm tur a ni.

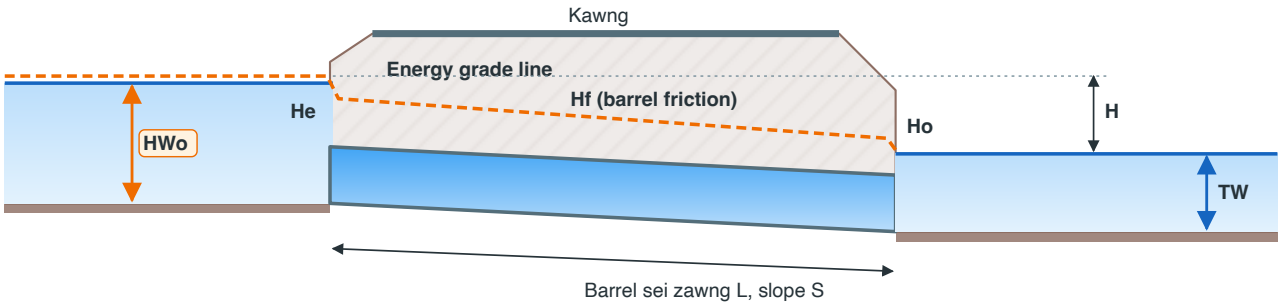
Culvert hydraulics: inlet control leh outlet control (profile, scale ang a ni lo)

(a) Inlet control



HWi hi Q leh inlet (pianphung, kam, skew) chauhah a innghat; HDS-5 inlet-control nomograph emaw equation aṭangin chhiar tur. Barrel chu a khat lovin a luang; barrel roughness, sei zawng leh tailwater-in HWi a nghawng lo.

(b) Outlet control



HWo = ho + H – L·S, H = He + Hf + Ho leh ho = max[TW, (dc + D)/2] nen. Barrel chu a khat emaw a khat lovin a luang; roughness, sei zawng, slope leh tailwater an pawimawh vek. Design headwater = HWi leh HWo zinga lian zawk (Clause 9.4).

Milem 9.1 — Culvert hydraulics: inlet control leh outlet control. He Kaihhruaina Bu tana milem siam thar, FHWA, Hydraulic Design of Highway Culverts, HDS-5 (3rd ed., 2012) aṭanga siam danglam.

> **Hrilhfiahna.** HDS-5 (3rd ed., FHWA-HIF-12-026, April 2012) hian HEC-5, HEC-10 leh HEC-13-a culvert design thu a khawm a, tuna FHWA culvert manual a ni. Clause 9.4.3-a outlet-control equation hi SI units-a HDS-5 energy equation a ni: friction coefficient 19.63 hi 2g nen a inang. Table 9.1-a ke value-te hi HDS-5 aṭanga lak chhawn a ni. Weir coefficient sang ber 1.66 (SI) hi kawng chunga tui kal chhutna tana APWA 5600 (2006) tehna C ≤ 3.0 (US units) thlak danglamna a ni. Clause 9.4.5-a headwater tehna-te hi he Kaihhruaina Bu-in a ruat a ni: HW/D ≤ 1.2 hian design ruahpui-ah inlet chu submerged-orifice flow-ah a luh thuk lutuk loh nan a veng, chutah chuan tui luang pun tlem tê pawhin headwater a tisang nasa ṭhin. Clause 9.4.8(c) hi a entirna hmasa chiang a awm lo; Mizoram-ah culvert hlui chungah kawng siam thar a nih hian culvert invert tihsan a tam a, luanna chunglamah tui leh leidip a khawl tir ṭhin avangin telh a ni.

9.5 Channel khuh lo

9.5.1 **Tui luang chhutna.** Channel khuh lo (open channel)-te chu Table 6.6-a n hmangin uniform flow tana Manning's equation-in design tur a ni. Tailwater, bridge, culvert, kawi (bend) emaw cross-section danglamna-in tui sang zawng a nghawng hmunah, gradually varied flow (standard step) zirchianna hmangin chhut tur a ni. Heng hmunah hi chu dinhmun pangngai a ni: Sairang, Bairabi, Vairengte, Chawngte leh Tlabung-a leh Champhai phai-a phai leh lui kam zawl drain-te (luipui tuilianin an outfall a khar thei); Tuirial leh Serlui B dam hnuaia drain-te (tui chhuah tirin an tui dawngtu level a ruat); leh Aizawl, Lunglei, Serchhip leh tlang chhip khawpui dangte-a drain chhuk nasa, down-drain (tlang pang zawh chhuk drain), terrace swale (tlang panga hmun zawl siam chunga tui luanna), lui leh kawngpui (drop structure leh chute-in kailawn angin an siam a, kailawn tinah critical depth an kal tlang).

9.5.2 **Tui luan dan (flow regime).** Design tui luang-ah, channel chu supercritical chute anga design a nih loh chuan, Froude number chu 0.8 a pel loh tur a ni (CPHEEO 2019, §5.3). Design tui luang-ah channel reng rengah Froude number 0.8 leh 1.2 inkara tui luang phal a ni lo.

9.5.3 **Velocity phal.** Design tui luang-a velocity chawhrual chu Table 9.2-a tehna a pel loh tur a ni.

Table 9.2 — Channel-a velocity chawhrual phal sang ber

Lining emaw lei	Velocity sang ber (m/s)	Hnar
Concrete lining	3.0	CPHEEO 2019 Table 5.11
Riprap (lung lian phah) lining	1.8	CPHEEO 2019 Table 5.11
Hlobet lining	1.2	CPHEEO 2019 Table 5.11
Lei channel tihnghet (pianphung channel siam danglam)	2.0, emaw a tlem zawk chuan critical velocity	CPHEEO 2019 §5.10.3
Lined lo, sand zawi	0.46	Fortier leh Scobey (1926), tui fim
Lined lo, sandy loam	0.53	A chunga ang khan
Lined lo, silt loam	0.61	A chunga ang khan
Lined lo, loam nghet	0.76	A chunga ang khan
Lined lo, clay khauh	1.14	A chunga ang khan
Lined lo, gravel zawi	0.76	A chunga ang khan

Lining emaw lei	Velocity sang ber (m/s)	Hnar
Lined lo, gravel lian	1.22	A chunga ang khan

Lining nghet lo (flexible lining) (thlai, riprap, geosynthetic) chu a aiah FHWA HEC-15, *Design of Roadside Channels with Flexible Linings*, 3rd edition (2005)-a permissible shear stress kalphung hmangin design theih a ni.

9.5.4 **Dung lam slope.** Engineered channel-ah, drop structure (Clause 9.6.6) emaw chute siam a nih loh chuan, dung lam slope chu natural lining tan 0.4% leh concrete lining tan 0.2% a pel loh tur a ni (CPHEEO 2019, Table 5.11).

9.5.5 **Freeboard leh kawi.** Freeboard (tui sang ber chunga zau dah) chuan Bung 6, Table 6.7 a zawm tur a ni a, kawi-a superelevation tel tui sang zawng chung aṭanga teh a ni. Kawi radius chuan Bung 6, Clause 6.7.10 a zawm tur a ni.

9.5.6 **Sir slope.** Structural emaw geotechnical design-in slope chhuk zawk a thlawp loh chuan:

- (a) lei channel lined lo-te sir slope chu 1V:2H aia chhuk loh tur a ni; leh
- (b) hlo an hlawh ṭhin hlobet channel-te sir slope chu 1V:3H aia chhuk loh tur a ni.

9.5.7 **Low-flow channel.** Bed zau zawng 3 m emaw a aia zau channel-ah Clause 6.7.3-a self-cleansing velocity-in ruah sur lohna hun tui luang (DWF) phurtu low-flow channel chiang a awm tur a ni.

9.5.8 **Transition.** Cross-section danglamnaah transition zawi zawi hman tur a ni. Supercritical flow-ah thut taka zau leh zim phal a ni lo.

9.5.9 **Leihnuai tui sang hmuna lining.** Leihnuai tui sang emaw tidal nghawng hmuna lined channel-te chuan filter nei weep hole a nei tur a ni, emaw channel a ruak laiin uplift do thei turin design tur a ni.

9.5.10 **Pianphung channel.** Tih theih chinah pianphung channel humhalh tur a ni (CPHEEO 2019, §5.10.3 note; Bung 7). Pianphung channel thlak danglam ngei ngei a ngaih chuan, a theihna chuan Bung 6-a design AEP a phak tur a ni a, a velocity chuan Table 9.2 a zawm tur a ni.

> **Hrilhfiahna.** Lined channel velocity leh slope-te hi CPHEEO (2019) Table 5.11 value an ni. Lei lined lo value-te hi Chow (1959)-in a lak chhawn angin, tui fim tana Fortier leh Scobey (1926) velocity phal hlui an ni. Mizoram-a lei tam (Surma group (a Bhuban leh Bokabil unit-te) shale, siltstone, mudstone leh sandstone leh Barail sandstone chunga tlang pang chhuk nasa tlang lei pan lo leh colluvium, phai-a colluvial leh alluvial lei chawhpawlh, lui kam zawl-a lung leh lungtê dip (CGWB, Lunglei), leh khawpui tlang pang-a lei vur leh lei laih bal; chungah hian tui luangin a phur gravel, lungpui, leimin bal leh bawlhhlawh chuan, lei ngei ai chuan, channel hnuai-in a tuar tur a ruat (he Kaihhruaina Bu chhiar dan)) tan pek an ni. Froude number 0.8 leh 1.2 inkar khap hi critical flow pumpelh tura CPHEEO thurawn, chutah tui chung chu "a nghet lo a, a fawn" ("becomes unstable and wavy") (§5.3) tih chhunzawmna a ni. He chhunzawmna hi he Kaihhruaina Bu-in a siam a ni. Sir slope leh low-flow channel pawh he Kaihhruaina Bu-in a ruat a ni, Mizoram khawpui channel tam tak hian Bung 8-a cross-connection paih a nih hma chu ek tui chawhpawlh ruah sur lohna hun tui luang an phur avangin. Bed zau phei chuan a zau zawng zawngah ek bal (sludge) a dip ṭhin a, low-flow channel hian ruah sur lohna hun tui luang chu a khawm tlat.

9.6 Energy dissipator, outlet humhalhna leh drop structure

9.6.1 **A ngaih hun.** Design AEP emaw 1% AEP-a outlet velocity chu Table 9.2-a tui dawngtu channel velocity phal aia a san apiangah pipe, culvert leh channel outlet tinah, leh lined lo channel, dil (tank) emaw tui awmna-a outlet tinah outlet humhalhna emaw energy dissipator (tui chakna tihnemna) siam tur a ni.

9.6.2 **Kalphung.** Energy dissipator leh outlet humhalhna chu FHWA HEC-14, *Hydraulic Design of Energy Dissipators for Culverts and Channels*, 3rd edition (2006) kalphung-te hmangin design tur a ni a, dissipator chi chu a hman theih chin (range of application) azirin thlan tur a ni.

9.6.3 **Riprap apron.** Apron phei-a luang chhuak outlet kual tan, riprap size laimu (median) chu HEC-14 apron equation hmangin chhut tur a ni:

> D50 = 0.2 · D · [Q / (g^0.5 · D^2.5)]^(4/3) · (D / TW)

chutah D50 chu lung size laimu (m), D chu culvert diameter emaw rise (m), Q chu design tui luang zat (m³/s), g = 9.81 m/s² leh TW chu tailwater thuk zawng (m) a ni. TW hriat a nih loh chuan, 0.4D-ah lak tur a ni.

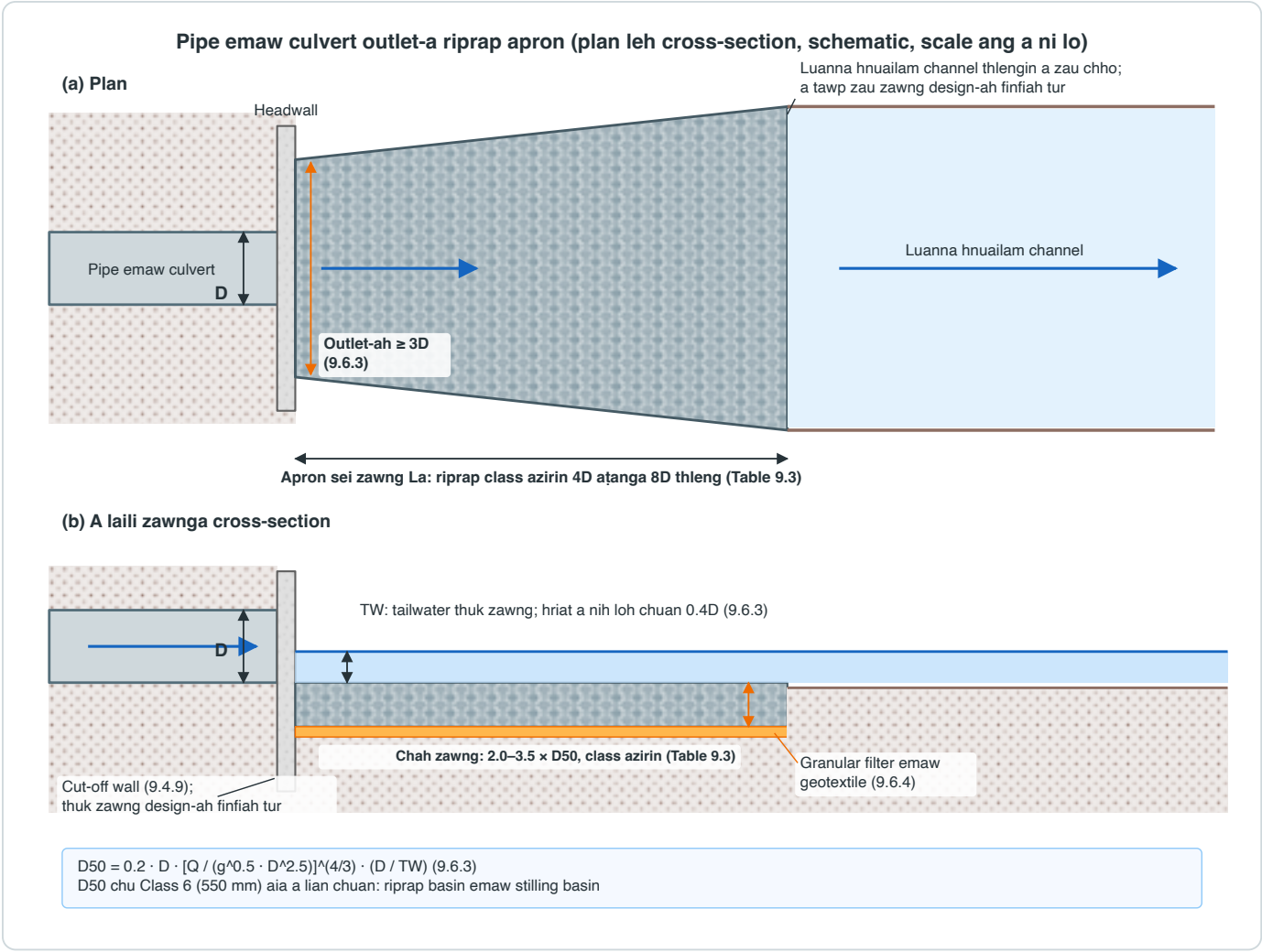
Apron sei zawng leh a chah zawng chuan HEC-14 riprap-class table (Table 9.3) a zawm tur a ni. Outlet-a apron zau zawng chu 3D tal a ni tur a ni a, luanna hnuailam channel thlengin a zau chho tur a ni.

Table 9.3 — Riprap class leh apron lenzawng (HEC-14)

Class	D50 (mm)	Apron sei zawng	Apron chah zawng
1	125	4D	3.5 D50
2	150	4D	3.3 D50
3	250	5D	2.4 D50
4	350	6D	2.2 D50
5	500	7D	2.0 D50
6	550	8D	2.0 D50

Thu lakna: FHWA HEC-14 (2006), §10.2 leh Table 10.1, state-agency design worksheet-a lak chhawn angin. Chhut chhuah D50 chu Class 6 aia a lian chuan, riprap basin emaw structural stilling basin hman tur a ni.

9.6.4 **Riprap filter leh grading.** Riprap chu granular filter emaw geotextile chungah dah tur a ni. Lung chu a kil nei (angular), a nghet rei leh Clause 9.6.3-a D50 a phak theih nan grade tur a ni.



Milem 9.2 — Pipe emaw culvert outlet-a riprap apron: outlet-ah apron zau zawng 3D tal, luanna hnuailam channel thlenga zau chho; sei zawng leh chah zawng Table 9.3 aṭangin; granular filter emaw geotextile chunga lung (Clause 9.6.3 leh 9.6.4). He Kaihhruaina Bu tana milem siam thar, FHWA, Hydraulic Design of Energy Dissipators for Culverts and Channels, HEC-14 (3rd ed., 2006), §10.2 aṭanga siam danglam.

9.6.5 **Stilling basin.** Velocity emaw Froude number chu riprap apron leh basin hman theih chin aia a san chuan, structural stilling basin (tui chakna tihnemna khur) emaw impact basin chu HEC-14 emaw a sawi US Bureau of Reclamation basin chi-te aṭanga design tur a ni.

9.6.6 **Drop structure.** Channel slope chu Clause 9.5.4 emaw Table 9.2-a velocity tehna a pel dawn hmunah drop structure (tui tlak thlakna structure) hman tur a ni.

- (a) Drop ding dik (straight vertical drop) tan, drop number $D = q^2 / (g\,h^3)$ chhut tur a ni, chutah q chu unit discharge (m²/s) leh h chu drop sang zawng (m) a ni. Pool geometry chu Rand (1955) inzawmna aṭanga ruat tur a ni: drop sei zawng Ld/h = 4.30 D^0.27; pool thuk zawng Yp/h = 1.00 D^0.22; sequent depth y1/h = 0.54 D^0.425 leh y2/h = 1.66 D^0.27.
- (b) Baffled chute leh stepped drop chu HEC-14 emaw US Bureau of Reclamation kalphung hmangin design tur a ni.
- (c) Public drain-a vertical drop pakhat sang zawng chu 1.5 m a pel loh tur a ni. Drop-te chuan Bung 6, Clause 6.13.8 hnuaia kam humhalhna a nei tur a ni.

9.6.7 **Coastal leh beach outfall.** Beach chunga emaw estuary-a outfall-te chu fawn (wave) leh scour laka humhalh tur a ni. Littoral sand-in outfall a khar thei hmunah, outfall chu machine hmanga hawn leh theih turin design tur a ni a, drainage system chu Bung 5 hnuaiah outfall khar dinhmunin endik tur a ni.

> **Hrilhfiahna.** HEC-14 (3rd ed., FHWA-NHI-06-086, July 2006) hi tuna FHWA energy-dissipator manual a ni. Apron equation leh class table hi HEC-14 §10.2 (Equation 10.4 leh Table 10.1) aṭanga lak a ni. Equation leh table hi thuziak dang (Tennessee handbook pakhat leh state-agency riprap worksheet pakhat)-a lak chhawn angin hetah pek a ni. Apron zau zawng 3D pawh chung thu hnar ngei aṭanga lak a ni. Purdue zirchianna (JTRP) chuan HEC-14 apron kalphung hi a hman theih chinah fimkhur deuh (conservative) a ni tih a hmu. Rand (1955) drop inzawmna-te hi standard a ni a, Chow (1959)-ah lak chhawn a ni. Vertical drop pakhat tana 1.5 m tehna hi a entirna hmasa chiang a awm lo; khawpui drain-a mipui himna atan he Kaihhruaina Bu-in a ruat a ni.

9.7 Detention outlet structure

9.7.1 **Outlet bulpui (primary outlet).** Detention facility outlet bulpui chuan:

- (a) Bung 4-a luan chhuah tir zat (release rate) leh tui hniam hun (drawdown time) a siam tur a ni;
- (b) pump hmang facility (Clause 9.9) loh chuan, mechanical hmanrua emaw operator hmalakna awm lovin hna a thawk tur a ni;
- (c) **50 mm** aia tê orifice (tui chhuahna khur tê) a nei loh tur a ni a, orifice tin chu trash screen-in humhalh tur a ni (Clause 9.8.5); leh
- (d) lei chung aṭangin tihfai theih a ni tur a ni.

9.7.2 **Orifice.** Orifice tui luang chu hetiang hian chhut tur a ni:

> Q = Cd · A · (2 g h)^0.5

chutah A chu orifice area (m²) leh h chu orifice laimu (centroid) chunga head (m) a ni, emaw orifice chu tui hnuaia a pil chuan luanna chunglam leh hnuailam tui sang zawng danglamna a ni. Plate pan-a orifice kam hriam tan Cd chu 0.60 a ni tur a ni. Kam dinhmun dang tan, enchhin tawh value tlangzarh hman tur a ni.

9.7.3 **Weir.** Weir (tui luan khamna dai) tui luang chu Q = Cw · L · H^1.5 hmangin chhut tur a ni, heng nen:

- (a) sharp-crested rectangular weir: Cw = 1.84 (SI), end contraction tin tan effective length chu 0.1 H-in tihtlem a ni;
- (b) V-notch weir: Q = 1.38 · tan(θ/2) · H^2.5 (SI), chutah θ chu notch angle a ni; leh
- (c) broad-crested weir leh spillway crest: Cw = 1.44 aṭanga 1.70 thleng (SI), crest pianphung leh head azira table tlangzarh aṭanga thlan.

Tui hnuaia pil weir-te chu inzawmna tlangzarh hmangin submergence tan siam dik tur a ni.

9.7.4 **Stage–discharge rating.** Multi-stage outlet (riser (outlet ding)-a orifice leh weir, outlet pipe nen) tan, designer chuan stage tinah control awm thei zawng zawng (orifice tin, weir tin, riser crest, leh inlet leh outlet control hnuaia outlet pipe) hnuaia tui luang zat a chhut tur a ni a, a belhkhawm value **tlem ber** a hmang tur a ni. Rating chu outlet invert aṭanga emergency spillway (tui luan liamna) crest leh design head thleng table-a siam tur a ni.

9.7.5 **Tailwater.** Rating-te chu Clause 9.2.1-a tailwater nen chhut tur a ni. Tui dawngtu chu outlet aia a sang thei chuan, outlet-ah Clause 9.10 hnuaia flap gate emaw non-return valve a awm tur a ni a, khawlna chuan Bung 5-a outfall khar endikna a zawm tur a ni.

9.7.6 **Emergency spillway.** Emergency spillway chuan outlet bulpui tihtawp nia ngaih leh basin a ṭan laia khat nen 1% AEP tui lut a kal tlang tir tur a ni, embankment (dai) crest thlengin freeboard **0.3 m** nen. Hlauhawmna sang basin-te chu 0.2% AEP tui lut tan pawh endik tur a ni (Bung 4).

9.7.7 **Embankment kal tlang outlet pipe.** Embankment kal tlang outlet pipe-te chuan pipe zawha piping dang turin filter diaphragm emaw seepage collar a nei tur a ni a, inlet chu flare emaw headwall nei a ni tur a ni.

9.7.8 **Anti-vortex.** Riser crest chunga design head chu riser diameter aia a lian riser outlet-te chuan anti-vortex plate a nei tur a ni.

> **Hrilhfiahna.** Trash screen nei orifice tê ber 50 mm, emergency-spillway tehna leh tui hniam hun-te hi he Kaihhruaina Bu tehna bulpui an ni (Bung 4). Orifice tê ber hi APWA 5600 (2006, 5608.4) tê ber 3 in (75 mm vel) aiin a tê zawk. Site tê-ah Bung 4 mixed-frequency dan-a luan chhuah tir zat hniam a phalsak a, screen ṭha (Clause 9.8.5) a innghah. "Mechanical hmanrua awm lo" dan hi APWA 5600 (2006, 5608.4) zuina a ni, chu chuan outlet bulpui chu enkawltu awm lovin hna a thawk tur a ni a ti. Orifice leh weir coefficient-te hi textbook value pangngai an ni (entirnan Brater leh King, *Handbook of Hydraulics*; Chow 1959). Sharp-crested coefficient 1.84 leh end-contraction siam dikna 0.1H hi SI units-a Francis formula a ni. Broad-crested range 1.44–1.70 hi table-a tarlan ṭhin US range 2.6–3.1 SI inang a ni. Clause 9.7.7 leh 9.7.8 hi dam leh detention hmanna pangngai zuina a ni.

9.8 Trash rack leh screen

9.8.1 **A ngaih hmun.** Trash rack (bawlhhlawh dangna) emaw screen chu heng hmunah siam tur a ni:

- (a) drain khuh lo chu pipe, drain khuh emaw 30 m aia sei culvert-a a luh hmunah (Bung 6, Clause 6.13.4);
- (b) detention outlet orifice tinah (Clause 9.7.1);
- (c) pump sump tin inlet-ah (Clause 9.9); leh
- (d) tui awmna-a outfall-ah, Bung 8-a gross pollutant trap ṭhen angin.

9.8.2 **Conduit luhna rack.** Conduit leh culvert luhna rack-te chuan heng hi an nei tur a ni:

- (a) bar inkar fim 75 mm aia tlem lo leh conduit chhung lenzawng tê ber chanve aia tam lo;
- (b) conduit cross-section area let 4 tal gross area;
- (c) rack 50% tihtawp nen design tui luang-ah rack kal tlang velocity chawhrual 1.0 m/s aia sang lo; leh
- (d) rack chu kut hmanga hual (rake) tur a nih chuan 1V:2H aia chhuk lo inclination, hnathawhna platform leh handrail nen.

9.8.3 **Head loss.** Rack fai kal tlanga head loss chu Kirschmer equation hmangin chhut tur a ni:

> $h_r = \beta \cdot (t / b)^{(4/3)} \cdot (V^2 / 2g) \cdot \sin\theta$

chutah t chu bar chah zawng, b chu bar inkar fim, V chu approach velocity, θ chu horizontal aṭanga rack kawi zawng, leh β chu bar pianphung factor (kam hriam rectangular bar tan 2.42; bar kual tan 1.79) a ni. HGL leh headwater chu rack **50% tihtawp** nen endik tur a ni (head loss chu area hawng chanve nen chhut).

9.8.4 **Tihtawp laia tui luan liamna.** Rack tin chuan tui luan liamna kawng (overflow route) a nei tur a ni, rack tawp vek chuan building-ah tuilian a thlen loh nan emaw Bung 6-a tehna a pel loh nan.

9.8.5 **Detention outlet screen.** Detention orifice chunga screen-te chu a humhalh orifice aia kua tê zawk nei leh orifice area let 10 tal area hawng nei a ni tur a ni.

9.8.6 **Pump sump screen.** Pump-station inlet-a bar screen-te chu pump manufacturer-in a sawi angin, pump-in a kal tlang theih thil khal lian ber aia inkar fim tê zawk a ni tur a ni. Screen-te chu module paih theih (removable)-in siam tur a ni a, design tui lut chu 1 m³/s aia a tam chuan mechanically raked screen (machine-in a hual screen) hman tur a ni.

9.8.7 **Himna.** Conduit sei luhna rack-te chuan mihring a hip luh loh nan a veng tur a ni. Rack tawp vek hydrostatic load tan design tur a ni.

> **Hrilhfiahna.** CPHEEO (2019, §8.3.1.3) chuan pump-station bar screen-te chu inkar "58 mm vel" ("approximately 58 mm") nei, module-a siam, clogging (bal avanga tihtawp) a awm hunah emergency overflow nen a sawi. Clause 9.8.6 hian chu kalphung chu a zui a, mahse inkar chu pump azira danglam ṭhin pump solids-passing size nen a inzawm tir. 50% tihtawp endikna hi Bung 6-a grate clogging factor nen a inmil. Kirschmer equation leh a shape factor-te hi standard an ni (Kirschmer 1926, hydraulic handbook-a lak chhawn angin). Rack inkar, area ratio, kal tlang velocity, conduit sei zawng 30 m tehna, orifice tana screen area 10× leh mechanical raking tana 1 m³/s tehna-te hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni.

9.9 Pump leh sump

9.9.1 **Pump hman hun.** Gravity drainage-in Bung 5 leh 6 mamawh a phak theih loh hmunah chauh pump hman tur a ni, entirnan kawng underpass (kawng hnuai kal tlang) (Bung 6, Clause 6.10.5), basement, hmun hniam leh Bung 5-a outfall khar endikna hnuaia tide-lock outfall-ah.

9.9.2 **Design tui lut leh khawlna.** Station chu catchment (ruahtui luan khawmna hmun) leh luanna chunglama khawlna reng reng kal tlanga route inflow hydrograph (hun hrang hranga tui luang zat) nen design tur a ni. Pump theihna leh khawlna chu a ṭhuin thlan tur a ni:

- (a) station chuan a rawngbawl element design AEP a phak tur a ni (underpass tan, 1% AEP endikna nen 2% AEP);
- (b) station-in tidal outfall a rawngbawl chuan, Bung 5-in a phut angin, tidal-lock rei zawng (default: tide sang inzui pahnih, 6 h zel) chhung outfall tihzim nen khawlna leh pump-te chuan 48 h design tui zat (volume) a dawm tur a ni; leh
- (c) pump-te chu tailwater hniam ber laia sump level hniam ber leh tailwater sang ber (HAT leh surge leh 0.3 m) inkara static head zawng zawng tan thlan tur a ni.

9.9.3 **Wet-well tui zat.** Wet-well tui zat hman theih (pump-stop leh pump-start level hniam ber inkar) chu heng zinga lian ber hi a ni tur a ni:

- (a) variable-speed drive leh automatic control dah a nih chuan, tui lut tlem ber minute 5 (CPHEEO 2019, §8.3.3);
- (b) chuti a nih loh chuan, tui lut sang ber minute 10 aṭanga 15 thleng, emaw pump manufacturer cycle time tlem ber tana tui zat ngai, $V = Q \cdot t$ aṭangin (CPHEEO 2019, Eq. 8.1); leh
- (c) constant-speed pump tan, pump tin tan $V = \Theta \cdot q / 4$ tui zat, chutah Θ chu motor manufacturer-in a rawt cycle time tlem ber leh q chu pump theihna a ni (FHWA HEC-24, 2001).

9.9.4 **Duty leh standby.**

- (a) Duty pump-te chu tih theih chinah size inang an ni tur a ni (CPHEEO 2019, §8.3.3).
- (b) Standby theihna chu duty pump lian ber nen a inang tal tur a ni a, duty pump zat 50% aia tlem loh tur a ni.
- (c) Duty leh standby hna chu automatic-in an inthlak chhawk tur a ni.

9.9.5 **Pump chi.** Pump-te chu sand leh bal nei ruahtui tan remchang solids-handling (non-clog) chi an ni tur a ni. Axial-flow pump-te chu bal an tuar thei loh avangin Clause 9.8.6 zawm screen hnungah chauh hman tur a ni (CPHEEO 2019, §8.3.2).

9.9.6 **Sump leh intake design.** Sump geometry, pump inkar, submergence tlem ber leh approach flow dinhmun chuan pump manufacturer mamawh leh ANSI/HI 9.8 (Rotodynamic Pumps for Pump Intake Design) a zawm tur a ni. Pump reng reng chu 1 m³/s aia a lian emaw, sump chuan ANSI/HI 9.8 geometry pangngai a zawm loh chuan, physical

hydraulic model study neih tur a ni. Pump emaw motor inkiang inkar fim tlem ber chu unit tê leh lai tan 0.6 m leh unit lian tan 1.0 m a ni (CPHEEO 2019, §8.2.5).

9.9.7 **Leidip leh screen.** Wet well luanna chunglamah leidip dawnna (silt trap) leh bar screen siam tur a ni (Clause 9.8.6; Bung 6, Clause 6.13.3).

9.9.8 **Control leh enfiahna.**

- (a) Pump-te chu primary level sensor (ultrasonic, radar emaw pressure) leh a hrang float-switch back-up hmangin thunun tur a ni.
- (b) High-level leh pump-fault alarm chu telemetry hmangin local body control room-ah thawn tur a ni.
- (c) Sump level, pump run hours leh power dinhmun chu ziak (log) tur a ni a, kum 5 tal vawn tur a ni.

9.9.9 **Power supply.**

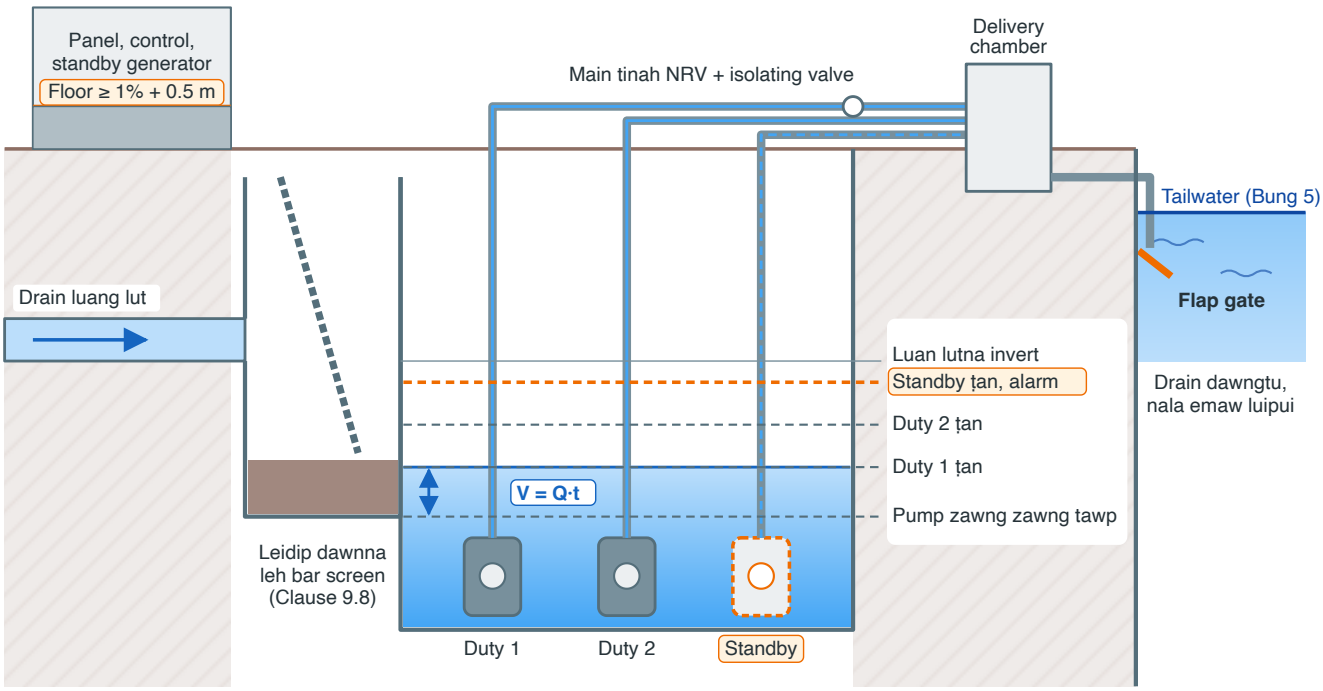
- (a) Station chuan power hnar hrang pahnih a nei tur a ni: grid supply leh duty pump zawng zawng vawikhatah tlan tir thei standby generator (emaw grid feeder hrang pahnihna) (CPHEEO 2019, §2.4.2.3(j)).
- (b) Duty pump zawng zawng **darkar 72** tal chawl lova tlan tir theihna fuel chu Clause 9.9.10-a tuilian level chungah, site-ah khawl tur a ni.
- (c) Standby power-a inthlak chu automatic a ni tur a ni.

9.9.10 **Station tuilian laka humhalhna.** Electrical leh control room chhuat, generator leh transformer chu station-a 1% AEP tuilian level aia 0.5 m tal a sang tur a ni (Bung 6, Clause 6.11). Enkawlna motor-te station luhna kawng chu 1% AEP ruahpui-ah hman theih a ni reng tur a ni.

9.9.11 **Tui chhuahna (discharge).** Pump tin chuan a rising main hran a nei tur a ni, emaw main-te an inzawmna hmunah non-return valve leh isolating valve. Rising main-te chu Clause 9.10 hnuaia flap gate emaw non-return valve nei delivery chamber emaw outfall-ah an luang chhuak tur a ni. Discharge piping chu friction formula hriat lar hmangin size ruat tur a ni (CPHEEO 2019, §8.3.9).

9.9.12 **Emergency inzawmna.** Station tin chuan hard-standing hmun leh mobile pump-te delivery chamber-a an luan chhuah theihna quick-coupling inzawmna a nei tur a ni.

Ruahtui pump station: wet well, screen, level leh outfall (cross-section, scale ang a ni lo)



Duty capacity, wet-well volume leh control: Clause 9.9. Standby ≥ duty pump lian ber. Power: hnar pahnih (grid + generator). Station leh a khawlna hi tui dawngtu luipui a san laiin outfall khar chungin endik a ni (Bung 5).
Level-te hi entirna chauh; pump curve, submergence tlem ber leh darkar khata ṭan phal zat aṭangin ṭan leh stop level ruat rawh.

Milem 9.3 — Ruahtui pump station: wet well, screen, level leh outfall. He Kaihhruaina Bu tana milem siam thar, CPHEEO, Manual on Storm Water Drainage Systems (2019), Chapter 8, leh FHWA, Highway Stormwater Pump Station Design, HEC-24 (2001) aṭanga siam danglam.

> **Hrilhfiahna.** CPHEEO (2019) Chapter 8 hian ruahtui pump chungchang a sawi: wet-well size (§8.3.3), pump chi (§8.3.2), trash screen (§8.3.1.3), hmun mamawh (§8.2.5) leh "electricity a tlakchham laia emergency hnathawh atana standby" ("as standby for emergency operation during failure of electricity") generator set mamawh (§2.4.2.3). "Duty pump unit-te 50% tal" ("minimum 50% of the duty pump units") standby unit a rawt. Clause 9.9.4(b) hi a khauh zawk: standby chu duty pump lian ber nen a inang tal tur a ni, chuvangin a pump lian ber hman theih loh lai pawhin station chuan a design hna a thawk thei reng. He dan khauh zawk hi he Kaihhruaina Bu-in a ruat a ni. FHWA HEC-24 (*Highway Stormwater Pump Station Design*, FHWA-NHI-01-007, 2001) hi FHWA pump-station manual a ni. Darkar 72 fuel khawlna hi Bung 2-a darkar 72 design ruahpui nen inmil turin he Kaihhruaina Bu-in a ruat a ni. Model-study tehna, telemetry leh data vawn mamawh-te, leh emergency inzawmna-te hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni.

9.10 Tide gate, flap gate leh non-return valve

9.10.1 **A ngaih hmun.** Invert chu tui dawngtu 1% AEP still-water level aia hniam outfall tinah flap gate, tide gate emaw non-return valve siam tur a ni (Bung 5).

9.10.2 **A chi.** Lo pawm theih hmanrua-te chu:

- (a) hinge nei flap gate (cast iron, ductile iron, stainless steel, HDPE emaw composite);
- (b) elastomeric in-line emaw pipe tawp check valve (duckbill chi); leh

- (c) penstock emaw sluice gate, kut emaw motor hmang, hupna pahnihna (secondary closure) atan.

9.10.3 **Hupna pahnihna.** 900 mm emaw a aia lian outfall-te, leh pump emaw khawlna system rawngbawl outfall tin chuan, gate enkawl theih nan, leh gate a hawng tlat (jam open) a nih chuan back-up atan, flap gate luanna chunglamah penstock emaw stop-log slot a nei tur a ni.

9.10.4 **Hydraulics.** Hmanrua a hawn laia head loss chu manufacturer enchhin data aṭanga lak tur a ni a, HGL-ah telh tur a ni (Bung 6, Clause 6.8.7). Flap gate-te chu head danglamna tê-ah an hawng tur a ni (CPHEEO 2019, §6.3.10.1).

9.10.5 **Sand leh bal.** Sand emaw bal-in gate a hawng tlat emaw a hup tlat thei beach, estuary leh creek outfall-ah:

- (a) gate chu lei chung aṭanga luh theih chamber-ah dah tur a ni, emaw elastomeric check valve hman tur a ni; leh
- (b) gate chu fûr hun chhungin high-tide emaw surge thlen hnu tinah endik tur a ni (Bung 10).

9.10.6 **Siamna thil.** Hinge, pin, link leh fixing-te chu thir ei (corrosion) do thei thil an ni tur a ni (CPHEEO 2019, §6.3.10.1). Coastal leh tidal hmunah hei hian stainless steel grade 316, bronze emaw metal ni lo thil a kawh (Clause 9.13).

9.10.7 **Gate hnunga khawlna.** Ruahpui laia gate a hup chuan, a hnunga khawlna emaw pump chuan Bung 5-a outfall khar endikna a zawm tur a ni.

> Hrilhfiahna. CPHEEO (2019, §6.3.10.1) chuan tidal tui-a outfall-te-a flap gate leh flood gate a sawi. "Gate a hup lai chhunga pump hman loh tum a nih chuan khawlna tawk a ngai thei" ("adequate storage may be necessary if pumping is to be avoided during the closure of the gate") tih leh hinge pin leh link-te chu "thir ei do thei thil an nih a ṭha" ("should be of corrosion-resistant materials") tih a tarlang. Mizoram hian tuifinriat kam a nei lo a, chuvangin State-ah tide-in outfall a khar lo va, Clause 9.6.7, 9.9.2(b), 9.10.5 leh 9.13.6-a beach, estuary, tidal leh coastal ruahmanna-te, leh Table 9.5-a coastal leh tidal row-te hi a lang lo; Clause 9.9.2(c)-ah tailwater sang ber chu Bung 5-a luipui, lui, reservoir emaw dil level sang ber a ni. State-ah ruahtui drain chungah pumping station reng reng hmuh a ni lo a, outfall tam zawk, Aizawl-a outfall-te pawh tiamin, luipui tailwater awm lovin lui chhuk nasa-ah an tla thla mai a (Clause 5.8.5(a) leh (b)), chuvangin Clause 9.9 hnuaia pump leh sump hi Bung 5-a outfall khar endikna-in phai ram site chu gravity-in a tihru thei lo tih a lantirna hmunah chauh a ngai: Khawthlangtuipui kama Tlabung-ah, June 2017-ah sub-division chhunga in 350 vel tui a lip nia sawi a ni a (district officer-te chhiar dan chuan 9 a zavaia leh 60 aia tam a ṭhenkhat), July 2019-ah in 400 vel (150 chu khawpui chhungah), leh August 2023-ah chhungkaw 40 sawn chhuah an ni (a zavaia chanchin tlangzarh angin) (Clause 5.8.5(d)); Tlawng kama Sairang-ah, June 2018-ah chhungkaw ṭhenkhat an tang (chanchin tlangzarh angin), leh sub-area MZ-A1-a Bairabi leh Vairengte lui kam zawl-ah (Clause 5.8.5(c)); leh Champhai phai leh Chawngte-ah, survey-in luipui-in outfall a khar tih a lantir chuan. Chung outfall-te chu an aia sang thei luipui-ah an tawp avangin, chutah chuan 1% still-water level hnuaiah gate a ngai a, a hnunga khawlna emaw pump chu darkar 72 aia tlem lo outfall khar tan size ruat a ni a, Tlabung-ah chuan tuilian chhinchhiahna emaw khawtlang mite record-in luipui a rei zawka a ding tih a lantir chuan a rei zawk tan (Clause 5.8.5(c) leh (d)). State-a CWC site reng reng hian warning level emaw danger level a nei lo a, high flood level tlangzarh awm chhun chu Tuirial-a Turial-ah 149.0 m a ni (June ni 17, 1995; SANDRP-in a ziah chhawn angin CWC level, chanchin tlangzarh angin; datum tarlan a ni lo), chuvangin phai-a gate sill leh pump ṭan level chu datum hming tarlan nena survey-a tuilian chhinchhiahna aṭangin ruat a ni. NEEPCO dam (open chute spillway nei 75 m zoned earth-fill dam; full reservoir level 90.5 m, minimum drawdown level 68.0 m (CERC, Petition No. 125/MP/2021)) hnuaia Tuirial thleng drain-te chu tui chhuah tir record sang ber, emaw NEEPCO-in a pek hma chu spillway theihna nen endik a ni (Clause 5.8.5(e)), leh dam-break zirchianna pakhat chuan "lui inkawpna bulah" ("near the confluence") peak 3,035.34 m³/s a route nia sawi a ni (chanchin tlangzarh angin), chu chu Clause 2.3.6(i)-a hlauhawmna thlitfimna (hazard screening)-ah a tel tur a ni; Serlui B level-te hmuh a ni lo [TBC]. Heng dam-te hi he bung ni lovin dam-safety standard angin design an ni a, mahse an level leh tui chhuah tir-te hi he bung boundary condition an ni. State tam zawk hi a chhuk nasa a, tui a luang chak. Aizawl tlang pang hi "300 aṭanga 450 thleng" ("300 to 450") a ni, chu chu Master Plan for Aizawl: Vision 2030 thuziak scan-a chhiar angin 30° aṭanga 45° thleng a ni; Serchhip khawpui 89.2% chu 30° aia a chhuk a, 38.7% chu 45° aia a chhuk (khawpui tana MIRSAC slope class chunga he Kaihhruaina Bu chhutna); leh SD&SM 2017 hian 60° chung chauhah site development permit a hnial (reg. 14). Heng tlang pang-te hi Clause 9.5.4-a 0.4% leh 0.2% aia nasa fe

an ni a, chuvangin drop structure (Clause 9.6.6), stepped channel, baffled chute leh stilling basin (Clause 9.6.5 leh 9.6.6(b)) leh Clause 9.5.2 hnuaia design supercritical chute-te hi dinhmun pangngai an ni a, dinhmun danglam an ni lo; IRC:SP:42-2014 (§8.5.1) pawhin tlang kawngah drain lined, stepped emaw baffled a phut tawh a ni. SD&SM 2017 hian heng structure tê ber-te geometry a ruat: reinforced concrete 75 mm tal chah zawnga phah, 300 mm tal thuk leh 1 in 20 tal gradient nei terrace swale leh ditch (tuihawr), down drain-a luang chhuak lova 400 m² aia tam aṭanga tui khawn khawm run pakhat mah awm lo, chung lam drainage kawng 10 m aia sei nei lei laih pang (cut slope) tin chhip zawha 300 mm tal thuk leh 800 mm zau phah interceptor drain (cut chung lama ruahtui dangtu drain), lei vur hnuaia drain "energy dissipater nena siam" ("constructed with energy dissipaters"), leh drainage luan chhuahna hmunah "lei khawrh lo downdrain" ("non-erosive downdrains") (regs. 25 leh 27); a "hydrology leh hydraulic chhutna" ("hydrology and hydraulic calculations") chu licence nei civil engineer-te kutah a dah (Schedule I), leh he bung hian a pe. Mizoram-ah, he series-a tlang ram edition-te angin, catchment-ah hmasawnna awm lohna tlang pang, lei laih pang emaw lui a telna drain chunga structure tan heng hi he Kaihhruaina Bu-in a ruat: (a) drop, chute emaw down-drain chu energy dissipator-ah a tawp tur a ni a, drain lined emaw pianphung channel nghet-ah a luang chhuak tur a ni, humhalh loh tlang pang, lei vur emaw lei laih hmai-ah engtikah mah ni lovin; stepped channel pool tin chu a ru thei turin siam tur a ni a, tihfai nan thlen theih a ni tur a ni; vertical drop pakhat mah Clause 9.6.6(c)-a 1.5 m a pel loh tur a ni; leh SD&SM reg. 27-a swale, interceptor drain emaw down-drain chu Bung 2-a design ruahpui tan Bung 6-a freeboard nen size ruat tur a ni a, regulation-a tlem ber aiin engtikah mah tihtê loh tur a ni; (b) chutiang drain chu pipe, drain khuh emaw culvert-a a luh hmunah, Bung 6-in a ruat catchment size leh sediment bulking leh tihtawp factor-te nen (Clause 6.3.6(f)–(h)), inlet luanna chunglamah debris rack (bal dangna), tui luangin bal a chunga a chawi chhoh theih tura kawi, a ding tur a ni a, a bar inkar fim chu lui hnuai (bed)-a lungpui leh bawlhhlawh survey aṭanga thlan leh Clause 9.8.2(a)-a mi aia tlem lo a ni tur a ni, leh rack luanna chunglamah debris basin emaw sediment trap a awm tur a ni; India emaw Mizoram-ah debris basin size ruat dan inkaihhruaina reng reng hmuh a nih loh avangin [TBC], basin tui zat chu hmasa tuilian-a site-a bal leh bawlhhlawh dip leh debris-yield kalphung tarlan aṭangin chhut tur a ni a, catchment-a leimin hnu (slide scar), kawng laih, quarry hmai, lei bal khawlna leh bawlhhlawh paihna tin chu hnar angin chhiar tel tur a ni; a spillway chuan, Clause 9.7.6 ang bawkin, basin bal-in a khat lai pawhin 1% AEP tui lut a kal tlang tir tur a ni a, a tihruaktu machine-te tan ramp a nei tur a ni; (c) lui chunga culvert chuan tih theih chinah barrel pakhat chauh a nei tur a ni (Clause 9.4.8(a)), inlet-ah lungpui do tura deflector nen headwall leh apron tihkhauh (armoured), bed zawh invert (Clause 9.4.8(c)), leh Clause 9.6 hnuaia humhalh outlet, pianphung channel nghet-a hruai, humhalh loh tlang pang-ah engtikah mah ni lovin; State-a leimin thlentu ruahpui hi ni tam tak a rei ṭhin avangin, Clause 2.3.6(e)-a darkar 72 ruahpui pawh a kal tlang tir tur a ni; (d) tlang pang emaw lei vur dangtu retaining wall tin chuan weep hole leh a hnunga subsurface drain (lei hnuai drain) a nei tur a ni, backfill lei zawi dang tura filter nen, drain lined-a luang chhuak, a hnuai lam tlang pang-ah engtikah mah ni lovin, kum tin March ni 31 hmaa endik leh tihfai (Bung 10); SD&SM 2017 hian subsurface drainage "nghetna atana a ngai angin" ("as necessary for stability") (reg. 27) leh "lei vur slope-a nawr ṭha lo thei leihnuai tui, tuikhur ang chi" ("subsurface water, such as springs, which may exert undesirable pressures on the fill slope") thununna (reg. 26) a phut avangin; (e) phah loh tlang pang, tlang kawng, quarry (lung laihna) emaw in sakna hmun aṭanga ruahtui luang (runoff) drain dawngtu lined tin chuan public drain, lui emaw dil a zawm hmain sediment trap a nei tur a ni, leh Chite, Tuikual leh Lawibual lui-a drain outfall tin leh khawtlang hnuaia lui tin chuan solid-waste trap emaw screen a nei tur a ni (Clause 6.3.6(e) leh (m)); leh (f) drain chhuk nasa-a lining chu Table 9.2-a velocity tan chauh ni lovin, a phur gravel leh lungpui hrual (abrasion) tan pawh design tur a ni. Tlang ramah he bung structure reng reng lei-a tui luh tir (exfiltrate) turin sak loh tur a ni: geotechnical certificate-in a phal loh chuan, 10° aia chhuk pianphung lei-ah, slope eng ang pawha Surma-group shale, siltstone emaw mudstone chungah, colluvium, lei vur, lei laih bal emaw leimin bal chungah, map-a lang Moderate, High emaw Very High leimin hlauhawm zone-ah, emaw lei laih pang emaw retaining wall chung lamah a sang zawng let hnih chhungah soakaway, soak pit, exfiltrating chamber, perforated pipe emaw joint hawng drain a awm loh tur a ni, leh High emaw Very High zone-ah chuan engtikah mah (Clause 4.11, tlang dan (hill rule)); chutah chuan pipe, chamber leh channel-te chu tui put chhuak thei lo (watertight) an ni, SD&SM 2017 hian "tlang panga leihnuai tui lut zat tihpun, leh sewerage leh tui luanna chu thunun ṭha lova tlang pangah paih" ("increasing the amount of groundwater penetrating into slopes, and disposing of sewerage and drainage onto slopes in a poorly controlled manner") chu "tlang pang nghet lohna a tipung nasa thei" ("can greatly increase slope instability") mihring thiltih zingah a tarlan avangin (reg. 1). A ṭulzia hi record-in a lantir. Directorate of Geology and Mineral Resources (chanchinbu-ah "Directorate of Geology and Mining") team pakhat chuan 2022-

> 23-ah hmun 55 an endik a, "leimin lian ṭhena thum ṭhena hnih … chu tui luanna ṭha lo avanga thleng a ni" ("two-thirds of large-scale landslides … were due to improper drainage") tih an hmu (chanchin tlangzarh angin). Aizawl-a Laipuitlang–Ramhlun Venglai lungpui tlak (rockslide) chuan, MIRSAC 2011 map-in "Very High" a tih ramah, "ruahpui, khawpui ri nen thlipui" ("heavy rainfall, thunderstorm") hnuah, May ni 11, 2013 (chanchinbu pakhatah May ni 15) zing dar 3 velah in 15 a tichhia a, chu chanchinbu chhiar dan chuan ruang 17 hmuh chhuah leh mi 8 chhanchhuah an ni a, review dang chuan mi 8 thi a ti. May ni 28, 2024-a Cyclone Remal-ah Melthum leh Hlimen inkara lung laihna (quarry), kum sawmthum chhung hman loh tawh nia sawi, a chim a, May ni 29 thlengin Aizawl district-ah mi 29 thi leh 7 hloh nia sawi a ni a, a hnuah quarry-ah 15 leh Hlimen-ah 5 tih a ni (a zavaia chanchin tlangzarh angin). Durtlang BSUP housing complex-ah July ni 2, 2019-ah block 20 zinga pathum a chim a, mi pathum a thi a, IIT-in 2020-a a rawt hmalakna, rock bolt, wire net leh buttressed toe wall, pakhat mah thawh a ni lo (CAG, Report No. 1 of 2025). Aizawl-a Hunthar-a NH-6 chu "ruahpui tam berah a dang ṭhin" ("blocks in most storms") (2018 leh 2024, chanchin tlangzarh angin), chuvangin PWD emaw national-highway agency-te kawng drain emaw culvert chu humhalh loh tlang pang-ah engtikah mah a luang chhuak lo (Clause 6.3.6(k)). He bung structure reng reng hi debris flow emaw leimin kal tlang tir turin design a ni lo: map-a lang leimin hlauhawm zone, 60° aia chhuk tlang pang, quarry hmai, Hunthar Veng hmun lut zawlh (sinking area), lei laih pang, lei vur emaw retaining wall hnuaia drain reng rengah, emaw Tuirial dam hnuaia tui chhuah tir lui chhung (release reach)-ah, Clause 2.3.6(i)-a thlitfimna (screening) a hmasa ber a, structure chu hlauhawmna pawnah dah a ni. Drain-te hian bawlhhlawh leh ek tui an phur bawk avangin, screen hi gate ang bawkin a pawimawh: State hian ek tui (sewage) 51.81 MLD a siam a, tihfaina theihna chu "Aizawl khawpui tan chauh" ("only for Aizawl city") 10 MLD a ni (O.A. No. 606 of 2018-a National Green Tribunal hnena State report, August ni 31, 2025 dinhmun), CPCB chuan Chite leh Tuikual lui chu a polluted river stretch (lui chhung bawlhhlawh) Priority II-ah a dah (2025), leh master plan chuan Aizawl W-I area ṭhena thum ṭhena khata tui tlin chu kawng sir drain-a bawlhhlawh khal (solid waste) avangin a puh a, chuvangin khawtlang hnuaia lui chunga rack chu Clause 9.8.4-a tihtawp dinhmunah endik a ni. Mizoram khawpui reng reng drain chunga flap gate, debris rack, sediment trap, check dam leh pumping station, an theihna leh hman dan nen, inventory (tarlanna) reng reng, Tuirial emaw Serlui B dam gate-te hman dan an hnuaia lui chhung nena inzawm reng reng, leh outfall reng reng-a design luipui, reservoir, dil emaw lui level reng reng mipui hmuh theihah hmuh a ni lo. Clause 9.10.3 leh 9.10.5 hi he Kaihhruaina Bu-in a ruat a ni, flap gate emaw penstock hna thawk lo, emaw leidip, gravel, lungpui, leimin bal emaw bawlhhlawh-in a hawng tlat chuan luipui tuilian chu phai drain network-ah a kir lut tir a, a hup tlat chuan a dang tlat avangin. Mizoram lui leh drain-te hian leidip bakah leimin bal leh bawlhhlawh an phur: Master Plan for Aizawl: Vision 2030 chuan drain-te chu "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") tih a hmu a, Aizawl W-I area ṭhena thum ṭhena khata tui tlin chu kawng sir drain-a bawlhhlawh khal avangin a puh a, chu drain ngei hian Aizawl catchment pakhat chauhin sewer a neihna khawpui-te in chhunga tui bal (sullage) an phur (Bung 8, Clause 8.9), chuvangin gate, a screen leh a chunga debris rack chuan load inang an tuar a, a ṭhuin tihfai reng ngei ngei tur a ni; leh Tuirial emaw Serlui B dam tui chhuah tir chu an hnuaia lui chhung tana hriattirna (warning) nena inzawmtu dan reng reng hmuh a nih loh avangin [TBC], chutiang lui chhung-a outfall chunga gate chu tuilian pum chhung hlauhawmnaah awm angin ngaih ngei ngei tur a ni.

9.11 Inlet leh grating

9.11.1 **Hydraulics.** Inlet theihna, inkar leh clogging (bal avanga tihtawp) chuan Bung 6, Clause 6.6 a zawm tur a ni.

9.11.2 **Load class.** Grating, khuh (cover) leh frame-te chu an awmna hmuna motor kal tan rate tur a ni. Load class chu IS 1726 (cast iron manhole cover leh frame) emaw EN 124 (gully top leh manhole top) mi a ni tur a ni, a tlem berah:

- (a) carriageway (motor kalna kawng) leh median: EN 124 class D400 emaw a inang heavy-duty IS class;
- (b) kerb (kawng kam dai) aṭanga 0.5 m chhunga kerb-side channel inlet: class C250 emaw a inang; leh
- (c) kekawng (footpath) leh cycle track: class B125 emaw a inang.

9.11.3 **Grate pianphung.**

- (a) Carriageway, cycle track leh kekawng-a grate-te chuan kal lam (direction of travel) nena parallel kua 25 mm aia zau a nei loh tur a ni.
- (b) Theihna data enchhin nei lo grate chi-te chu Bung 6-a clogging factor nen FHWA HEC-22 (2024)-a weir leh orifice kalphung hmangin rate tur a ni.

9.11.4 **Kerb kua.** Kerb-opening inlet-te chuan kua sang zawng fim 100 mm tal leh sei zawng 1.0 m tal a nei tur a ni. Kerb inlet chu drain khuh bang kal tlangin a luang chhuak chuan (Bung 6, Clause 6.13.1), kua chu kawng level-ah a awm tur a ni.

9.11.5 **Himna.** Public ram-a grating leh khuh-te chu hmanrua (tool) hmang lova lak chhuah theih loh turin an frame-ah hinge emaw lock tur a ni.

9.11.6 **Inlet chamber.** Inlet chamber-te chuan Bung 6, Clause 6.6.7-a silt sump (leidip dawnna khur) a nei tur a ni a, sump chu suction emaw grab machine-in tihruak theih turin size ruat tur a ni.

> **Hrilhfiahna.** NDMA (2010, §4.13) chuan drainage inlet tana cast-iron grating atan IS 5961 a kawhhmuh. Load class-te hi khawvel pum huapa hman EN 124 class-ah a innghat. Parallel kua tana 25 mm tehna hi cycle khalhtu leh ke-a kal himna atan ruat a ni. APWA 5600 (2006, 5604.2) chuan kerb kua chu 4 ft (1.2 m vel) tal sei leh 6 in (150 mm vel) tal sang fim a phut. Clause 9.11.4 hian Mizoram khawpui-a kawng zim zawk leh kerb hniam zawk tam tak tan remchang tlem ber tê zawk a ruat.

9.12 Manhole, junction chamber leh luhna kawng

9.12.1 **Awmna leh inkar.** Manhole-te chu Bung 6, Clause 6.7.11 leh Table 6.8-a hmun leh inkar-ah siam tur a ni. Pipe-te chu manhole pangngai tan an lian lutuk chuan, lei chung thlenga riser nei junction chamber hman tur a ni (CPHEEO 2019, §11.3.7.3).

9.12.2 **Chhung size tlem ber.** Manhole-te chuan Table 9.4-a chhung lenzawng tal an nei tur a ni (CPHEEO 2019, §11.3.7.6):

Table 9.4 — Manhole chhung size tlem ber

Pianphung leh thuk zawng	Chhung size tlem ber
Rectangular, thuk zawng 0.9 m aia tlem	900 mm × 800 mm
Rectangular, thuk zawng 0.9–2.5 m	1,200 mm × 900 mm
Kual (circular), thuk zawng 0.9 m aia thuk leh 1.65 m thleng	900 mm diameter
Kual, thuk zawng 1.65 m aia thuk leh 2.30 m thleng	1,200 mm diameter
Kual, thuk zawng 2.30 m aia thuk leh 6.0 m thleng	1,500 mm diameter
Kual, thuk zawng 6.0 m aia thuk leh 9.0 m thleng	1,800 mm diameter

Manhole chu pipe inzawm lian ber leh a sir tin-a benching dah theih khawpin a lian bawk tur a ni.

9.12.3 **Luhna kua.** Public drain-a manhole leh access chamber luhna kua fim chu tihfaina hmanrua thlak thlak theih nan 600 mm tal a ni tur a ni.

9.12.4 **Drop.** Lut leh chhuak invert danglamna chu 0.6 m aia a tam chuan, drop connection siam tur a ni. 0.6 m hnuaiah chuan, danglamna chu pipe lut slope emaw benching siam rem hmangin lak tur a ni (CPHEEO 2019, §11.3.7.5). Pipe size a danglamna manhole kal tlanga invert drop chu diameter danglamna ṭhen hetiang hi tal a ni tur a ni (CPHEEO 2019, Table 11.6):

- conduit 400 mm aia tê: chanve;
- 400 mm aṭanga 900 mm thleng: ṭhena thum ṭhena hnih;
- 900 mm aia lian: ṭhena nga ṭhena li.

9.12.5 **Benching.** Manhole chhuat chu pipe chhuak crown thleng tal bench tur a ni a, pipe lut tin aṭanga tui luang hruai tura channel siam nen.

9.12.6 **Surcharge.** 1% AEP HGL chu khuh aia a sang thei main-a manhole-te (Bung 6, Clause 6.8.4) chuan chu nawrna tana design bolt, lock emaw hinge nei khuh a nei tur a ni.

9.12.7 **Machine hmanga tihfai.** Manhole, chamber leh drain khuh-te chu lei chung aṭanga machine (suction, jetting, grab emaw robotic hmanrua) hmanga tihfai tur angin design tur a ni. Ladder nghet a awm chuan, thir ei do thei, encapsulated thil a ni tur a ni.

> **Hrilhfiahna.** Size leh drop mamawh-te hi CPHEEO (2019) Chapter 11 aṭanga lak a ni. Luhna kua 600 mm, benching dan leh khuh bolt nei-te hi he Kaihhruaina Bu-in a ruat a ni. Machine hmanga tihfai tura design hian *The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013* hnuaia kut hmanga tihfai hlauhawm khapna a ṭanpui.

9.13 Siamna thil leh durability

9.13.1 **Exposure class.** Concrete structure-te chu IS 456: 2000, Table 3-a exposure class tan design tur a ni. Site zirchianna-in dinhmun nasa zawk a lantir loh chuan Mizoram-ah Table 9.5-a class tlem ber-te an huam:

Table 9.5 — Mizoram hmun tana IS 456 exposure class tlem ber

Hmun	IS 456 exposure class tlem ber
Ram chhung drain leh structure	Moderate
Coastal environment-a drain leh structure, leh ek tui chawhpawlh tui phur emaw phur thei drain reng reng	Severe
Tuifinriat tui chiah (spray) tuar, emaw tui al emaw aggressive leihnuai tui nena inhmet structure	Very severe
Tidal zone-a structure	Extreme

9.13.2 **Concrete.** Concrete grade tlem ber, water–cement ratio sang ber, cement content tlem ber leh reinforcement nominal cover chu exposure class tana IS 456-a mi a ni tur a ni. Chhiartu remchan nan, IS 456 hian reinforced-concrete grade tlem ber chu M25 (moderate), M30 (severe), M35 (very severe) leh M40 (extreme), leh nominal cover chu a indawt zelin 30, 45, 50 leh 75 mm-ah a ruat.

9.13.3 **Lei aggressive.** Coastal leh delta hmuna structure tin-a leihnuai tui leh lei chu chloride leh sulphate tan enchhin tur a ni. Cement chi leh concrete mix chu IS 456 hnuaia result azirin thlan tur a ni.

9.13.4 **Ek tui chawhpawlh tui luang.** Ek tui (sewage) chawhpawlh tui phur emaw phur thei pipe leh drain khuh-te chu sulphide (crown) corrosion laka humhalh tur a ni, sacrificial concrete chah zawng, thir ei do thei lining emaw concrete ni lo pipe thil hmangin.

9.13.5 **Pipe.** Concrete pipe-te chuan IS 458 a zawm tur a ni, class chu structural design-in thlan. Pipe thil dang (entirnan ductile iron, HDPE emaw structured-wall plastic pipe) chuan Indian Standard hman tlak a zawm tur a ni a, approving authority phalna a nei tur a ni.

9.13.6 **Thir hnathawh (metalwork).** Tuifinriat kam aṭanga 5 km chhungah, leh tidal leh tui al hmun zawng zawngah:

- (a) fixing, hinge, ladder, handrail leh screen frame-te chu stainless steel grade 316, emaw protective coating nei hot-dip galvanised steel, emaw metal ni lo thil an ni tur a ni; leh
- (b) metal chi danglam-te chu an inkar hran (isolate) tur a ni.

9.13.7 **Lung hnathawh (masonry).** Tier A body-a public drain thar-te chu reinforced emaw plain concrete-a siam tur a ni. Tier B body-a drain tan chauh brick emaw lung masonry hman phal a ni, tui khawih hmai chu plaster a nih a, Table 6.6-a n value a phak chuan.

> Hrilhfiahna. IS 456 exposure class leh grade leh cover value-te hi remchan nan IS 456: 2000 (Table 3, 5 leh 16) aṭanga lak a ni. Standard hian a thunun a, designer-te chuan a amendment tuna mi an hmang tur a ni. Mizoram hmun-te exposure class-a ṭhen, sulphide-corrosion mamawh leh Tier A body-a masonry drain thar khap-te hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Ek tui cross-connection dawng drain-te (dinhmun pangngai, Bung 8) hian hydrogen sulphide an siam a, chu chuan tui chung lama concrete humhalh loh a ei ṭhin.

9.14 Thehluh tur mamawh

Structure design tin chu **Hydraulic Structure Report** (Form 9-1) nen thehluh tur a ni, a huam ang zelin heng hi a chhungah a awm tur a ni:

1. culvert chhutna (HDS-5 emaw HY-8 output) HWi, HWo, outlet velocity, tailwater, kawng chunga tui kal leh tihtawp endikna nen;
2. channel tui chung profile, velocity, Froude number leh freeboard;
3. outlet humhalhna leh dissipator design, riprap size ruatna nen;
4. detention outlet stage–discharge table leh emergency spillway endikna;
5. 50% tihtawp endikna nen screen leh rack design;
6. pump station design report: inflow hydrograph, khawlna, pump curve leh system curve, wet-well tui zat, control, power supply leh Bung 5 outfall khar endikna;
7. head-loss data nen gate leh valve thlan;
8. inlet, grate leh khuh load class; leh
9. exposure class leh siamna thil statement (Clause 9.13).

Thu hnar (bung)

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Belhchian leh Form

Belhchian / Form	A chhunga thu
9A	HDS-5 inlet-control coefficient leh SI units-a culvert entirna chhutna
9B	Standard drawing: headwall, riprap apron, drop structure, trash rack, detention riser
9C	Pump station design checklist leh control philosophy pangngai

Belhchian / Form	A chhunga thu
Form 9-1	Hydraulic Structure Report checklist

BUNG 10

Thehluh tur, Endikna, Kalpui leh Enkawl, leh Dan Zawm Tirna

10.1 Tum leh a huam chin

10.1.1 He bung hian he Kaihhruaina Bu dan zawm (compliance) chu engtin nge lantir, endik, sak, hna thawk zel tir leh zawm tir (enforce) a nih tur tih a sawi. A huamte chu:

- (a) thehluh tur (submittal) stage-te leh a chhunga thu awm tur (Clause 10.3–10.4);
- (b) compliance calculator (dan zawm endikna chhutna) (Clause 10.5);
- (c) professional certification (thiamna nei mi nemnghehna) leh endikna (Clause 10.6–10.7);
- (d) sakna hna endikna leh as-built (siam zawh hnua a awm dan) certification (Clause 10.8–10.9);
- (e) enkawlna puanchhuahna (maintenance declaration), O&M plan (kalpui leh enkawl plan), endikna leh kalna kawng (access) (Clause 10.10–10.13);
- (f) public asset hlan (Clause 10.14);
- (g) dan zawm tirna (enforcement) (Clause 10.15); leh
- (h) enfiahna (monitoring), thil thleng hnua endikna leh data tlangzarh (Clause 10.16–10.17).

10.1.2 He bung hi Clause 1.5.2 hnuaia Bung 4 leh 5 huam development (hmasawnna hna) leh public work zawng zawngah a huam. Clause 10.3.1 (Stage 0), 10.15 leh 10.17 hi Clause 1.5.4 chauh huam development-ah pawh a huam.

Hrilhfiahna. Phalna pek hunah endik loh, phalna pek anga sak loh, a hnua enkawl loh criterion chuan nghawng a nei lo. Mizoram-ah chhiatna chu criteria awm loh leh khawpui pakhat chauh thleng phalna pek system a ni. Khawpui reng reng ruahtui luanna drain (tui luanna) tan design return period (kum engzat zelah nge a lo thlen ṭhin), intensity emaw runoff coefficient sawina UD&PA, Aizawl Municipal Corporation, Lunglei Municipal Council, PWD, PHED emaw IWRD thuziak reng reng hmuh a ni lo, leh Master Plan for Aizawl: Vision 2030 chuan Aizawl Urban Area 67%-ah kutcha drain a awm a, 18%-ah drain a awm lo a, 15%-ah pucca drain a awm tih a hmu. Phalna pek kawng hian he bung a siam. AMCBR leh SD&SM chu Corporation ram chhungah chauh an huam (AMCBR reg. 1(2)). Building permit chu Corporation online building permission system, OBPAS, June 2018 aṭanga hman mek leh 2023 amendment-in kawng tur atana a siam, hmangin dil a ni a, chu chuan regulation leh master plan anga awm lo proposal reng reng chu "a tir kir tur a ni" ("shall return"); Local Council no-objection certificate chu dilna nen a kal (AMCBR reg. 4–5; SD&SM Form 1). AMCBR hian drainage thehluh tur mamawh tam tak a phut tawh: "sewerage leh leilung chung drain, septic tank leh soak pit awmna leh a lian zawng" ("sewerage and surface drains, position and sizes of septic tank and soak pit") lantirtu site plan (reg. 5(5)(v)), "tui luanna leh inchung pang lantir" ("indicating drainage and roof slope") roof plan (reg. 5(6)(iv)), "site development leh structure nghet, retaining wall, leilung chung drain ang chi" ("site development and permanent structures like retaining wall, surface drain") (reg. 5(6)(viii)), ruahtui khawl khawm (rainwater harvesting) facility (reg. 5(6)(ix) leh 33), kawngah emaw vengte compound-ah emaw spout nei lova "lei chunga pipe hmanga" ("at ground level by pipe") tui luan chhuah tir in chung (reg. 26(2)(b)), leh "vantlang drain hnai ber thlenga a tawk drain" ("of adequate capacity to the nearest public drain") lei chung drain emaw closed conduit emaw (reg. 37(ii)). SD&SM 2017 chuan "building permit bakah" ("in addition to a building permit") site development permit a belh (reg. 5(1)), kawng pahnihin: regular site development, Form 1-ah site plan, lei laih leh lei vur zat, title leh Local Council no-objection certificate nen, "Low leimin hlauhawm zone-ah CHAUH phal" ("allowed ONLY in zones of Low landslide hazard"); leh

engineered site development, map-a lang Moderate, High leh Very High leimin hlauhawm zone-ah, map-a lang lo 24° emaw a aia nasa zawk tlang pangah, 3 m emaw a aia thuk lei laihah, 200 m³ aia tam hnaah leh structure dawmtu hnaah mamawh, geotechnical report, "lei chung leh leihnuai drainage device zawng zawng plan kimchang" ("Detailed plans of all surface and subsurface drainage devices"), "drain reng reng-in a enkawl area drainage area leh a ruahtui luang ngaihtuah zat lantirna map" ("A map showing the drainage area and the estimated runoff of the area served by any drains") leh "tui luanna plan, site grade zawh hnua floor sanzawng nen" ("A drainage plan, including elevations of floors with respect to finish site grade") nen (reg. 6); a Schedule I chuan licence nei civil engineer-te chu "hydrology leh hydraulic chhutna tiamin, drainage structure design" ("Design of drainage structures, including hydrology and hydraulic calculations") tan thiamna nei angin a ruat. 2025 amendment aṭang khan, building pangngai "plot 93 square meter aia tê, geo-hazard zone hniam leh moderate chhunga awm" ("on plots measuring less than 93 square meters and located within low and moderate geo-hazard zones") chu empanel (thiamna list-a dah luh) technical personnel-in an self-certify thei a, "Aizawl Landslide Hazard Map" ("the Aizawl Landslide Hazard Map") zawm a nihna puanchhuahna nen (Annexure B-I leh form C-IV), leh Occupancy Certificate chu hna ni 7 chhunga endikna hnuah a chhuak. Private drain chu Chairman phalna ziakin chauh municipal drain-ah zawm theih a ni (Mizoram Municipalities Act, 2007, s.295), leh remtihna ziak lovin drain reng reng municipal drain emaw water-course reng rengah luan lut tir theih a ni lo (s.296). Corporation ram pawn lamah building regulation reng reng hmuh a ni lo: Lunglei Municipal Council tan pakhat mah hmuh a ni lo [TBC]; Village Council-te chuan District Disaster Management Authority phalna nen in sakna atana hmun him lo an puangchhuak thei a, State-in a siam hunah model building bye-laws an zawm tir tur a ni (Mizoram (Village Councils) Act, 2025, s.13(6); hmuh a ni lo); WARDMA chuan Autonomous District Council-te pawn lamah ruahtui khawl khawm a thupek thei (Mizoram Water Resources (Management and Regulation) Act, 2024, s.16(2)(ix)); Mizoram River Protection Authority chuan River Conservation Zone chhunga hna chu Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, hman mek a nih a, zone notify (Gazette-a tarlan) a nih chauhin phalna a pe ang (pahnih mah finfiah a ni lo); leh Lai, Mara leh Chakma Autonomous District Council-te-ah building emaw drainage dan thuziak reng reng hmuh a ni lo, Kamalanagar Town Planning Committee no-objection certificate leh kawng sir in sak chungchanga Chakma District Council notice, an hming aṭanga hriat, bak chu (chanchin tlangzarh angin). Dan reng rengin drainage report a phut lo, ruahtui luang sang ber a khap lo, site chhunga detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) a phut lo, design ruahpui a ruat hek lo. Chuvangin he bunga ruahtui item tin hi record-a licence nei civil engineer-in Form 1-1, 2-1, 10-2 leh 10-3-ah a certify theih tur leh, Corporation-in he Kaihhruaina Bu hi a pawm chuan, AMCBR leh SD&SM-in OBPAS hmanga an phut tawh drawing-te hmangin a endik theih turin ziah a ni: Table 10.1-a Stage 1 leh Stage 2 thehluh tur chu building permit leh, mamawh a nih chuan, engineered site development permit nen a kal a, chu permit runoff map leh drainage plan chu he bung drainage report kaihna a ni a, regular-track Form 1 chu drainage plan tihawlsam kaihna a ni; self-certify 93 m² aia tlem plot chuan in chunga khawlna, public drain-a inzawmna leh Clause 4.11 tlang dan (hill rule) huam, empanel technical person-in hming a ziahna, drainage puanchhuahna tihawlsam a keng; Stage 4 chu Occupancy Certificate endikna nen a kal; leh drain inzawmna chu s.295 leh 296 phalna nen a kal. He bung hi hna kalpui dan a ni.

10.2 Thumal awmzia

Thumal	He bung-a a awmzia
Thehluh tur (submittal)	Clause 10.3 stage pakhatah Authority hnena thehluh thuziak bawm khat.
Drainage report	Clause 10.4-in a phut report hmasa (Stage 1) emaw a tawp (Stage 2) emaw.
Ruahtui facility	He Kaihhruaina Bu-in a phut retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw), detention, tui ṭhatna, tui luan tirna (conveyance), pump, gate emaw outfall (drain tui luan chhuahna) element reng reng, public emaw private emaw.
Hold point	Authority emaw certify-tu professional-in a endik hma loh chuan hna chhunzawm loh tur sakna stage (Clause 10.8).

Thumal	He bung-a a awmzia
As-built certificate	Facility chu phalna pek angin sak a ni a, design angin hna a thawk tih Clause 10.9 certificate.
Neitu (owner)	Enkawlna puanchhuahna hnuaia facility mawhphurtu mi emaw pawl emaw, emaw asset hlan a nih chuan ULB.
O&M plan	Clause 10.11 kalpui leh enkawlna plan.
Facility register	Clause 10.17 facility-te public register.

Thumal dangte awmzia chu Clause 1.4-ah a awm.

10.3 Thehluh tur stage-te

10.3.1 Thehluh tur chu Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 phalna step-te nena inzawmin, heng stage-ah hian thehluh tur a ni (Table 10.1):

Table 10.1 — Thehluh tur stage-te leh inzawm phalna

Stage	Thehluh tur	Engtik	Inzawm phalna
0	**Dilna hma** meeting leh **Form 1-1** (A Huam leh Huam Loh Thutlukna)	Planning permission emaw layout dilna hmain	Awm lo (thurawn record)
1	**Drainage report hmasa**	Planning permission emaw layout dilna nen	Planning permission / layout phalna
2	**Drainage design tawp**	Building permit hmain, emaw permit chu planning permission nena pek a nih chuan hna ṭan hmain	Building permit / hna ṭanna
3	Hold point-a **sakna hna endikna**	Sak lai	Awm lo (record dah)
4	**As-built certificate** leh finfiahna test	Completion certificate hmain	Completion / occupancy certificate
5	**Enkawlna puanchhuahna** register, emaw public asset **hlan**	Completion certificate hmain emaw a nen	Completion certificate; asset lo pawmna
6	**Kumtin puanchhuahna** leh endikna report	Zawh hnu kum tin	Dan zawm zelna

10.3.2 **Stage 0 hi a ngei ngei tur a ni**:

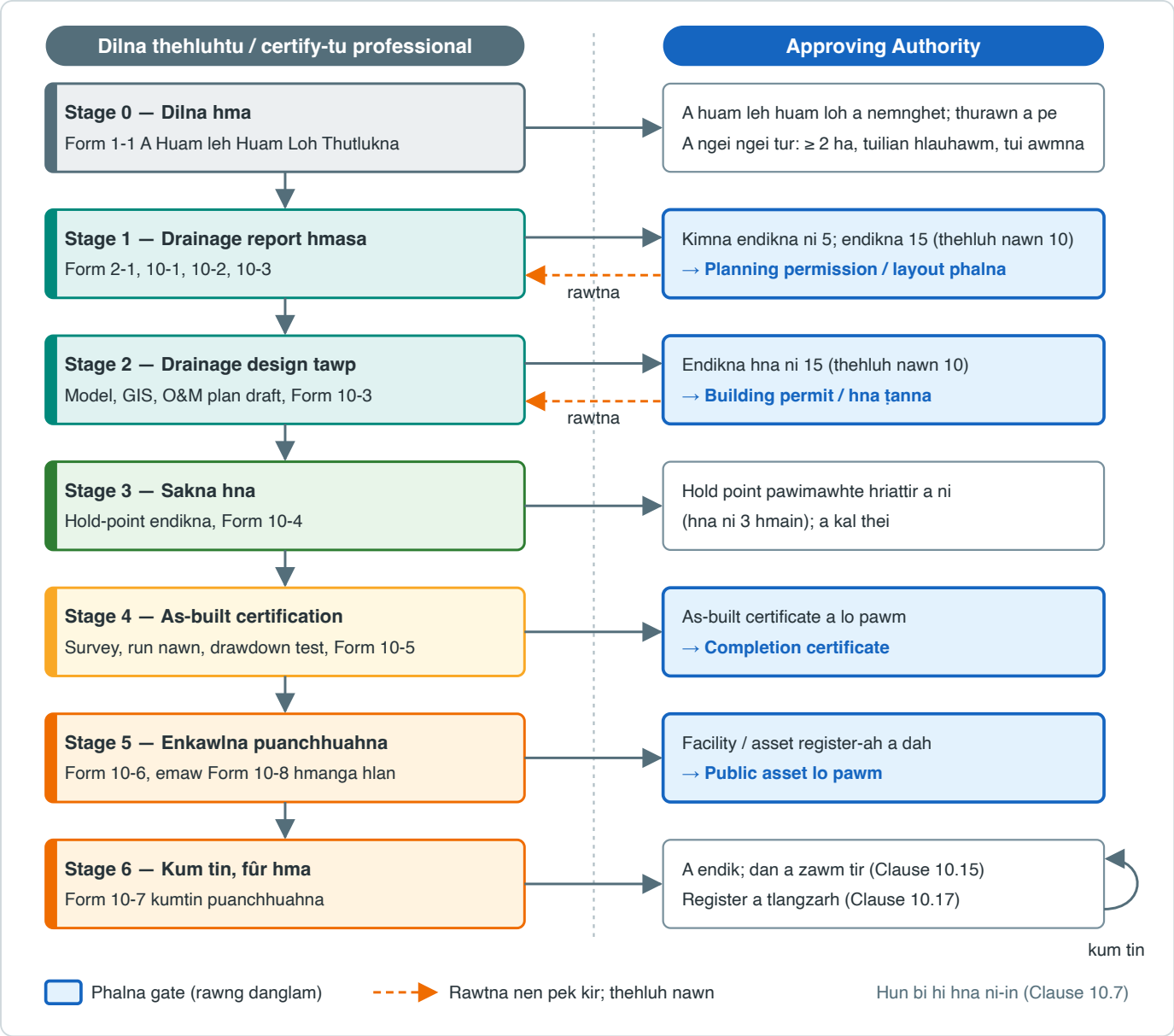
- (a) 2 ha emaw a aia lian site;
- (b) tuilian hlauhawm catchment (ruahtui luan khawmna hmun; flood-sensitive) chhunga site;
- (c) variance, waiver, regional facility emaw fee-in-lieu rawttu site; leh
- (d) tidal outfall (tuifinriat thlen theih loh, Mizoram-ah a awm lo)-a tui luang emaw tui awmna (waterbody) bula awm site.

Site dangte tan chuan Stage 0 hi duh thlan a ni a, Form 1-1 chu Stage 1 nen thehluh a ni.

10.3.3 **Stage inzawm khawm.** Tuilian hlauhawm catchment pawna 1 ha aia tlem site-te tan, Authority-in Stage 1 leh 2 chu thehluh tur pakhat angin a lo pawm thei.

10.3.4 **Public work.** Public work tan, Stage 1 chu DPR drainage section a ni a, Stage 2 chu tender drawing drainage section a ni. Sanction-tu authority chuan Clause 10.7 hnuaia stage inzawm chu endik a nih hma loh chuan hna chu a sanction loh tur a ni a, tender a chhuah loh tur a ni.

10.3.5 **Phalna hnua thlak danglamna.** Stage 2 hnua tui luh theih lohna hmun (impervious), level, khawlna, outlet (luan chhuahna) emaw outfall tidanglamtu thlak danglamna reng reng chu, sak a nih hmain, compliance calculator chhut nawn nen thehluh nawn tur a ni.



Milem 10.1 — Thehluh tur, endikna leh phalna kalphung (Clause 10.3–10.10). He Kaihhruaina Bu tana milem siam thar.

Hrilhfiahna. Stage-te hian APWA 5600-a ruahtui zirchianna hmasa leh tawp, sakna hna endikna leh enkawlna inremna indawt dan (APWA 5600, 2006, §5608 leh §5609) an zawm a, Mizoram applicant (dilna thehluhtu)-in a zawm tawh AMCBR/SD&SM step-te-ah dah a ni. Stage 4 chu completion certificate nena inzawm tir hi MBBL 2016 RWH model, completion certificate hmaa endikna phuttu (MBBL 2016, §9.6) entawn a ni. Clause 10.3.2 leh 10.3.3-a 2 ha leh 1 ha tehna hian a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni.

10.4 A chhunga awm tur leh checklist-te

10.4.1 **Drainage report hmasa (Stage 1).** Report-ah hian a tlem berah heng hi a awm tur a ni:

- (a) Form 1-1 leh, a hman theih chuan, Form 1-2 (Variance / Waiver Dilna);
- (b) level awm mek leh rawt, tui luh theih lohna hmun, leh site-a luang lut leh luang tlang catchment ri lantirna site plan;
- (c) lei (HSG), hun bik-a leihnuai tui sang ber (seasonal high groundwater table), leh infiltration (lei-a tui luh) test result emaw test plan emaw (Bung 3);
- (d) Clause 2.13-in a phut anga tihkim **Design Ruahtui Tlak Sheet (Form 2-1)**;
- (e) pre-development (hmasawnna hma lam) dinhmun leh hydrologic kalphung (Bung 3);
- (f) Clause 1.2 indawt dan hman dan: area humhalh, retention kalphung, detention ngaihdan leh tui luan tirna;
- (g) compliance calculator (Clause 10.5) aṭanga retention, tui ṭhatna leh detention tui zat (volume) hmasa leh luan chhuah tir zat (release rate);
- (h) luanna hnuailam (downstream) huam chin leh tailwater (outfall hnuailama tui sang zawng) dinhmun (Bung 5);
- (i) tui awmnate, setback (tui kam aṭanga hmun kalhlen tur) leh 1% AEP level (Bung 6 leh 7); leh
- (j) facility leh enkawlna kalna kawng atana ram dah hran (Clause 10.13).

10.4.2 **Drainage design tawp (Stage 2).** Design tawp-ah hian Stage 1-a thu awm siam thar bakah, heng hi a awm tur a ni:

- (a) Clause 2.5.2-a khawlna duration tin leh Bung 4-in a phut AEP tin tan chhutna tawp, Bung 5-a outfall khar endikna tiamin;
- (b) facility tin tan stage–storage–discharge table, leh emergency spillway design (Bung 4);
- (c) tui luan tirna element, inlet (luan lutna) leh structure-te hydraulic design (Bung 6 leh 9);
- (d) tui ṭhatna design leh mamawh a nih chuan first-flush (ruah tlak hmasa ber tui bal) emaw gross pollutant trap (Bung 8);
- (e) facility tin sakna drawing, a kimchang leh specification;
- (f) sakna indawt dan, retention leh infiltration area-te bal (sediment) leh lei tihkhauh (compaction) laka humhalhna tiamin (Clause 10.8.3);
- (g) hold-point schedule (Clause 10.8);
- (h) O&M plan draft (Clause 10.11) leh enkawlna puanchhuahna draft (Clause 10.10);
- (i) model input file-te leh Clause 10.4.4 GIS data; leh
- (j) Clause 10.6 certificate-te.

10.4.3 **Checklist.** Thehluh tur tin hian **Drainage Report Checklist (Form 10-1)** a keng tur a ni a, Clause 10.4.1–10.4.2 item tin a sawina phêk emaw sheet emaw, emaw a huam loh chhan a lantir tur a ni. Form 10-1 tihkim lo nen chuan Authority-in thehluh tur technical endikna a ṭan loh tur a ni.

10.4.4 **Digital thehluh tur.**

- (a) Report leh drawing-te chu zawn theih PDF angin thehluh tur a ni.
- (b) Hydrologic leh hydraulic model-te chu an format ngei, tlan theih (entirnan SWMM .inp, HEC-HMS emaw HEC-RAS project file) angin, software version hman nen thehluh tur a ni.
- (c) Facility, outfall, tui luan kawng (flow path) leh catchment ri-te chu GIS data (GeoPackage emaw shapefile) angin WGS 84 (EPSG:4326)-ah emaw UTM zone hman tur (State pum tan 46N, 21°58'–24°35' N leh 92°15'–93°29' E chhunga awm (Lallawmzuali and Muniyan, 2024), zone 46N (90°–96° E) chhungah, chuvangin project reng reng hian zone dang a mamawh lo (he Kaihhruaina Bu chhiar dan)) emaw-ah, Belhchian 10B-a tarlan attribute-te nen thehluh tur a ni.
- (d) Level-te chu vertical datum hming nei nena khaikhinin sawi tur a ni. Tui dawngtu luipui-te CWC level-monitoring site-te river datum (thu hnar hmuh reng rengin a sawi lo), NEEPCO-in metre-a a tlangzarh Tuirial dam reservoir level (datum sawi lo) leh Serlui B level (hmuh a ni lo), leh Bung 5-a hman gauge nei lo lui, luipui leh dil-a tuilian chhinchhiahna (flood mark) survey-te nena an inzawmna chu sawi tur a ni.

10.4.5 **Thehluh turah form hmante tlangpui** (Table 10.2):

Table 10.2 — Thehluh turah form hmante

Form	Thupui	Stage
1-1	A Huam leh Huam Loh Thutlukna	0 emaw 1
1-2	Variance / Waiver Dilna	1
2-1	Design Ruahtui Tlak Sheet	1, 2
10-1	Drainage Report Checklist	1, 2
10-2	Compliance Calculator Tlangpui	1, 2, 4
10-3	Professional Design Certificate	1, 2
10-4	Hold-Point Endikna Record	3
10-5	As-built Certificate	4
10-6	Enkawlna Puanchhuahna (Maintenance Declaration)	5
10-7	Kumtin Enkawlna Puanchhuahna leh Endikna Report	6
10-8	Asset Hlanna Certificate	5

Hrilhfiahna. Tlan theih model leh GIS data hian applicant tan senso tam a ngai lo a, Authority chu hna endik thei turin a siam a, a hnuah khawpui pum private khawlna dinhmun hmuh theihna a siam. Mizoram-ah khawpui drain tan design return period emaw design ruahpui notify a awm lo, leh return period, runoff coefficient, intensity–duration–frequency inzawmna emaw time of concentration dan sawina UD&PA, Aizawl Municipal Corporation, Lunglei Municipal Council, PWD, PHED, IWRD emaw Aizawl Smart City Ltd thuziak reng reng hmuh a ni lo. ADB North Eastern Region Capital Cities Development Investment Program Aizawl tranche tana thuziak hmuhte chuan tui pek leh sewerage an huam a, storm drainage an huam lo (a tlangpui angin), leh Aizawl Smart City Ltd storm-drain project reng reng hmuh a ni lo. Building regulation-te chuan National Building Code (2005, 2019 amendment aṭang khan "hun hun-a siam ṭhat angin" ("as amended from time to time")) leh, leimin hlauhawmna tan, IS 14458 leh IS 14496 (Part 2) an kawhhmuh (AMCBR Annexure F). SD&SM 2017 chuan terrace swale, interceptor drain (cut chung lama ruahtui dangtu drain), down-drain (tlang pang zawh chhuk drain) leh building-pad gradient geometry a ruat a (reg. 27), engineered dilna hnenah "drain reng reng-in a enkawl area drainage area leh a ruahtui luang ngaihtuah zat lantirna map" ("A map showing the drainage area and the estimated runoff of the area served by any drains") a phut a (reg. 6), mahse design ruahpui, return period emaw runoff coefficient a ruat lo; "hydrology leh hydraulic chhutna" ("hydrology and hydraulic calculations") chu licence nei civil engineer-te kutah a dah (Schedule I). Master plan chuan Aizawl drain-te chu "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design") tih a hmu a, Aizawl Urban Area 67%-ah kutcha drain, 18%-ah drain awm lo leh 15% chauhah pucca drain a awm. Kawng drain-te chuan IRC:SP:42-2014 leh IRC:SP:48 an zawm. Ruahtui tlak zirchianna-te pawhin design ruahpui an pe lo. IMD *Extremes* (2012 thleng data)-ah Mizoram station a awm lo, chuvangin khawpui reng reng tan darkar 24 record official a awm lo; peer-review frequency zirchianna awmchhun (Lallawmzuali and Muniyan, *MAUSAM*, 2024) chuan thla tin leh kum tin ruahtui tlak zat chauh a fit; IMD ram pum zirchianna (Das et al., 2022) chuan Mizoram panel a nei lo; leh State pum hi CWC subzone 2(c)-ah a awm a, chu tan chuan CWC-in Flood Estimation Report a tlangzarh lo. Ni khata ruahtui tlak nasa ber hriat chu chanchinbu value a ni: Aizawl-ah ni khatah 148 mm, June ni 12, 2018 a ni maithei (report ni chu he Kaihhruaina Bu chhiar dan), leh October 2025-ah Chawngte-ah 130 mm (pahnih hi chanchin tlangzarh angin). Chuvangin State design value-te chu Bung 2-a mi a ni: sub-area tinah NIH-DHAARA, Clause 2.3.6(c)(i)-a State pum hniam ber, sub-area MZ-A leh MZ-A1-ah Clause 2.3.6(c)(ii)-a Barak-phai hniam ber, Clause 2.3.6(e)-a darkar 72 factor leh Clause 2.3.6(f)-a ratio rih (interim ratio), leh thehluh tin hian a design innghahna a sawi ngei ngei tur a ni. Form 2-1 leh Form 10-2 hian design tin-in a input a sawi tih an tichiang.

10.5 Compliance calculator

10.5.1 State Stormwater Technical Committee chuan **compliance calculator** a chhuah tur a ni a, a enkawl tur a ni: site pakhat tan heng hi titu version-control spreadsheet emaw web tool:

- (a) Clause 1.5 applicability test (a huam leh huam loh test) a hmang;
- (b) Belhchian 2E thuk zawng aṭanga retention tui zat, leh tui ṭhatna tui zat (Bung 8) a chhut;
- (c) detention laka area humhalh leh retention tui zat credit-te a hmang (Bung 4);
- (d) design-aid kawngah (Clause 1.7, S-1), unit-storage table-te aṭanga retention leh detention tui zat a pe;
- (e) alternative S-2-ah, AEP tin tan site aṭanga luan chhuah phal zat (permissible site discharge) a pe; leh
- (f) **Compliance Calculator Tlangpui (Form 10-2)** a siam chhuak.

10.5.2 **Hman dan.**

- (a) Stage 1, 2 leh 4 thehluh tur tin hian calculator version hman mek aṭanga Form 10-2 a keng tur a ni.
- (b) Design-aid kawngah chuan, calculator hi khawlna chhutna awmchhun a ni thei.
- (c) Design-aid kawng pawn lamah chuan, calculator hi tlangpui leh screening endikna a ni. Bung 3 hydrograph (hun hrang hranga tui luang zat) zirchianna a thlak lo. Model result chu calculator screen aṭanga calculator guide-a tolerance sawi aia tam a danglam chuan, report-in a chhan a sawi tur a ni.

10.5.3 **Version control.** Calculator hian output tinah a version a chhinchhiah tur a ni. Version thar chu chhuah hnu thla 6-ah thehluh tur thar-ah a huam, Clause 2.14.2 nen inmilin. Thehluh tur pakhat hian Stage 1 aṭanga 4 thleng version pakhat a hmang tur a ni, Applicant-in a hnu lam version a thlan loh chuan.

10.5.4 **Inhawnna.** Calculator, a user guide leh a chhunga table tin hnar chu man nei lovin tlangzarh tur a ni.

> Hrilhfiahna. Mid-America Regional Council chuan APWA 5600 Version 2025.01 nen Compliance Calculator (.xlsm) leh Calculator Start-Up Guide, site activity plan template leh Policy Supplement nen a chhuah (MARC stormwater management page, 2025). Calculator hian credit nei standard layer tam tak chu reviewer-in rang taka a endik theih number inmil set khatah a chantir. Singapore chuan dan awlsam zawk takin chutiang nghawng chu a nei: darkar 4 thleng kum 10 ruahpui tan allowable C value 0.55 pakhat, formula hmanga hman (PUB Code of Practice, cl. 7.1.5). Mizoram calculator hian Tier B authority-te a ṭanpui bik a, chutah chuan chhutna pum a ni thei.

10.6 Professional certification

10.6.1 **Tu nge hming ziak thei.** Drainage report leh design-te chu hydrology leh hydraulics-a thiam registered professional (Clause 1.4)-in a buatsaih leh hming a ziak tur a ni. Heng zinga pakhat tan chuan, hming ziaktu chu Authority emaw UD&PA-in **Stormwater Design Professional anga empanel (thiamna list-a dah luh)** civil engineer a ni tur a ni:

- (a) 1 ha emaw a aia lian Tier A site;
- (b) tuilian hlauhawm catchment chhunga site reng reng;
- (c) embankment (dai) nei facility reng reng, emaw 0.2% AEP tana endik high-hazard basin (Bung 4); leh
- (d) pump hmang facility, tide gate emaw regional facility reng reng.

10.6.2 **Empanelment criteria** chu UD&PA-in a chhuah tur a ni a, civil engineering degree, drainage design-a tawnhriat inmil, leh he Kaihhruaina Bu training course zawhna a keng tur a ni.

10.6.3 **Certificate.** Hming ziaktu chuan **Professional Design Certificate (Form 10-3)** a tihkim tur a ni a, heng hi a certify tur a ni:

- (a) design hian he Kaihhruaina Bu a zawm, variance tarlan leh phalna pek bak chu;

- (b) ruahtui tlak, lei leh tailwater input-te chu Form 2-1 leh 10-2-a chhinchhiah ang an ni; leh
- (c) model thehluhte hian result report-te an siam chhuak nawn thei.

10.6.4 **Mimal endikna.** Clause 10.6.1(c) leh (d) hnuaia facility-te chu designer (design siamtu) nena inzawmna nei lo empanel professional pahnihnain a endik tur a ni. Chu professional chuan Form 10-3 chu endiktu angin hming a ziak tur a ni.

10.6.5 **Certification dik lo.** Certificate dik lo emaw ngaihthah taka siam chu Clause 10.15 hnuaiah dan bawhchhiatna (offence) a ni.

> Hrilhfiahna. Singapore chuan tui luang sang ber thunun nana a ABC Waters design feature hmante chu Professional Engineer (Civil) ni bawk ABC Waters Professional-in a thlawp (endorse) turin a phut (PUB Detention Tank Guide, 2024). India-ah Singapore-a ang professional engineer register dan anga awm a awm lo, chuvangin he clause hian AMCBR/SD&SM registration a hmang a, hlauhawmna sang zawk dinhmun tan empanelment a belh. 1 ha tehna hi he Kaihhruaina Bu-in a ruat a ni.

10.7 Endikna kalphung leh hun bi

10.7.1 **Kimna endikna.** Authority chuan thehluh tur tin chu Form 10-1 nen **hna ni 5** chhungin a endik tur a ni a, endikna atan a lo pawm emaw, a tlachham item list nen a pe kir emaw tur a ni.

10.7.2 **Technical endikna.** Authority chuan technical endikna a zo tur a ni a, phalna, phalna dinhmun nei emaw rawtna list inzawm khawm pakhat chu heng hun chhungin a chhuah tur a ni:

- (a) thehluh tur hmasa tan lo pawm aṭanga **hna ni 15**; leh
- (b) thehluh nawn tan lo pawm aṭanga **hna ni 10**.

10.7.3 **Rawtna thar awm lo.** Thehluh nawn hunah, Authority chuan endikna hmasaa thlak danglam loh leh rawtna pek loh thu-ah rawtna thar a siam loh tur a ni, chu thu chuan himna a nghawng loh chuan.

10.7.4 **Endikna theihna.** Tier B authority emaw, overflow hna tan Tier A authority emaw chuan UD&PA list aṭanga empanel reviewer (endiktu) a hmang thei. Empanel reviewer chuan site khatah hna a thawk tawh loh tur a ni. Authority hi thutlukna siamtu a ni reng.

10.7.5 **Clearance rual.** Heng hi a mamawh chuan: IWRD-in a enkawl luipui emaw flood work chunga hna emaw chutah tui luan chhuah tir tan Irrigation & Water Resources Department (IWRD) phalna, emaw Autonomous District Council-te ram pawn lamah Mizoram Water Resources (Management and Regulation) Act, 2024 hnuaia WARDMA thupek, Tuirial reservoir emaw a dam hnuai lui chhung (reach)-a tui luang hna tan NEEPCO remtihna, leh Serlui B tan State power department remtihna [TBC], drain chu municipal drain-a zawm emaw water-course reng rengah luan lut tir tan Aizawl Municipal Corporation, emaw a ram chhungah Lunglei Municipal Council, phalna ziak (Mizoram Municipalities Act, 2007, ss.295 leh 296), riverine reserve emaw wetland chhunga hna tan Environment, Forests & Climate Change Department (EF&CC) ngaihdan, River Conservation Zone chhunga hna tan Mizoram River Protection Authority phalna hmasa, Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, hman mek a nih a, zone notify a nih chauhin (pahnih mah finfiah a ni lo), an kawng side drain, catch-water drain emaw culvert (kawng hnuaia tui kalna)-a tui luan chhuah tir tan PWD emaw national-highway agency remtihna, effluent phur tui luan chhuah tir tan MPCB remtihna, municipality pawna khaw drain chunga hna tan Village Council remtihna, tuikhur (tui chhuahna, spring) ang tui hnar hriat chian lam pana tui luang hna tan Village emaw Local Water Resources Committee ngaihdan, Autonomous District Council ram chhunga hna tan, District Council-in he Kaihhruaina Bu a pawm chuan, District Council remtihna, leh tui drain dawngtu neitu emaw kalpuitu pawl chu Authority a nih loh chuan chu pawl

remtihna (entirnan sewer tan PHED emaw SIPMIU), emaw agency dang inremna (concurrence) a mamawh chuan (Bung 7), Authority chuan endikna atana a lo pawm ni ngeiah thehluh tur chu a thawn chhawng tur a ni a, endikna hun-te chu a rualin a kal tur a ni.

10.7.6 **Permit hun bi nena inmilna.** Clause 10.7.1–10.7.2-a hun-te hi sawrkar-in a ruat planning permission leh building permit hun bi pumpui chhungah a kal a, a tihseisei lo.

10.7.7 **Chhan.** Hnialna emaw dinhmun (condition) tin hian a innghahna he Kaihhruaina Bu clause a sawi tur a ni.

> **Hrilhfiahna.** Endikna hun-te hian a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Rawtna list inzawm khawm pakhat leh "rawtna thar awm lo" ("no new comments") dan hi engineering endikna-a hman ṭhin ṭha tak an zawm.

10.8 Sakna hna endikna

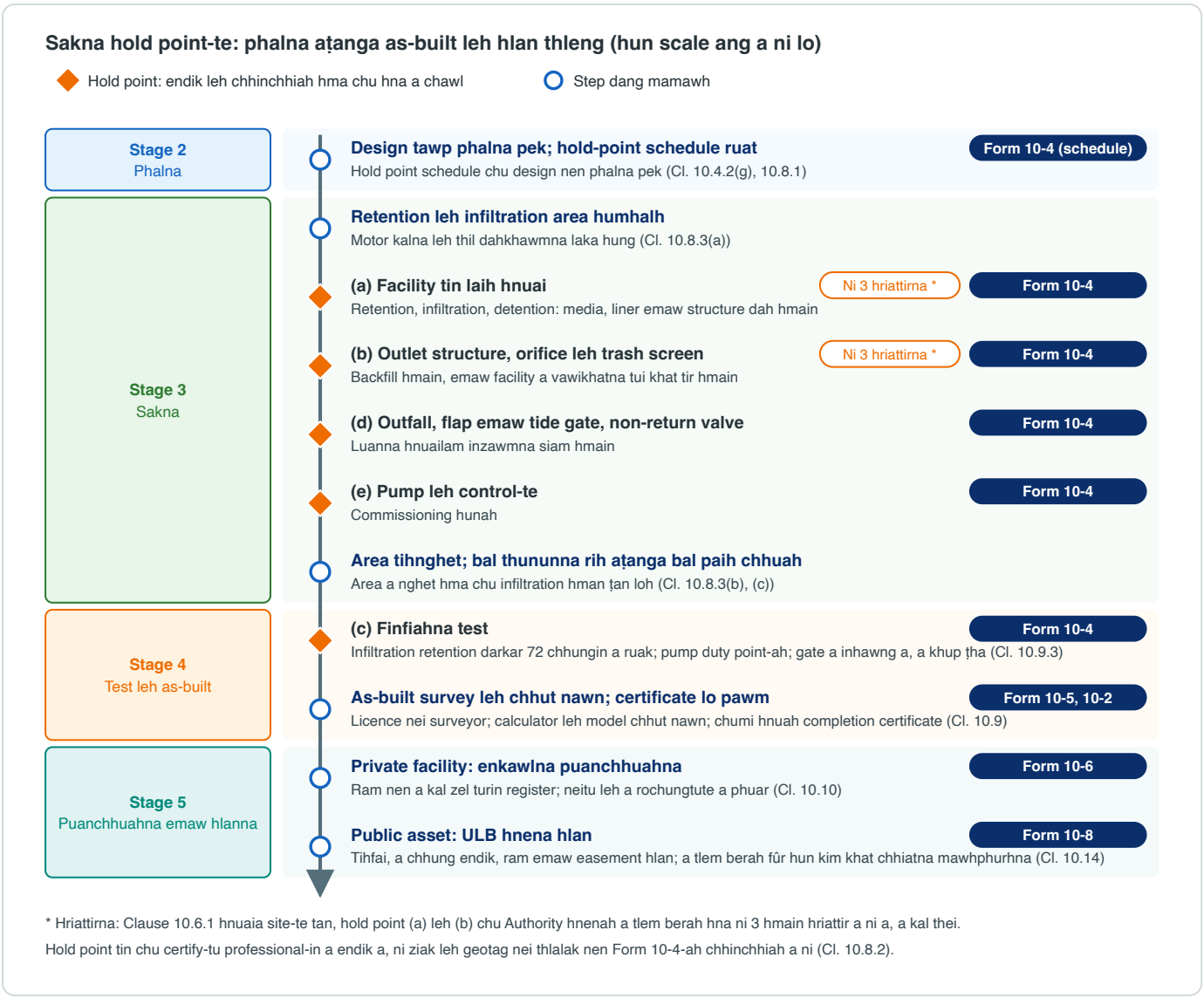
10.8.1 **Hold point.** Phalna pek hold-point schedule (Form 10-4) hian a tlem berah heng hi a keng tur a ni:

- (a) retention, infiltration leh detention facility tin laih hnuai, media, liner emaw structure dah hmain;
- (b) outlet structure, orifice leh trash screen, backfill hmain emaw facility chu a vawikhatna tui khat tir hmain;
- (c) Clause 10.9.3 infiltration test-te;
- (d) outfall, flap emaw tide gate leh non-return valve (tui kir leh dangtu valve), luanna hnuailam inzawmna siam hmain; leh
- (e) pump leh control-te, commissioning hunah.

10.8.2 Hold point tin chu certify-tu professional-in a endik tur a ni a, ni ziak leh geotag nei thlalak nen Form 10-4-ah chhinchhiah tur a ni. Clause 10.6.1 hnuaia site-te tan, hold point (a) leh (b) chu Authority hnenah a tlem berah hna ni 3 hmain hriattir tur a ni a, a kal thei.

10.8.3 **Sak lai humhalhna.**

- (a) Retention leh infiltration area-te chu sakna motor kalna leh thil dahkhawmna laka hung tur a ni.
- (b) Infiltration facility-te chu an hnena tui luan luhna area a nghet hma loh chuan hman ṭan loh tur a ni.
- (c) Bal thununna rih atana facility hman reng reng aṭanga bal (sediment) chu as-built survey hmain paih chhuah tur a ni.



Milem 10.2 — Phalna aṭanga as-built certification leh hlan thleng sakna hold point-te, step tina form hman nen (Clause 10.8–10.10 leh 10.14). Hold point-te chu Clause 10.8.1-a angin hawrawp pek an ni. He Kaihhruaina Bu tana milem siam thar, APWA Section 5600 (2006), §5608 sakna endikna leh enkawlna inremna indawt dan aṭanga siam danglam.

> **Hrilhfiahna.** Infiltration facility-te hi sak lai hian an tlawlh fo ber, hna an thawh hmaa lei tihkhauh emaw leidipin tihkhat emaw an nih hunah. Hold point (a) leh (c) hian chu tlawlhna chu an tum. Ni 3 hriattirna hi he Kaihhruaina Bu-in a ruat a ni.

10.9 As-built certification

10.9.1 Completion certificate pek hmain, certify-tu professional chuan **As-built Certificate (Form 10-5)** chu heng nen a thehlut tur a ni:

- (a) licence nei surveyor-in facility tin level, khawlna tui zat, outlet lenzawng leh invert (tui luanna hniam ber), leh outfall as-built survey;
- (b) as-built value nen compliance calculator, leh model hman a nih chuan model, chhut nawn;
- (c) hold-point record tihkim (Form 10-4); leh
- (d) O&M plan tawp leh enkawlna puanchhuahna hming ziak emaw hlanna thuziak (Clause 10.10 leh 10.14).

10.9.2 **Lo pawmna.** As-built facility chu heng a nih chuan lo pawm a ni:

- (a) design level tina as-built khawlna tui zat chu Bung 4-in a phut tui zat aiin a tlem lo;
- (b) outlet lenzawng leh invert-te chu design phalna pek nen an inmil; leh
- (c) chhut nawnna chuan Bung 4 leh 5 criterion tin zawm a nihna a lantir.

Inthlauhna reng reng chu siam ṭhat tur a ni, emaw Clause 10.3.5 hnuaiah zawm a nihna certify nawn tur a ni.

10.9.3 **Finfiahna test.** Infiltration-a innghat retention facility tin chu, Bung 4-in a phut angin, **darkar 72** chhunga a ruak tih lantir turin sak zawh hnuah test tur a ni. Pump hmang facility-te chu an design duty point-ah test tur a ni. Tide gate leh non-return valve-te chu an inhawng thei a, an khup hunah tui a put chhuak lo tih lantir tur a ni.

10.9.4 Authority chuan Form 10-5 lo pawm a nih hma loh chuan completion certificate a pe loh tur a ni.

> Hrilhfiahna. Darkar 72 retention drawdown hi Bung 4 criterion a ni. He Kaihhruaina Bu hian sak hmaa test chauh innghah lovin, sak zawh hnuah test turin a phut, sak laia lei tihkhauh hian infiltration rate chu design value aia hniam hle-ah a tihniam theih avangin.

10.10 Enkawlna puanchhuahna leh covenant

10.10.1 **Puanchhuahna.** Private ruahtui facility tin neitu chuan completion certificate pek hmain **Enkawlna Puanchhuahna (Maintenance Declaration) (Form 10-6)** a ziak tur a ni. Puanchhuahna hian:

- (a) facility tin, a awmna leh O&M plan phalna pek a tarlang tur a ni;
- (b) neitu leh a ram rochungtu (successors in title) chu O&M plan angin facility kalpui, endik leh enkawl turin a phuar tur a ni;
- (c) Authority chu endik nan, leh Clause 10.15 hnuaia works in default (neitu-in a tih loh hna Authority-in a tih) tih nan luh theihna dikna (right of entry) a pe tur a ni;
- (d) Authority phalna tel lova facility paih, vur, khuh, tihtlem emaw hman dan thlak a khap tur a ni; leh
- (e) ram nen a kal zel a, leitu hnena puan a nih theih nan register a ni tur a ni.

10.10.2 **Neitu tam development.** Apartment, layout leh gated community tan, puanchhuahna hian developer-in a hlan hnua mawhphurtu association emaw pawl emaw a tarlang tur a ni. Chu pawl chu dan angin din a nih a, puanchhuahna chu ziakin a lo pawm hma loh chuan developer chu mawhphurtu a ni reng.

10.10.3 **Kumtin puanchhuahna.** Tier A area-a facility neitu tin leh, khawi hmunah pawh, pump hmang facility, tide gate emaw regional facility neitu tin chuan kum tin **March ni 31** hmain **Kumtin Enkawlna Puanchhuahna leh Endikna Report (Form 10-7)** a thehlut tur a ni. Report hi neitu leh, Clause 10.6.1(c) leh (d) hnuaia facility tan, empanel professional-in hming an ziak tur a ni. Clause 10.12 fûr hma (pre-monsoon) endikna chu tih a ni tawh a, chhiatna reng reng siam ṭhat a ni tawh tih a sawi tur a ni.

10.10.4 **Hlan chhawn.** Hralh emaw hlan chhawn hunah, hralhtu chuan puanchhuahna leh Form 10-7 hnuhnung ber a puang tur a ni. Leitu chuan hlan chhawn ni aṭangin mawhphurhna a la.

> Hrilhfiahna. Singapore chuan pump hmang detention system neitu-te chu PUB hnenah kumtin puanchhuahna leh thuziak thehlut turin a phut (PUB Detention Tank Guide, Code of Practice §13.2 a tarlan). Code of Practice Addendum No. 3 (16 Apr 2025) chuan Sewerage and Drainage Act amendment hnuah, flood barrier leh pump hmang detention tank tan kumtin enkawlna puanchhuahna a rawn hmang. APWA 5600 (2006, §5608) chuan detention facility tan easement (mi ram kal tlanga hman phalna) leh enkawlna ruahmanna a phut. Register

puanchhuahna hi Mizoram-ah a pawimawh, podium hnuaia leh basement-a detention tank-te hi building chenchilh a nih hnuah parking emaw thil dahna-ah thlak awlsam an nih avangin. March ni 31 ni hi Mizoram ruahtui tlak nasa ber a tlakna fûr hun (April–October) hmaa awm turin he Kaihhruaina Bu-in a ruat a ni.

10.11 O&M plan

10.11.1 Ruahtui facility tin hian O&M plan, Stage 2-a phalna pek leh Stage 4-a tihfel, a nei tur a ni. Plan-ah hian heng hi a awm tur a ni:

- (a) facility tin inventory leh plan drawing, design level, tui zat leh outlet kimchang nen;
- (b) hna pangngai leh a zat: endikna, bal leh leidip paih chhuah, thlai enkawl, screen tihfai;
- (c) leidip paih chhuah ṭul hun, a thuk zawng emaw design tui zat percentage-a sawi;
- (d) Form 10-7 nena inmil endikna checklist-te;
- (e) pump system, gate leh valve tan: kalpui dan, test schedule, standby power, leh cyclone emaw ruahpui hriattirna (warning) hunah tih tur;
- (f) Bung 4 tui hniam hun (drawdown time) nena inmilin, tui tlin leh thosi pun laka venna;
- (g) hmun khap (confined space), tui thuk leh mipui luhna tana himna;
- (h) kalna kawng leh hmanrua mamawh (Clause 10.13);
- (i) kumtin senso chhut zat leh a pe tur; leh
- (j) record vawn tur, leh engtik chen nge vawn tur.

10.11.2 **Public facility.** ULB emaw Department neih facility tan, O&M plan chu asset register (Clause 10.14.3)-ah dah tel tur a ni a, kumtin enkawlna budget-ah sum pek tur a ni.

Hrilhfiahna. Mizoram-ah fûr hma leidip laih chhuah (desilting) ruattu State order ni nei a awm lo: Master Plan for Aizawl: Vision 2030 chuan "monsoon a lo thlen hmain kum tin drain-te tihfai a ngai" ("drains need to be cleaned every year before the onset of monsoon") tih chauh a sawi a, a ram chhunga khaw 8% chauhin enkawl fel taka drain khuh lo an nei a, 40%-in a hun hunin an enkawl a, 52%-in enkawlna an nei lo tih a hmu. Drain-te hi an neitu-te zingah ṭhentu notification a awm lo (he Kaihhruaina Bu chhiar dan), leh kut hrang hrangin an kalpui: Aizawl Municipal Corporation, a Local Council-te nen, public drain leh public street kama drain, a kuta awm (Mizoram Municipalities Act, 2007, s.289(1)) tan; Corporation hnena hlan ngai loh State kawng side drain tan PWD a thawk a (CAG), statute-ah chuan chu drain-te bawk chu Corporation kutah awm mah se, he Kaihhruaina Bu hian chu inkaihna chu a sawi a, a chinfel lo; NH-6 leh national highway dang tan national-highway agency-te; sewer leh Chite sewage treatment plant tan PHED leh SIPMIU; Lunglei-ah Lunglei Municipal Council; khaw drain tan Village Council-te, State-in an hnena a pek theih mawhphurhna ("Sanitation and drainages", Mizoram (Village Councils) Act, 2025, s.15(1)(q)); leh, Autonomous District Council ram-ah, District Council-te leh an Village Council-te [TBC]. Site development permit hnuaia terrace swale, interceptor drain leh down-drain sakte chu neitu-te-in an enkawl (SD&SM 2017, reg. 27). Roadmap to Stability (Landslide Policy Committee for Aizawl City, 2014) chuan PHED chu "tui luanna system design leh sak, en reng leh siam ṭhat emaw tihṭhat nan Public Health Engineering Department chhungah office din" ("Create an office within the Public Health Engineering Department to design and build, monitor and repair or improve drainage systems") turin a ngen a, Corporation chuan "AMC ram chhunga hmasawnna hna zawng zawng (Kawng, Tui luanna, lung laihna etc.) thunun thuneihna a nei tur a ni" ("should have controlling authority for all developmental activities (Roads, Drainage, quarries etc.) within AMC area") a ti; pakhat emaw tih a nih leh nih loh hmuh a ni lo [TBC]. Gate pawimawh berte hi tum dang atan kalpui an ni: Tuirial dam hi NEEPCO-in electric atan a kalpui a, a tui chhuah tir, emaw Serlui B tui chhuah tir, chu a hnuai lui chhung-te tana hriattirna nena inzawmtu dan hmuh a ni lo [TBC]. Mizoram khawpui reng reng flap gate, check dam emaw pumping station, luipui level, dam tui chhuah tir emaw ruahtui tlak hriattirna nena inzawmtu kalpui dan public domain-ah hmuh a ni lo. He Kaihhruaina Bu-a gate leh pump tin hian hriattirna chhuah a nih hunah tih tur dan ziak a mamawh.

10.12 Endik zat

10.12.1 **Neitu endikna.** Neitu-te chuan facility-te chu a tlem berah Table 10.3-a tarlan angin an endik tur a ni:

Table 10.3 — Neitu endik zat tlem ber

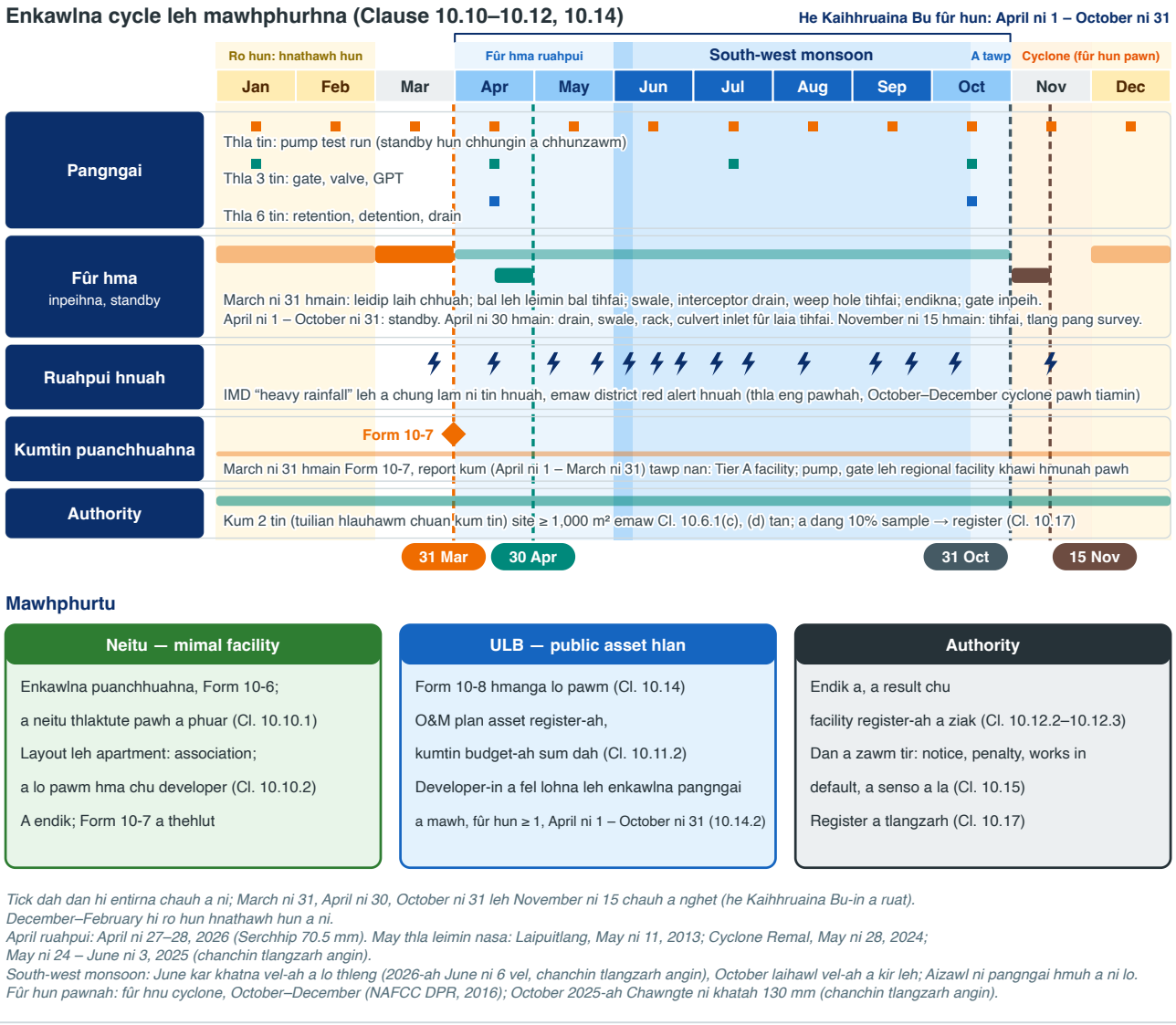
Facility chi	Pangngai	Fûr hma (March ni 31 hmain)	Ruahpui thleng hnuah
Retention / infiltration (soakaway, trench, bioretention, permeable paving)	Thla 6 tlan zelin	Aw	Aw
Lei chung detention basin emaw hman tam theih open space area	Thla 6 tlan zelin	Aw	Aw
Leihnuai emaw podium detention tank, gravity outlet	Thla 6 tlan zelin	Aw	Aw
Pump hmang detention, pump leh control-te	Thla tin test run	Aw, duty test kim nen	Aw
Flap / tide gate, non-return valve	Thla 3 tlan zelin	Aw, seal test nen	Aw
Gross pollutant trap / first-flush device	Thla 3 tlan zelin	Aw	Aw
Mimal drain leh inlet-te	Thla 6 tlan zelin	Aw	—

Ruahpui thleng (heavy-rainfall event) chu, he Clause tan, gauge phalna nei hnai berin IMD "ruahpui" ("heavy rainfall") category emaw a aia sang ruahtui tlak a chhinchhiahna ni, emaw district tan red alert puanchhuah a nihna ni a ni. Mizoram-ah, flap gate, non-return valve, debris rack (bal dangna), sediment trap, debris basin, culvert inlet leh pump hmang facility reng reng fûr hma endikna, Tlawng, Tlabung-a Khawthlangtuipui emaw phai luipui dang-in a khar theih outfall gate-te tiamin, drain, lui inlet, catch-pit, rack, trap, basin leh culvert tin aṭanga leidip laih chhuah leh bal, bawlhhlawh leh leimin bal tihfaina, SD&SM reg. 27 terrace swale, interceptor drain leh down-drain tihfaina, retaining wall weep hole leh leihnuai drain endik leh tihfaina, leh pump duty leh gate seal test-te chu **March ni 31** hmain zawh tur a ni; rack, culvert, flap gate leh pump hmang facility reng reng, an standby power nen, chu ni vekah inpeih tawh tih certify tur a ni, he Kaihhruaina Bu fûr hun hi April ni 1-ah a ṭan a, April-ah ruahpui a lo thleng ṭhin avangin. Chumi hnuah flap gate, rack leh pump reng reng chu thla tin test run nen **April ni 1 aṭanga October ni 31 thleng** standby-ah dah tur a ni a, Tuirial reservoir emaw Tuirial emaw Serlui B dam hnuai lui chhung-a outfall-ah chuan tui chhuah tir (release) a tawp thleng, chu chu a hnu zawk a nih chuan. Drain, terrace swale, interceptor drain, rack, culvert inlet leh catch-pit-te chu April ruahpui bal, bawlhhlawh leh leimin bal laka **April ni 30** hmain tihfai nawn tur a ni, State-a ni chiang nei ruahpui thihna tam ber thlentu May ruahpui hmain, leh khawpui tina public drain, lui inlet, rack, trap, basin leh culvert tin chu fûr hun leidip, leimin bal leh bawlhhlawh laka **November ni 15** hmain tihfai tur a ni, an chunga lei laih pang, terrace leh retaining wall survey nen, October aṭanga December thleng fûr hnu (post-monsoon) cyclone-te tan drain-te a fai theih nan.

10.12.2 **Authority endikna.** Authority chuan heng hi a endik tur a ni:

- (a) 1,000 m² emaw a aia lian site-a facility tin, emaw Clause 10.6.1(c) emaw (d) hnuaia facility, a tlem berah kum 2 zelah vawi khat, leh tuilian hlauhawm catchment-ah kum tin; leh
- (b) facility dang zinga a tlem berah 10% chu kum tin duh duha thlan (random sample).

10.12.3 Authority endikna result-te chu facility register (Clause 10.17)-ah dah tur a ni.



Milem 10.3 — Kumtin enkawlna cycle leh mawhphurtu: pangngai, fûr hma (March ni 31 hmain) leh thil thleng hnua endikna, kumtin puanchhuahna (Form 10-7) leh Authority endikna (Clause 10.10–10.12 leh 10.14). He Kaihhruaina Bu tana milem siam thar. Hun bi hian fûr hun (April–October) a zawm; kum chhunga tick awmnate hi entirna chauh a ni.

Hrilhfiahna. Clause 10.12.2-a ṭhen dan hian RWH tana MBBL 2016 endikna kalphung, 1,000 m² chunga building-te 100% enfiah leh a hnuai lam 10% duh duha endik phuttu (MBBL 2016, §9.6) a zawm. Table 10.3-a endik inkar hun-te hi he Kaihhruaina Bu-in a ruat a ni. March ni 31 hun tawp hi south-west monsoon hmaa ṭan ruah hun tan he Kaihhruaina Bu-in a ruat a ni. He Kaihhruaina Bu-ah fûr hun hi April ni 1 aṭanga October ni 31 thleng a ni a, a thla hmasa pahnih hian State-a ni chiang nei ruahpui thihna tam ber thlentute a rawn keng: Aizawl-a Laipuitlang–Ramhlun Venglai lungpui tlak (rockslide) (chanchinbu leh AGU Landslide Blog angin May ni 11, 2013, paper pakhat angin May ni 15, 2013), Cyclone Remal laia Melthum–Hlimen lung laihna (quarry) chim (May ni 28, 2024) leh May ni 24, 2025 aṭanga June ni 3, 2025 thleng leimin 598 (DM&R zat, chanchin tlangzarh angin). April ruahpui avangin April ni 27–28, 2026-ah district panga aṭanga pakua thlengah school chawlh tir a ni a, Serchhip-ah 70.5 mm leh Hnahthial-ah 55 mm a sur (chanchin tlangzarh angin). CGWB chuan "May aṭanga September tawp lam thleng ruahpui" ("heavy rainfall during May to late September") a hmu (Lunglei booklet), leh NAFCC tana Agriculture Department project report chuan "May aṭanga September thleng ruah tam" ("high rainfall during May to September") (2016). NDMA (2010) chuan ram pum tan fûr hma leidip laih chhuah tan March ni 31 a ruat a, he Kaihhruaina Bu hian chu ni chu a vawng, he series-a North-East edition dangte ang bawkin. December aṭanga February thleng hi hna thawh hun a ni. Drain leidip laih chhuah emaw tlang pang drain, rack leh gate inpeih tir tura ni ruattu Mizoram order reng reng hmuh a ni lo; Master Plan for Aizawl: Vision 2030 chuan "monsoon a lo thlen

hmain kum tin drain-te tihfai a ngai" ("drains need to be cleaned every year before the onset of monsoon") tih chauh a sawi. Chuvangin he Kaihhruaina Bu hian leidip laih chhuah leh bal, bawlhhlawh leh leimin bal tihfaina, SD&SM reg. 27 terrace swale, interceptor drain leh down-drain tihfaina, retaining wall weep hole leh leihnuai drain endik leh tihfaina, fûr hma endikna, kumtin puanchhuahna leh rack, culvert, flap gate leh pump reng reng inpeihna tan March ni 31 a la a, inpeihna ni a hnu zawk a awm lo. Tlang pang drain leh weep hole tana zirchianna-in a rawt April ni 15 chu hman a ni lo, Kaihhruaina Bu fûr hun hi April ni 1-ah a ṭan a, 2026 April ruahpui chu April ni 27–28-ah a lo thlen avangin. Aizawl-a south-west monsoon lo thlen leh kir leh ni pangngai chu hmuh a ni lo [TBC]; 2026-ah monsoon chu June ni 6 vel khan Mizoram a thleng (chanchin tlangzarh angin). Hetah hian Mizoram record ngei hian ni pakhat a sawn. He series-a North-East edition dangte chuan rack, culvert leh inlet-te chu May ni 31 emaw May ni 15 emaw hmain vawi hnihna an tihfai a, mahse State-a ni chiang nei May thil thleng thihna thlentu hmasa ber chu May ni 11-ah a thleng (Laipuitlang, 2013), chuvangin May ni 15 hmaa tihfai tur chu a hnu lamah a lo awm thei a, May ni 31 hmaa tihfai tur chu pathum zawng zawng hnuah. Chuvangin drain, terrace swale, interceptor drain, rack, culvert inlet leh catch-pit-te chu April ni 30 hmain tihfai nawn a ni, April ruahpui hnu leh record-a May chhiatna ni chiang nei zawng zawng hmain. Fûr hun hnuah pawh ruahpui a la thleng zel: chu 2016 report bawk chuan "fûr hnu hun (October aṭanga December) cyclone-te hi fûr hma hun (April leh May) cyclone-te aiin an nasa zawk" ("the cyclones of the Post Monsoon season (October to December) are more intense than those of Pre-Monsoon season (April & May)") a ti a, Chawngte-ah October 2025-ah ni khatah 130 mm a sur, "ram chhunga sang ber" ("highest in the region") (chanchin tlangzarh angin). Chuvangin flap gate, rack leh pump reng reng chu October ni 31 thleng standby-ah dah a ni a (Milem 10.3), leh khawpui tin-in November ni 15 hmain an drain-te vawi hnihna an tihfai a, an lei laih pang, terrace leh retaining wall-te an survey. Zirchianna November ni 30 chu hman a ni lo: November ni 15, series ni, chuan cyclone hun a tam zawk hnu ni lovin a hmaah drain-te a tihfai. Table 10.3 thil thleng hnua endikna-te hian kum chhunga engtik hunah pawh ruahpui an huam. Report kum hi April ni 1 aṭanga March ni 31 thleng a ni a, March ni 31 kumtin puanchhuahna hian a zawh tir theih nan.

10.13 Enkawlna kalna kawng

10.13.1 Facility tin hian endik leh enkawl nan kalna kawng nghet a nei tur a ni, drawing phalna pekah lantir leh enkawlna puanchhuahnain emaw, public facility tan, easement emaw ram hlanin emaw humhalh.

10.13.2 **Lei chung facility.** Basin, dil tê (pond) leh channel khuh lo-te hian inlet, outlet leh a hnuai thleng motor kalna kawng, leh a tlem berah a sir khatah enkawlna kawng (maintenance strip) an nei tur a ni. Basin-a luhna ramp-te chu bal paih chhuah nana khawl mamawh tan a inmil tur a ni.

10.13.3 **Leihnuai facility.** Tank-te hian heng hi an nei tur a ni:

- (a) inlet, outlet leh chamber tin chunga luhna kawngkhar;
- (b) kailawn emaw kalkawng nghet, leh hmun khap (confined space) luhna tana boruak luhna;
- (c) bal paih chhuah nan sump emaw hmun hniam; leh
- (d) kut hmanga tihfai theih tawk chung zau.

10.13.4 **Outlet.** Orifice leh screen-te chu facility tui khat chhunga luh ngai lovin tihfai nan thlen theih an ni tur a ni.

10.13.5 Kalna kawng-te chu kal theihna dang thei khawpin a chungah sak, hung emaw parking atan hman loh tur a ni.

Hrilhfiahna. APWA 5600 (2006, §5608) chuan detention facility tan 15-ft (4.5 m vel) enkawlna kalna kawng a phut. Mizoram khawpui-a plot lenzawng hian site tinah zau zawng nghet hman a harsa a, chuvangin he Kaihhruaina Bu hian hna thawh dan mamawh a ruat. Belhchian 10C-in enkawlna kalna kawng lenzawng a sawi.

10.14 ULB hnena public asset hlan

10.14.1 Developer-in ULB hnena hlan tura a sak drain, kawng, open space facility, regional facility leh ruahtui asset dangte chu heng a nih chauhin hlan tur a ni:

- (a) as-built certificate (Clause 10.9) lo pawm a nih tawh;
- (b) facility tihfai a nih tawh a, pipe leh culvert-te chhung lam endik a nih tawh (entirnan CCTV emaw mihring luhin), record hlan nen;
- (c) ram, emaw a chunga easement, ULB hnena hlan a nih tawh;
- (d) O&M plan, drawing, GIS data leh warranty-te hlan a nih tawh; leh
- (e) **Asset Hlanna Certificate (Form 10-8)** chu lehlam lehlamin hming an ziak tawh.

10.14.2 **Chhiatna mawhphurhna.** Developer chuan hlan hnuah a tlem berah **fûr hun kim khat, April ni 1 aṭanga October ni 31 thleng,** huam defects liability period (chhiatna mawhphurh hun) chhung chhiatna leh enkawlna pangngai tan mawhphurtu a ni reng tur a ni. ULB chuan he hun chhung tan security deposit a vawng thei.

10.14.3 **Asset register.** Lo pawm hunah, ULB chuan asset chu a GIS drainage asset register-ah leh Clause 10.17 facility register-ah a dah tur a ni.

10.14.4 **Private facility.** Private facility chu ULB-in he Clause hnuaiah dan angin a lo pawm loh chuan a enkawlna puanchhuahna hnuaiah neitu mawhphurhna a ni reng.

> **Hrilhfiahna.** NDMA (2010) chuan drain-te GIS inventory a phut. Hlan hunah developer GIS data phut hian khawpui a lo lian zel ang zelin chu inventory chu ULB tan senso nei lovin a siam. Chhiatna hun hian fûr khat a huam, Mizoram drainage chhiatna tam tak hi fûr hmasa berah chauh a lan avangin.

10.15 Dan zawm tirna

10.15.1 **Dan bawhchhiatna.** Heng hi he Kaihhruaina Bu bawhchhiatna (contravention) an ni:

- (a) mamawh a nih laia drainage design phalna pek nei lova sak;
- (b) phalna pek ang ni lova facility sak;
- (c) phalna tel lova facility paih, vur, khuh, tihtlem emaw hman dan thlak;
- (d) facility enkawl loh, emaw Form 10-7 thehluh loh;
- (e) storm drain-a ek tui (sewage) zawm;
- (f) tui awmna setback emaw lei vur phal loh zone (Bung 7)-a sak emaw vur;
- (g) tui luanna pianphung kawng emaw tui luanna system lian tui luan kawng dan; leh
- (h) certification dik lo emaw ngaihthah taka siam.

10.15.2 **Hmalakna indawt.** Authority chuan heng indawt hian hma a la tur a ni, a hmaa mi a hlawhtlin loh chuan emaw bawhchhiatna a nasat chuan a hnu lam step-ah a kal ang (Table 10.4):

Table 10.4 — Dan zawm tirna hmalakna indawt

Step	Hmalakna
1	Bawhchhiatna, clause bawhchhiat, siam ṭhatna leh zawm tur hun sawina hriattirna ziak.
2	Development la zo lo tan stop-work order, emaw completion certificate pek loh.
3	Act emaw rule huam hnuaia hremna (penalty).
4	Authority-in works in default a tih, a senso chu neitu hnen aṭanga lak.

Step	Hmalakna
5	Mi dangte tan hlauhawmna a thlen loh chuan, public system nena private drain inzawmna tihchhuah.
6	Certify-tu professional chu registering authority hnena report, leh empanel list aṭanga tihtawp rih (suspension).

10.15.3 **Hmalakna nghal.** Fûr chhunga bawhchhiatna chuan nunna emaw thil neih a tihhlauhawm chuan, Authority chuan works in default a ti nghal thei a, a senso chu a hnuah a la thei.

10.15.4 **Security deposit.** Clause 10.6.1 hnuaia site-te tan, Authority chuan works in default tan security deposit emaw bank guarantee, as-built certificate lo pawm hnua chhuah, a phut thei.

10.15.5 **Record.** He Clause hnuaia hriattirna leh hmalakna tin chu facility register-ah dah tur a ni.

> **Hrilhfiahna.** Hremna (penalty) hi a tlangpuiin sawi a ni. He Kaihhruaina Bu hian ama ngeiin dan bawhchhiatna emaw sum chawitirna (fine) a siam thei lo a, thuneihna-te chu Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 siamna Act-te leh municipal Act-te aṭangin a lo chhuak. Step indawt dan hi he Kaihhruaina Bu-in a ruat a ni. Mizoram-ah court-te leh National Green Tribunal hi tlang pang leh lui-te thununtu hna thawk an lo ni ta a, statute-te erawh hian record-ah hman tlem thuneihna an keng. Gauhati High Court (Aizawl Bench) chuan, INTACH Mizoram Chapter lehkha chungchanga suo motu public-interest case-ah, July 2024-ah "Tun aṭang hian Bawngkawn – Durtlang (Leitan) kawng sir lehlam leh lehlamah sak hna thar reng reng phal a ni tawh lo vang" ("no new construction activity shall henceforth be allowed on either side of the Bawngkawn – Durtlang (Leitan) road") tiin thu a pe a, chhuat khatna chunga Corporation phalna-te chu "chawl rih" ("in abeyance") a ti a, leimin veng tura retaining wall sakte chu a hrang a, master plan-a "36 degree aia chim tlang pangah development chu nasa takin tihtlem a ṭha" ("development on slope more than 36 degree should be strongly discouraged") tih a tarlang (chanchin tlangzarh angin; case number hmuh a ni lo [TBC]); chu Court bawk chuan January ni 27, 2021-ah 1965 Riverine Reserved Forest notification a paih (quash) a, State appeal chu November ni 9, 2022-ah withdraw angin paih a ni (chanchin tlangzarh angin). Tribunal chuan ek tui leh bawlhhlawh lui chhung-te a enkawl: O.A. No. 593 of 2017 leh O.A. No. 673 of 2018-ah MPCB chuan February ni 6, 2021 aṭanga Chite sewage treatment plant trial run, River Rejuvenation Committee, leh May ni 5, 2020-a ruat compensation kalphung, "tun thlengin chhawrna engmah chawi a la ni lo" ("no compensation has been levied till date") (MPCB report, February 2021) a report; O.A. No. 606 of 2018-ah State chuan thla ruk zelin a ek tui leh tihfaina theihna a report. Statute-te hian Corporation chu he bungin a mamawh thuneihna an pe a, mahse drainage-a an hman record hmuh a ni lo, chuvangin finfiah an ni lo: municipal area chhunga drain zawng zawng chu "private emaw public emaw ni se, Board of Councillors survey leh thununna hnuaiah a awm tur a ni" ("whether private or public, shall be under the survey and control of the Board of Councillors") (Mizoram Municipalities Act, 2007, s.290); Corporation-in a tihfai (s.291) a, hriattirna tel lovin private ram kal tlangin tui tlin thut a luan chhuah tir thei (s.294); private drain chu Chairman phalna ziak nen chauh municipal drain-ah a lut thei (s.295), leh remtihna ziak lovin drain reng reng municipal drain emaw water-course reng rengah luan lut tir theih a ni lo (s.296); Corporation chuan tui bal chu ruahtui aṭanga hranin luan chhuah tir turin a phut thei (s.298); State chuan drainage hna "famkim lo, hlawhtling lo emaw inmil lo" ("imperfect, inefficient or unsuitable") a thunun thei (s.299); leh municipal drain, culvert emaw ruahtui channel chungah structure reng reng sak theih a ni lo, ₹500 thleng leh ni khatah ₹100 sum chawitirna hremna nen (s.300). Act hnuaia regulation siam chuan ₹1 nuai thleng sum chawitirna, thiam loh chantir hnua ni khatah ₹1,000 nen a ruat thei (s.374), mahse AMCBR emaw SD&SM-in an ruat em tih endik a ni lo [TBC]. SD&SM 2017 chuan "neitu chu an permit hnuaia drainage facility dah enkawl mawhphurtu a ni" ("The owner … responsible for maintaining drainage facilities installed under their permit") (reg. 27) a ti a, endikna kalphung sawi a awm lo, chuvangin tuin emaw a endik hma chu mawhphurhna hming chauh a ni. AMCBR hi permit hmangin a kal: OBPAS, 2023 aṭang khan regulation leh master plan anga awm lo proposal reng reng "a tir kir tur a ni" ("shall return"), leh 2025 aṭang khan, hna ni 7 chhunga endikna hnua leh public kawng aṭanga thil bang paih chhuah hnua chauh Occupancy Certificate pek; June 2018 aṭanga April ni 1, 2024 thleng OBPAS dilna 15,162 zingah 7,159 a dik a, 6,214 hun a tawp (CAG). Mizoram Water Resources (Management and Regulation) Act, 2024 chuan dan bawhchhiatna hmasa tan thla 3 emaw ₹10,000 thleng leh a hnu lam tan thla 6 emaw ₹25,000 thleng hremna a ruat a, Deputy Commissioner chu

> hremtu authority angin (s.20), mahse MISWARC leh WARDMA dinna notification hmuh a ni lo [TBC] a, Act hi Autonomous District Council-ah a thleng lo, chuvangin drainage tan tun thlengin hming chauh a ni. Mizoram (Village Councils) Act, 2025 chuan Village Council chu District Disaster Management Authority phalna nen hmun "leimin tihziaawm nan in sak nana hmun him lo" ("unsafe site for house construction for mitigation of landslide") a puang thei a, "State sawrkar-in a siam ang" ("as may be framed by the State Government") model building bye-laws a pawm a, a zawm tir thei (s.13(6)), mahse model bye-laws hmuh a ni lo, chuvangin municipality pawna drainage tana building thununna hi finfiah a ni lo; Lai, Mara leh Chakma Autonomous District Council-ah heng Act-te zinga pakhat mah a huam lo, leh building emaw drainage chungchanga District Council dan thuziak hmuh a ni lo. CAG Report No. 1 of 2025 chuan "leimin hlauhawm hmun endik reng leh zirna (research) neih a ni lo" ("regular inspection of landslide prone areas and research studies have not been conducted") tih te, "khawpui ruahman loh lian chhohna enna Action Plan a awm lo" ("no Action Plan for checking unplanned urbanisation") tih te, "2015 aṭanga State Plan-a ngaihtuah" ("envisaged in the State Plan since 2015") automated leimin enfiahna din a ni lo tih te, seismic zone V tana National Building Code chu "sample Lawngtlai leh Mamit district-ah pawm a la ni lo" ("yet to be adopted in the sampled Lawngtlai and Mamit districts") tih te, leh July ni 2, 2019-a a chim hnua Durtlang BSUP complex tana IIT-in a rawt hmalakna pakhat mah tih a ni lo tih te a hmu; Mizoram-a storm drainage audit reng reng hmuh a ni lo. Hei hian zawm tir pangngai nei lo dan chuan thil tlem chauh a ti a, State-in leiah ri a hnuh lohnaah court-te-in an hnuh tih a lantir. Professional mawhphurhna (step 6) hi neitu-te chunga sum chawitirna aiin a ṭangkai zawk fo, design-a hming ziaktu chungah a thawh avangin.

10.16 Enfiahna leh thil thleng hnua endikna

10.16.1 **Enfiahna network.** Tier A authority-te chuan an outfall pawimawh leh regional facility-ah chhinchhiah theih ruah tehna (rain gauge) leh tui sang zawng gauge an enkawl tur a ni, emaw an hman theih tur a ni. Data chu minute 15 emaw a aia tlem inkarah vawn tur a ni.

10.16.2 **Thil thleng report.** ULB ram chhunga building-ah tuilian thlentu thil thleng reng reng hnuah, ULB chuan **thla 3** chhungin thil thleng report tawi a buatsaih tur a ni, heng hi chhinchhiahin:

- (a) gauge phalna nei hnai bera ruahtui tlak, duration zelin, Bung 2 design thuk zawng nena khaikhin;
- (b) CWC level-monitoring site hnai berah tui dawngtu luipui level, a awm chuan (Tlawng-a Sairang, emaw Tuirial-a Turial, tuilian sang ber tlangzarh nei site awmchhun, June ni 17, 1995-a 149.0 m; State-ah site pakhatin warning emaw danger level a nei lo), emaw NEEPCO chhinchhiah anga Tuirial reservoir level, datum hming nei zelah, leh, gauge a nih chuan, outfall-ah; Aizawl-a Chite lui leh Ser lui, leh Tlabung-a Khawthlangtuipui ang gauge nei lo lui, luipui emaw dil tan, thil thleng hnua tuilian chhinchhiahna survey leh kawng kal tlanna, rack leh culvert-a lungpui, leimin bal leh bawlhhlawh dah; outfall leh a chunglam drain-a flap gate, debris rack, sediment trap, debris basin, check dam leh pumping station tin dinhmun, a tin aṭanga bal leh bawlhhlawh paih chhuah zat leh pump a tlan darkar zat nen; outfall catchment chhunga leimin, tlang pang chim leh down-drain, interceptor drain leh weep hole tihtawp (blockage), leimin hlauhawm map-ah awmna tarlan; leh tui dawngtu level an ruat chuan Tuirial emaw Serlui B dam gate hawn leh tui chhuah tir;
- (c) tuilian hmun, a thuk zawng leh a rei zawng, theih chuan tuilian chhinchhiahna survey nen;
- (d) public leh endik private facility-te hnathawh, outlet tihtawp, pump tlawlh emaw gate khup reng reng tiamin; leh
- (e) hmalakna rawt.

10.16.3 **Thil thleng hnua endikna.** Thil thleng chuan State chhunga gauge phalna nei pahnih emaw a aia tamah 1% AEP darkar 24 emaw darkar 72 design thuk zawng a khum chuan (Clause 2.14.1), MSDMA chuan, State Stormwater Technical Committee nen, **thla 12** chhungin thil thleng hnua endikna a hruai tur a ni. He Kaihhruaina Bu criteria a tawk em tih a chhut tur a ni a, Clause 1.12 endiknaah a dah lut tur a ni.

10.16.4 **Facility hnathawh sample.** Authority chuan a tlem berah kum 5 zelah, private retention leh detention facility sample chu fûr chhung a enfiah tur a ni, design angin hna an thawk em tih finfiah nan.

Hrilhfiahna. Thil thleng hnua ṭanna hi Clause 2.14.1-a endikna ṭanna ruat tawh a ni. Mizoram leimin leh tuilian-te hi an endik zat aiin an chhiar fo zawk a, an zat chu thu hnarte a inang lo. Cyclone Remal-ah May ni 28, 2024-ah thihna zat chu ni chhung zawngin a pung zel tih report a ni a, May ni 29 thlengin Aizawl district-ah mi 29 an thi a, mi 7 an bo; a hnua report pakhat chuan Melthum–Hlimen lung laihna-ah mi 15 leh Hlimen-ah mi 5, Aizawl hmun pasarihah mi dang 34 thi a ti a, State thihna zat chu 27 aṭanga 29 thleng a ni (a zavaia chanchin tlangzarh angin). Laipuitlang–Ramhlun Venglai lungpui tlak hi chanchinbu chuan May ni 11, 2013 a ti a, paper pakhat chuan May ni 15, 2013 a ti a, chu paper chhiar dan angin mi 17, emaw endikna dang angin mi 8 a that. May ni 24, 2025 aṭanga June ni 3, 2025 thleng DM&R chuan leimin 598, mi panga thi, in 171 chhia leh hmun 257-a kawng dan a chhiar (chanchin tlangzarh angin). June 2017 Tlabung tuilian chuan chhiar dan pakhat angin sub-division chhungah in 350 vel a chim a, district official-te chhiar dan angin in 9 a chim vek a, 60 aia tam a chim ṭhenkhat (chanchin tlangzarh angin). 2017-18 aṭanga 2021-22 chhungin leimin chuan khaw 661 a nghawng a, mi 41 a that a, tuilian chuan khaw 434 a nghawng a, mi 12 a that (CAG, Report No. 1 of 2025). August 2026-ah ruahpui chuan Aizawl, Champhai, Lawngtlai leh Hnahthial-ah leimin a thlen tir a, thihna a awm lo, leh September 2026-ah Vairengte-a leimin chuan naupang mipa pakhat a that (pahnih hi chanchin tlangzarh angin). Heng thil thleng tan DM&R thihna zat tawp hmuh a ni lo [TBC]. Mizoram khawpui reng reng leimin emaw tuilian endikna, leh Aizawl Municipal Corporation, Lunglei Municipal Council emaw MSDMA-in tuilian zau zawng, thuk zawng emaw rei zawng record an vawn hmuh a ni lo, leh heng thil thleng tam zawk tan gauge-in ruah a chhinchhiah lo: Cyclone Remal-a Aizawl ruahtui tlak hriat a ni lo, leh May ni 28, 2024 IMD release-a Mizoram University-a 20 mm chu hun chiang lo tan a ni. NDMA (2010) chuan Class I, II leh III khawpui-ah "sq km 4 tinah 1" ("1 in every 4 sq km") automatic rain gauge a phut. Clause 10.16.1 chuan design leh endikna an ṭanpui hmunah chauh gauge a phut. Report leh sample inkar hun-te hi he Kaihhruaina Bu-in a ruat a ni.

10.17 Data tlangzarh

10.17.1 Authority tin chuan public website-ah heng hi a tlangzarh tur a ni a, a tlem berah thla 3 zelin a siam thar tur a ni:

- (a) **facility register**: he Kaihhruaina Bu hnuaia facility phalna pek tin awmna, chi, design tui zat, luan chhuah tir zat, neitu, as-built lo pawm ni, leh endikna result hnuhnung ber;
- (b) drainage report phalna pek tin tlangpui, Form 2-1 leh 10-2 nen;
- (c) variance leh waiver register (Clause 1.10);
- (d) Policy Supplement (Clause 1.7) hnuaia alternative hman (adopted)-te;
- (e) dan zawm tirna hmalakna (Clause 10.15.5); leh
- (f) thil thleng report leh thil thleng hnua endikna (Clause 10.16).

10.17.2 State Stormwater Technical Committee chuan compliance calculator, Belhchian zawng zawng, tuilian hlauhawm catchment map-te leh facility register-te State-level tlangpui chu open data angin a tlangzarh tur a ni.

10.17.3 Corporate neitu emaw association hming bak mimal data chu tlangzarh loh tur a ni. Infrastructure pawimawh himna kaihhnawih kimchang chu, a chhan chhinchhiahin, tlangzarh loh theih a ni.

10.17.4 Data tlangzarh chu khawl-in a chhiar theih (entirnan CSV leh GeoPackage) a ni tur a ni a, Government Open Data Licence – India emaw open licence inang hnuaiah chhuah tur a ni.

Hrilhfiahna. Hetah hian inhawnna hi design criterion a ni ve ngei. Mizoram drainage record tam tak hi public a ni: Aizawl Municipal Corporation chuan a website-ah AMCBR leh an amendment-te, SD&SM 2017, Mizoram Municipalities Act, 2007 leh Local Council Rules, Master Plan for Aizawl: Vision 2030, 2015 zonal regulation draft leh Roadmap to Stability a tlangzarh; Village Councils Act, 2025, Water Resources Act, 2024 leh Rivers Ordinance leh Bill, 2023 hi State thuziak tlangzarhah an awm; CAG Report No. 1 of 2025, National Green Tribunal hnena State leh MPCB report-te, CPCB tui bal lui chhung list (2025), Tuirial project chungchanga CERC order, CGWB

State profile leh district booklet-te, leh Meteorological Centre Aizawl tana IMD ni tin ruahtui tlak list-te hi online-ah an awm. Thil dang tam tak erawh public domain-ah hmuh theih a ni lo: Master Plan for Aizawl: Vision 2030 phalna notification leh a drain rawt Map 8.3, plan-ah awm mah se lak chhuah a ni lo [TBC]; AMCBR 2019 amendment gazette tawp leh SD&SM 2017 amendment reng reng; Corporation Landslide Hazard Maps (leimin hlauhawmna map) leh MIRSAC atlas layer tlangzarh angin; Lunglei Municipal Council emaw Lai, Mara leh Chakma Autonomous District Council-te building emaw drainage dan thuziak reng reng, leh Village Councils Act model building bye-laws; MISWARC, WARDMA leh MSDMA dinna notification-te, leh Rivers dan enact a nih leh nih loh; Smart City leh AMRUT hna-te tiamin, storm drain reng reng design innghahna; Mizoram ruah tehna reng reng ni tin leh darkar tin record, a ṭan kum nen; CWC site sheet leh gauge datum-te; Tuirial dam tui sang ber level (MWL), spillway data leh tui chhuah tir dan leh Serlui B level reng reng; DM&R thihna zat tawp; leh khawpui reng reng gate, rack, check dam leh drain inventory. Input leh facility record tlangzarh hian mipui, zirchiangtu leh agency dangte chu khawpui private khawlna pung zel chu a awm tak tak em tih endik theihna a pe. Open-format mamawh hi he Kaihhruaina Bu-in a ruat a ni.

10.18 He bung endikna

10.18.1 He bung hi Clause 1.12 hnuaiah Kaihhruaina Bu nen endik tur a ni. Form-te leh compliance calculator chu endikna inkarah State Stormwater Technical Committee-in Clause 10.5.3 hnuaiah a siam ṭha thei.

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Belhchian leh Form

Belhchian / Form	A chhunga thu
10A	Compliance calculator leh user guide
10B	GIS data specification leh attribute schema
10C	Enkawlna kalna kawng lenzawng

Belhchian / Form	A chhunga thu
10D	Facility chi zela O&M plan entirna
10E	Stormwater Design Professional leh reviewer tana empanelment criteria
Form 10-1	Drainage Report Checklist
Form 10-2	Compliance Calculator Tlangpui
Form 10-3	Professional Design Certificate
Form 10-4	Hold-Point Endikna Record
Form 10-5	As-built Certificate
Form 10-6	Enkawlna Puanchhuahna (Maintenance Declaration)
Form 10-7	Kumtin Enkawlna Puanchhuahna leh Endikna Report
Form 10-8	Asset Hlanna Certificate
Form 2-1	Design Ruahtui Tlak Sheet (Bung 2)

BUNG 11

Basin leh Khawpui Ruahtui Luanna Master Plan

11.1 Tum leh a huam chin

11.1.1 Bung 2 aṭanga 10 thleng hian project pakhat zel a thunun. He bung hian chu project-te inzawmtirtu plan tan mamawh tur a ruat: **Basin Ruahtui Luanna Master Plan (BSMP)**. Khawpui emaw urban area pakhat drainage basin (lui pakhat emaw outfall pakhata ruahtui luan khawmna ram) tin tan BSMP pakhat buatsaih a ni. Khawpui pakhat BSMP zawng zawng chuan a **Khawpui Ruahtui Luanna Master Plan (City Stormwater Master Plan)** a siam.

11.1.2 BSMP chuan:

- (a) basin tan tunlai leh nakin dinhmunah tuilian hlauhawmna a map tur a ni;
- (b) tui luanna system (drainage system) hmun tin-in a thlen ngei ngei tur level of service (LoS; tuilian laia system hlen tur tehna) a ruat tur a ni (Clause 11.6);
- (c) chu level of service thlen nan hna, khawlna (storage) leh ram mamawhte a zawn chhuak a, a pawimawh dan indawtin a dah tur a ni (Clause 11.7 leh 11.8);
- (d) regional storage, dil leh tank siam ṭhat lehna leh tui luanna lian (major flow path) tan dan anga ram hman dan plan (statutory land-use plan)-ah ram a dah hran tur a ni (Clause 11.9);
- (e) Bung 4 hnuaia site design-te innghahna basin bik thil: regional facility, fee-in-lieu unit rate leh Bung 4 aia khauh zawk basin release rate (luan chhuah tir zat) a awm chuan, a ruat tur a ni (Clause 11.8.3); leh
- (f) catchment (ruahtui luan khawmna hmun) flood-sensitive (tuilian hlauhawm) anga notify (Gazette-a tarlan) tur a rawt tur a ni (Clause 4.5.4).

11.1.3 **Site design nena inzawmna.** BSMP awm emaw awm lo emaw, site criteria (Bung 4 aṭanga 8 thleng) hman a ni. BSMP chuan a basin tan site criteria chu a **khauh zawk** thei. Clause 4.13 leh 4.5.6-a regional detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) leh fee-in-lieu kawng chauh lo chu, a tihzangkhai loh tur a ni.

> **Hrilhfiahna.** Mizoram khawpui pakhatah mah design ruahpui nei storm-drainage master plan tlangzarh a awm lo. Master Plan for Aizawl: Vision 2030, Aizawl Development Authority tana IIT Kharagpur Department of Architecture and Regional Planning-in a buatsaih (Chief Minister thuchah, September ni 11, 2012) hi khawpui plan hmuh chhun a ni; OBPAS-in rawtna tin a endik nan a hmang (AMCBR, 2023 amendment), mahse a phalna notification hmuh a ni lo a, thu hnar pakhatin March 2013 a tih hi finfiah a ni lo [TBC]. A drainage bung chuan a sawifiah a, a rawt a; design a siam lo. A hmuh dan chu: "Aizawl Urban Area 67% hi kutcha drain a ni a, 18% hi tui luanna system reng reng a nei lo. Hmun 15% chauhin pucca drain a nei" ("67% of Aizawl Urban Area is having kutcha drains and 18% are without any drainage system at all. Only 15% of the area is provided with pucca drains"); "tlang panga a awm avangin Aizawl-ah tui tlin nasa a awm lo" ("no major water logging in Aizawl as it is situated in sloppy ground"), mahse Aizawl W-I area 33%-ah "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") tui a tling a, chu chu kawng sir drain (tui luanna)-a bawlhhlawh avanga ni angin a sawi; drain-te chu "hydraulic design a tlachham avangin leidipin a khat fo" ("silted up frequently due to insufficiency in the hydraulic design"); leh plan area chhunga khua 8% chauhin enkawl reng drain an nei. Drainage kawng awm sa chu nghet taka siam leh tui luanna pianphung chu "outfall-ah tihfaina hmanrua nen" ("with treatment facilities at the outfall points") humhalh a rawt a, a Map 8.3-ah drain leh catchment network a dah (lak chhuah a ni lo [TBC]), check dam riat, Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum leh Hlimen hnuaiah a rawt bawk; design ruahpui, return period (kum engzat

zelah nge a lo thlen ṭhin) emaw runoff coefficient a ruat lo a, drain pakhat mah a lenzawng a chhut lo. A hlauhawmna zoning kengkawh tur zonal leh ward development plan-te chu hman a la ni lo: an regulation-te chu May ni 17, 2023-ah sawrkar hnenah thawn a ni a, September 2023 thleng phalna pek a ni lo (CAG), leh 2015-a draft regulation-te pawh draft-ah a awm reng. Roadmap to Stability (Landslide Policy Committee for Aizawl City, 2014) chuan PHED hnenah "tlang pang hawng aṭanga hlatah ruahtui leh tui bal man leh phurh tur facility design leh sak nan kum nga capital outlay plan pawm leh hlen chhuak, nghet lo thei tlang pang tihhnawng lo tur hmunah paih chhuak" ("Adopt and implement a five year capital outlay plan to design and construct facilities to capture and transport rain and waste water away from exposed hillslopes and ejected at locations that will not saturate potentially unstable slopes") leh "Aizawl City chhunga septic tank, leach field leh soak pit zawng zawng paih bo" ("eliminate all septic tanks, leach fields and soak pits within Aizawl City") a ti a; chutiang plan hmuh a ni lo [TBC]. ADB, Aizawl Smart City Ltd emaw AMRUT storm-drainage project hmuh a ni lo a, Lunglei tan chuan a hming chauh hriat Development Planning Area notification bak plan engmah hmuh a ni lo [TBC]. Mizoram khawpui eng a storm drain tan pawh design return period ruatna thuziak tlangzarh a awm lo. Chutiang plan-in a mamawh design ruahpui, level of service, khawlna leh buffer criteria chu he bung hian Bung 2-a design ruahpui leh Clause 11.6-a level of service hmangin a pe a; UD&PA, Aizawl Municipal Corporation, Lunglei Municipal Council, PHED, IWRD, MSDMA, Village Council emaw District Council reng reng, emaw pawl dang reng rengin pawm a ni lo. Site tana kaihhruaina bu chuan basin buaina a tifel thei lo: dil (tank) khawlna bo; drain hawng, soak pit leh thunun loh tui luang chhuak avanga a hnawng a, a min thleng tlang pang, Laipuitlang-ah 2013-a leh Cyclone Remal laia 2024-a Melthum–Hlimen quarry pangah ang khan; Aizawl Urban Area 85%-ah kutcha emaw awm lo, "fûr hun chhungin tui luan chak tak nen an luang buai" ("turbulent with high velocities of currents during the monsoon season") lui chhuk nasaah tawp drain-te; sewered catchment pakhat chauh nei khawpui in chhunga tui bal (sullage) leh septic tui bal Chite leh Tuikual luiah, chuta ṭang chuan an tui petu luipuiah phurtu drain-te; phai tlemte, Tlabung, Sairang leh Bairabi te pawh tiamin, luipui tuilian; Aizawl Municipal Corporation, PWD, national-highway agency-te, Village Council-te leh, chhim lamah, District Council-te inkara ṭhen lui pakhat; leh amah chauhin a tawk na a, lui chhung dawt tilian ral drain-te. Kaihhruaina bu dang tehkhin theihte chuan site criteria leh basin ruahmanna an hmang dun:

- Denver-a Mile High Flood District chuan regional facility leh release rate ruatna major drainageway master plan a buatsaih.
- Kansas City APWA criteria hi regional watershed zirchianna (MARC) innghahna a ni.
- England-a Surface Water Management Plan-te (Defra, Surface Water Management Plan Technical Guidance, 2010) chuan buatsaihna, hlauhawmna tehna, thlan theih dante leh kengkawhna tih ang kalphung kal zel a ruat.
- Malaysia-a MSMA chuan urban area-te tan drainage master plan a phut.

He bung hian chu kalphung chu Mizoram, series-a North-East edition panganna leh a pang ber, tan a siam rem: tlang chhip leh tlang panga sak khawpui tan, Aizawl ang, Tlawng leh Tuirial phai inkara tlang chhipah awm, phai mahni nei lo, ruahtui hlauhawmna pui ber chu tuilian ni lovin drainage-in a ṭan tir leimin a nihna, leh drain-te lui chhuk nasaah an tawpna; phai leh lui kam zawl tlemte tan, Tlabung, Sairang, Bairabi, Vairengte, Chawngte leh Champhai phai, official taka flood plain nei lo nia sawi State-ah luipui tuilian tuar ṭhinte; CWC subzone 2(c)-ah a pumpui awm State tan, CWC-in Flood Estimation Report a tlangzarh lohna, ruah tehna (rain gauge) pakhatin mah darkar 24 record tlangzarh a neih lohna, chuvangin hmun tinah NIH-DHAARA chu Clause 2.3.6-a floor (hniam ber)-te nen design hnar a nihna; tui lut thei lo lei tan, CGWB-in "ruahtui luang chhuahna zone" ("run off zone") a tih Surma-group shale leh siltstone, tui chu well aṭanga ni lovin tuikhur (spring) leh in chung aṭanga lak a nihna; sewered catchment pakhat chauh nei khawpui sewer ang drain-te tan; swale, interceptor drain (cut chung lama ruahtui dangtu drain) leh down-drain (tlang pang zawh chhuk drain) geometry ruat a, design ruahpui erawh pe lo, khawpui pakhat chauh tana slope regulation tan; legal geography pathum, municipality-te, Village Council area-te leh Lai, Mara leh Chakma Autonomous District Council-te, State building, water-resources emaw rivers dan reng rengin a thlen lohna tan; leh a ruahpui thihna tam ber south-west monsoon hmaa May-a lo thleng ṭhinna fûr hun tan, chuvangin basin tinah BSMP chu ruahpui ni lovin hlauhawmna aṭangin a ṭan (Clause 11.3.3).

11.2 Thumal awmzia

Thumal	He Kaihhruaina Bu-a a awmzia
Basin	Tuifinriat, luipui emaw tui awmna (waterbody) lian lama outfall (drain tui luan chhuahna) pakhata luang ram, Clause 11.3 hnuaia tehfel ang.
Basin Ruahtui Luanna Master Plan (BSMP)	He bung hnuaia basin pakhat tana buatsaih plan.
Lead Authority	BSMP buatsaihtu tur pawl (Clause 11.4).
Level of service (LoS)	Tui luanna system hmun khatin tuilian laia a thlen ngei ngei tur, AEP (kum khatah a lo thlen theih dan) leh a rah chhuah hmanga sawi (Clause 11.6).
Tuilian hlauhawmna map (flood hazard map)	AEP leh scenario sawi chiang tana tuilian zau zawng, a thuk zawng, a chak zawng leh hlauhawmna class (H1–H6, Bung 6) map.
Regional facility	Development pakhat aia tam rawngbawltu, BSMP-a tarlan khawlna, luan tirna emaw outfall hna.
Capital Improvement Programme (CIP)	BSMP-a hna tarlanna, a pawimawh dan indawt leh a senso chhut (Clause 11.8.4).

11.3 Ruahmanna bul: basin, ward ni lovin

11.3.1 BSMP-te chu ward, zone emaw local body ramri ni lovin **hydrology basin zelin** buatsaih tur a ni. Basin-in local body ramri a kal tlang a nih chuan, BSMP pakhatin basin pumpui a huam tur a ni.

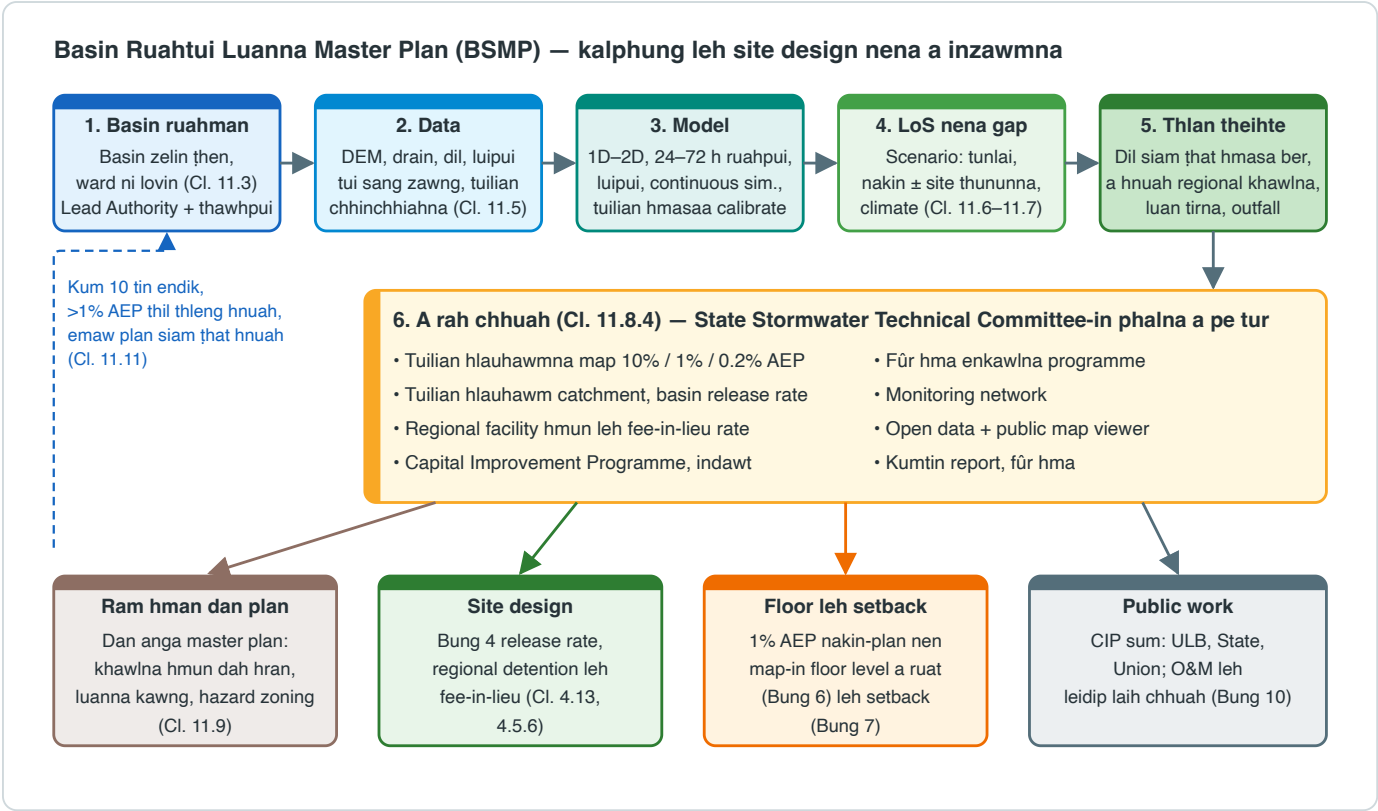
11.3.2 Basin ramri chu Clause 11.5.2-a digital elevation model aṭanga tehfel tur a ni a, drain network, kawng embankment (dai), canal leh dil (tank) tui petu channel nen khaikhin tur a ni. Basin inkara tui hawitir (diversion), canal, drain emaw surplus course hmanga a ni emaw, map-ah dah leh model-ah tarlan tur a ni.

11.3.3 Mizoram khawpui eng atan pawh basin tehfelna tlangzarh a awm lo. Hriatna-in a tarlanna urban area-te tan chuan, basin-te chu a tlem berah heng hi an ni, Clause 4.5.3.2-a flood-sensitive catchment indawt dan angin:

- **Aizawl khawchhak, Chite lui: Chite lui** catchment **Tuirial** thleng, a lui kaite, Chanmari, Ramthar, Mirawng, Tlak, Bangla, Taite, Bethlehem veng, Lawibual, Hmawngkawn, Zemabawktuikhur, Zuangtui leh Kawmthlang lui leh khawpui khawchhak lam pawh luang chhuaktu Muthi leh Tuipawl lui nen (Master Plan for Aizawl: Vision 2030); plan-a lui chhung tichhe nasa tarlan, Chite sewage treatment plant leh Chite lui Priority II chhung chu 1D network-ah; leh lui pakhatah mah gauge a awm loh avangin, survey-a tuilian chhinchhiahna leh lui leidip, bal leh bawlhhlawh nena 1% AEP tui sang zawng chu boundary condition atan;
- **Aizawl khawthlang, Ser lui: Ser lui** catchment **Tlawng** thleng, a lui tê hrang hrang, Ramri, Tuikal, Vai leh Zawngkawt lui leh Khatla, Tuikual, Vaivakawn leh Chanmari west lui, khawthlang lama "lui leh nullah tichhe nasa ber" ("the worst destructive streams and nullahs") (plan bawk), boundary condition ang chiah nen;
- **Aizawl, heng basin chhunga hlauhawm hmun:** khawpui chhim lam ramria **Hlimen–Melthum quarry belt**, **Hunthar Veng** lei chim chhuk zelna hmun leh Hunthar-a **NH-6** cut-te, leh **Durtlang Bawngkawn–Durtlang road** nen, an bal luanna kawng nen basin pahnih zinga a luanna lamah map tur [TBC];
- **Sairang, Tlawng: Tlawng**-a luang lut Sairang catchment-te, Sairang-a CWC tui sang zawng enna hmun (gauge-a tuilian sang ber, high flood level, tlangzarh a awm lo) leh survey-a tuilian chhinchhiahna boundary atan, leh outfall khar dinhmun chu design case atan (Clause 5.8.5(c));
- **Bairabi leh Vairengte, hmar lam phai:** sub-area MZ-A1-a khawpui pahnih catchment-te, a tlem berah darkar 72 ruahpui tan tui dawngtu luipui survey-a tuilian chhinchhiahna boundary atan, leh a hnuai lam lui chhung tan series-a Barak-phai dan bulhnai hman;

- **Tlabung, Khawthlangtuipui:** sub-area MZ-D1-a **Khawthlangtuipui**-a luang lut Tlabung catchment-te, darkar 72 aia tlem lo chhung luipui a survey-a tuilian sang zawnga awm chu boundary atan (Clause 5.8.5(d)), June 2017 leh July 2019 tuilian chu calibration hriatna atan, leh a hnuai lamah India thununna a awm lo;
- **Lunglei khawpui:** Lunglei catchment-te leh an tui dawngtu lui-te, an hming leh outfall-te chu BSMP hmasa berah finfiah tur [TBC];
- **Serchhip khawpui:** Serchhip catchment-te, a area 89.2% chu 30° aia pang zawk (MIRSAC slope class aṭanga he Kaihhruaina Bu chhutna), Mat lama luang lui-te nen [TBC];
- **Champhai khawpui leh Champhai phai:** khawpui leh sub-area MZ-C1-a buh zawl catchment-te, Tiau lama luang, survey-a tuilian chhinchhiahna boundary atan, leh India gauge reng aia hla Myanmar lui chhung-te nen;
- **Siaha leh Lawngtlai:** sub-area MZ-D-a Autonomous District Council khawpui pahnih catchment-te, District Council-te kaltlangin chauh, Kaihhruaina Bu hi an pawm chuan; leh
- **Tuirial tui chhuah tirna lui chhung:** NEEPCO dam hnuaia **Tuirial**-a luang lut catchment-te, tui chhuah tir record lian ber, emaw NEEPCO-in a pek hma chu spillway capacity, boundary atan (Clause 5.8.5(e)).

Sub-area tinah hlauhawmna hmasa ber (he Kaihhruaina Bu-in a ruat). Belhchian 2A-a sub-area tinah, State ruahtui hlauhawmna pui ber chu drainage-in a ṭan tir leimin a nih avangin, BSMP tin chu leimin, debris flow (bal luang), quarry pang, lei chim chhuk, phai rama luipui tuilian leh dam tui chhuah tir hlauhawmna endikna (hazard screening) hmangin a ṭan a, chu chu Corporation Landslide Hazard Maps (leimin hlauhawmna map) leh MIRSAC zonation a awmnaah, MSDMA leh DM&R inventory a awmnaah [TBC], leh Tuirial dam hnuaia NEEPCO tui chhuah tirna lui chhung hmanga siam a ni a, subzone 2(c)-in a neih loh CWC report aiah site bik hydrology a hmang (Clause 2.3.6(b), (c) leh (i)), ruahpui tawite bakah Clause 2.3.6(e)-a darkar 72 ruahpui nen. A chhan chu record hi a ni: "ram pum zinga 71 per cent aia tam chu Very High aṭanga Moderate Hazard Zone-ah a awm" ("more than 71 per cent of the total area is in Very High to Moderate Hazard Zone"), leh 2017-18 aṭanga 2021-22 chhunga leiminin khua 661 a nghawng a, mi 41 a thah (CAG, Report No. 1 of 2025); Directorate of Geology and Mineral Resources team-in "leimin lian ṭhena thum ṭhena hnih … chu tui luanna ṭha lo avanga thleng a ni" ("two-thirds of large-scale landslides … were due to improper drainage") tih an hmu (2022-23, chanchin tlangzarh angin); leh State ruahpui thihna tam ber ni chiang neite, Laipuitlang 2013, Cyclone Remal 2024 leh May ni 24 aṭanga June ni 3, 2025 thleng ruahpui te chu leimin an ni a, tuilian an ni lo. Hlauhawmna zone-te chu 1% AEP map-ah tarlan a ni a, an chhungah drain, khawlna emaw pumping station dah a ni lo, tlang ramah leiah tui luh tir a ni lo (Clause 4.11, tlang dan (hill rule)), leh CIP-a hna pakhat mah debris flow emaw leimin phur thei tura lenzawng chhut a ni lo. Khawpui dangte chuan an basin-te chu anmahni huamtu BSMP hmasa berah an tehfel ang. CWC, NEEPCO, master plan emaw court-in high flood level, reservoir level, ri emaw dam, gate emaw pumping station kalpui dan (operating rule) an neih chuan, BSMP chuan a boundary condition chu chuta ṭangin a la tur a ni a, chung level-te chu amah 1% AEP map-ah a tarlan tur a ni.



Milem 11.1 — Basin Ruahtui Luanna Master Plan kalphung leh site design nena a inzawmna. He Kaihhruaina Bu tana milem siam thar. Phase ruangam hi Defra, Surface Water Management Plan Technical Guidance (2010) leh Mile High Flood District master planning hmanna aṭanga siam danglam a ni.

Hrilhfiahna. Tui hian ward ramri a zawm lo. Ward tin tana drain plan chuan buaina chu ward dawtah, local body dawtah a hlan thei. Mizoram-ah lui pakhat chu tlang chhip aṭanga luipui thlengin kut tam takah a kal. Aizawl chu khawchhak lamah Tuirial-ah Chite lui kaltlangin a luang, chu chuan khawpui "chhak lam ṭhena thum ṭhena hnih aia tam" ("more than two-third of eastern portion") chu a lui kaite, Chanmari, Ramthar, Mirawng, Tlak, Bangla, Taite, Bethlehem veng, Lawibual, Hmawngkawn, Zemabawktuikhur, Zuangtui leh Kawmthlang lui nen a la a, Muthi leh Tuipawl lui kaltlang bawkin; leh khawthlang lamah Tlawng-ah Ser lui leh a lui tê hrang hrang, Ramri, Tuikal, Vai leh Zawngkawt lui kaltlangin (Master Plan for Aizawl: Vision 2030). Chung lui-te chu storm drain, sewer leh khawpui tui petu luipui tui petu an ni nghal: CPCB chuan Chite lui "SIPMIU STP bul aṭanga Armed Veng thleng" ("near SIPMIU's STP to Armed Veng") leh Tuikual lui chu a polluted river stretches Priority II-ah a dah (2025), leh master plan chuan septic tui bal chu "drain leh cross drain hmangin tui pekna hnar luipuiah" ("through drains and cross drains to the rivers, which are the sources of water supply") a luang tih a hmu. Lui pakhat kamah public drain leh public street drain-te chu Aizawl Municipal Corporation ta a ni (Mizoram Municipalities Act, 2007, s.289(1)), State kawng sir drain-te chu tihdan pangngaiah PWD ta an ni a, NH-6 ta chu national-highway agency-te ta, sewer-te leh Chite sewage treatment plant chu PHED leh SIPMIU ta, lui pianphung leh riverine reserve a awm chuan EF&CC leh Land Revenue & Settlement Department mawh a ni (he Kaihhruaina Bu chhiar dan), leh khawpui hnuaiah lui chuan Village Council ram a kal tlang. Khawpui piah lamah luipui-te chuan State an chhuahsan: Tlawng, Tuirial leh Tuivai chu hmar lamah Barak phaiah, Khawthlangtuipui chu chhim thlang lamah Bangladesh-ah, Chhimtuipui chu chhim lamah Myanmar-ah, leh Tiau, khawchhak ramriah, Myanmar-ah (he Kaihhruaina Bu chhiar dan); chhim lamah Lai, Mara leh Chakma Autonomous District Council-te chu municipal, village-council leh water-resources Act-te hnuaiah an awm vek lo. Lui leh municipal drain inṭhenna dan reng a awm lo (he Kaihhruaina Bu-in record a chhiar dan angin). He clause hian basin chu ruahmanna bul atan a siam, chutiang chuan model pakhatin lui tin chu tlang chhipa a hnar aṭanga luipui emaw reservoir (tui khuah) thlengin, lui chhung tin neitu tu pawh ni se, a phur thei nan, leh a ek tui phur chu luipui a thlen hmaa ṭhen hran a nih nan (Bung 8, Clause 8.9.5).

11.4 Tu nge buatsaih ang, engtikah nge

11.4.1 **Lead Authority.**

- Aizawl Development Plan Area basin-te tan: **Aizawl Municipal Corporation**, public drain leh public street drain-te a tana awm (Mizoram Municipalities Act, 2007, s.289(1)) leh a Board of Councillors-in AMCBR leh SD&SM a siamna (s.371), a **Local Council**-te nen, **Urban Development & Poverty Alleviation Department (UD&PA)** nen ṭangkawpin; UD&PA chu urban area master planning kaltu a ni a, a plan-te, Master Plan for Aizawl: Vision 2030 leh a hnua lo awm tur zonal leh ward plan-te chhungah BSMP dah luh a ni (Clause 11.9). Lunglei basin-te tan: **Lunglei Municipal Council**, UD&PA nen. Mawhphurhna tin hi Kaihhruaina Bu hi pawm a nih chuan chu pawl hna tur chauh a ni. Basin chu municipal ramri piah lam thleng a zau chuan, a kal tlang khuate Village Council-te chu thawhpui an ni a, BSMP pakhatin basin pumpui a huam (Clause 11.3.1).
- Lui leh lui pianphung chu municipal drain aṭanga, emaw local body drain chu luipui leh reservoir aṭanga ṭhen hrangtu order hmuh a ni lo; chutiang a siam hma chu, he Kaihhruaina Bu hian BSMP tin chhunga lui chhung-te chu heti hian a ṭhen, pawl tin chu lui chhung leh hna a neih emaw a kalpui-te leh chunga CIP ṭhenah Lead Authority a ni: luipui leh an tuilian hna tan **IWRD**; an ta drain-te tan **Aizawl Municipal Corporation** leh **Lunglei Municipal Council**; State kawng-te sir drain, catch-water drain leh culvert (kawng hnuaia tui kalna) tan **PWD**, leh NH-6 leh national highway dangte ta tan **national-highway agency**-te, an hna lei paih nen; sewer-te leh Chite sewage treatment plant tan **PHED** leh **SIPMIU**; Tuirial reservoir, a level leh a tui chhuah tir tan **NEEPCO**, leh Serlui B tan State power department; lui pianphung leh riverine reserve a awm chuan **EF&CC** leh **Land Revenue & Settlement Department** (he Kaihhruaina Bu chhiar dan); municipality pawn lama khua drain-te tan **Village Council**-te; leh BSMP-in a tarlan ngei ngei tur leimin, bal leh lei chim chhuk hlauhawmna map tan **MSDMA**, DM&R, Corporation Landslide Hazard Maps leh MIRSAC zonation nen.
- Urban local body nei lo notify a nih khawpui-te, Serchhip, Champhai leh Kolasib te pawh tiamin (chutiang khawpui 13 CAG chhiarna he Kaihhruaina Bu chhiar dan), leh Tier B pawl dangte-ah: Lead Authority chu UD&PA-in a ruat, khawpui Village Council-te nen; Autonomous District Council area-ah, Siaha leh Lawngtlai te pawh tiamin, District Council a ni, District Council-in Kaihhruaina Bu a pawm chauhin (pakhatin mah a pawm lo). Lui chhung emaw reservoir inang lama luang basin-te chu district plan pakhatah dah khawm theih a ni.

MSDMA leh Deputy Commissioner chu BSMP tin-ah rawn tur an ni; NEEPCO chu Tuirial reservoir emaw a dam hnuaia lui chhunga luang basin nei BSMP tin-ah, leh Serlui B tan State power department; EF&CC chu riverine reserve emaw wetland huam basin nei BSMP tin-ah; MPCB chu ek tui phur lui emaw drain-a hna rawt BSMP tin-ah, Chite, Tuikual leh Lawibual lui te pawh tiamin; Village emaw Local Water Resources Committee chu tuikhur emaw tui hnar dang hriat sa nei basin BSMP tin-ah; ram neitute, emaw Village Council, chu corridor (lui leh drain kama humhalh tur ram zau) emaw khawlna tan mimal ram emaw land pass-a chelh ram mamawh BSMP tin-ah, chu ram chu master plan-ah dah hran emaw inremna (agreement) hmanga humhim a ni; leh, outfall chu Barak phaia luang zel luipui-ah a awm basin tan, Tlawng, Tuirial emaw Tuivai ang, State bulhnai water resources department chu IWRD kaltlangin.

Irrigation & Water Resources Department (IWRD) chu a thununna hnuaia luipui, canal emaw dil huam BSMP tin-ah thawhpui a ni tur a ni.

11.4.2 **BSMP engtikah nge a ngaih.**

- (a) Tier A pawl tin chuan he Kaihhruaina Bu hman ṭan a nih aṭanga **kum 3** chhungin a area pumpui huam BSMP-te phalna a pe tur a ni.
- (b) Heng hma hian BSMP a ngai:
  - Clause 4.13 hnuaia regional detention emaw fee-in-lieu lo pawm a nih hmaah;
  - Clause 4.5.6.3 hnuaia fee vawn chu hman a nih hmaah; leh
  - Clause 11.8.3 hnuaia basin bik release rate hman a nih hmaah.
- (c) Tier B pawl chuan a Lead Authority emaw State Stormwater Technical Committee-in in emaw kawngpui lian tuilianin a chim fo tih a hmuh chuan BSMP a buatsaih tur a ni.

11.4.3 **Buatsaihna.** BSMP-te chu basin-scale model siamnaa tawnhriat nei, Stormwater Design Professional (Bung 10) anga empanel engineer-in, emaw a kaihhruaina hnuaiah buatsaih tur a ni.

11.5 Data leh survey

11.5.1 BSMP tin chuan Table 11.1-a data chu a khawn khawm a, a tlangzarh tur a ni (Clause 11.10):

Table 11.1 — BSMP tana data leh survey mamawh tlem ber

Data	Mamawh tlem ber
Lei sang hniam (terrain)	LiDAR emaw photogrammetry aṭanga digital elevation model, urban area-ah vertical accuracy 0.15 m RMSE emaw a aia ṭha zawk, Survey of India datum-a phuar
Drain network	Public drain, culvert leh outfall zawng zawng inventory, invert level (tui luanna hniam ber), lenzawng, dinhmun leh leidip thuk zawng nen; mimal drain 600 mm chung
Tui awmnate	Bung 7 hnuaia tank, dil, dil tê (pond) leh marsh zawng zawng survey: FTL, MWL, bund level, stage–storage, sluice, surplus weir, tui petu channel, luah hnehna (encroachment)
Luipui leh canal	Cross-section, m 200 aia hla lo inkarah leh structure tin-ah
Outfall, lui, luipui, dil leh reservoir	Level tin datum; phai ramah, outfall invert level chu tui dawngtu luipui high flood level nen, CWC tui sang zawng enna hmun hnai ber a awm chuan (Tuirial-a Turial, June ni 17, 1995-a 149.0 m, tlangzarh chhun; State-ah hmun pakhatin mah warning emaw danger level a nei lo; CWC level-te chu SANDRP-in a ziah chhuah ang, chanchin tlangzarh angin, datum sawi lovin), a dang chu survey-a tuilian chhinchhiahna nen, gauge local a awm chuan series hrangah vawng; tlang chhip khawpui outfall zalen-te tan, Aizawl-a Chite lui leh Ser lui te pawh tiamin, tui dawngtu lui bed leh kam profile lui inzawmna dawt thleng, a bal leh bawlhhlawh ri, leh a leidip, bal leh bawlhhlawh nena 1% AEP tuilian sang zawng; Tuirial reservoir emaw Tuirial leh Serlui B dam hnuaia lui chhung-a outfall tan, NEEPCO full reservoir level (90.5 m) leh minimum drawdown level (68.0 m), maximum water level leh spillway leh tui chhuah tir data, leh State power department aṭanga Serlui B level-te [TBC], eng nge hman tih sawi chiang; dil-te chu an survey-a tui luan chhuah level-ah; Aizawl Municipal Corporation Landslide Hazard Maps leh MIRSAC zonation-a leimin hlauhawm zone-te, 60° chunga tlang pang, quarry hman mek leh hman tawh loh, Hunthar Veng lei chim chhukna hmun leh lei laih pang, lei vur leh retaining wall hnuaia bal luanna kawng; leh outfall-a flap gate, debris rack (bal dangna), sediment trap, debris basin, check dam leh pumping station a awm chuan, an capacity leh kalpui dan nen
Ruahtui tlak leh level	Ruah tehna awm zawng zawng (IMD, a Meteorological Centre Aizawl leh Lengpui-a ruah tehna pangngai, IMD *Extremes*-ah pakhatmah tel lo, leh Mizoram University, Kolasib, Champhai, Khawzawl, Serchhip, Hnahthial, Saiha leh Chawnhu-a a automatic weather station-te (record rei zawng [TBC]); Mz-SWIC hnuaia automatic rain gauge leh weather station tarlan, hmun 30 vel (thu hnarah a kaltu hming kimchang a awm lo; ṭan kum leh logging interval [TBC]); Directorate of Science and Technology State Meteorological Centre, a series 1980s aṭanga 2021 thleng (gauge list hmuh a ni lo [TBC]); Serchhip, North Vanlaiphai, Lunglei, Haulawng leh Tlabung-a Agriculture Department ruah tehna pangngai; CWC ruah tehna, Bairabi, Dapchhuah, Mat-1, Tlabung, Tuichawng, Tuipui D leh Shitlangpui te pawh tiamin, leh Sairang leh Turial-a a tui sang zawng enna hmun; Tuirial dam-a NEEPCO reservoir record [TBC]; leh Aizawl Municipal Corporation, MSDMA emaw IWRD gauge emaw sensor an neih [TBC]) leh tui sang zawng record, May ni 28, 2024 (Cyclone Remal: Melthum leh Hlimen inkara lung laihna (quarry) hman tawh loh chu zing dar 6 velah a chim a, Aizawl-ah leimin dang a awm bawk; May ni 29 thlengin Aizawl district-ah mi 29 an thi a, mi 7 an bo tih report a ni a, a hnuah quarry-ah mi 15 leh Hlimen-ah mi 5, emaw Aizawl hmun pasarihah mi 34, leh State pumah mi 27–29 tih a ni (a zavaia chanchin tlangzarh angin); May ni 27–28, 2024-a Aizawl ruahtui tlak zat hmuh a ni lo a, May ni 28-a IMD thuchhuaha Mizoram University-a 20 mm chu hun eng chhunga mi nge tih a chiang lo), May ni 24, 2025 aṭanga June ni 3, 2025 thleng (leimin 598, mi panga thi, in 171 chhe leh kawng tihtawp hmun 257, Champhai 209, Serchhip 116, Khawzawl 75, Lunglei 61 leh Aizawl 21, DM&R chhiarna (chanchin tlangzarh angin); ni khatah Serchhip 104.6 mm, Kolasib 98.3 mm leh Aizawl 97.4 mm, chu ni chu chiang lo (chanchin tlangzarh angin); he ruahpui tan IMD series hmuh a ni lo), June 2018 (ni khatah Aizawl-ah 148 mm, June ni 12 a ni maithei, leh June ni 1 aṭanga 13 thleng Serchhip district-ah 677 mm, June ni 5-ah leiminah mi sawm an thi, Tiperabagh, Serhuan leh Tlabung-ah in tuilianin a chim a, Sairang-ah chhungkua an tang (a zavaia chanchin tlangzarh angin)), July 2019 (Tlabung-ah Khawthlangtuipui tuilianin in 400 vel a chim, a zinga 150 chu khawpui chhungah, leh State-ah mi pathum an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) leh June 2017 (Tlabung-a Khawthlangtuipui tuilian, chhiarna pakhatin sub-division-ah in 350 vel tuiin a chim a ti a, chhiarna dangin in 9 a kim vek leh 60 aia tam a ṭhen a chim a ti, mi 8–10 an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) chanchinte tan pawh tiamin
Tuilian hriatna	Hun kal tawha tuilian aṭanga survey-a tuilian chhinchhiahna leh map-a tuilian zau zawng, mipui report te pawh tiamin

Data	Mamawh tlem ber
Ram hman dan	Tunlai ram hman dan leh tui luh theih lohna (imperviousness); dan anga master plan aṭanga nakin ram hman dan
Lei leh leihnuai tui	HSG map (Belhchian 3A); fûr hun leihnuai tui sang ber; aquifer leh recharge (leihnuai tui tihpun) zone
Sewer inzawmna	Ek tui inzawmna dik lo hriat sa, drain-a ruah sur lohna hun tui luang (DWF), leh bawlhhlawh tamna hmun

Hrilhfiahna. 0.15 m accuracy hi a entirna hmasa chiang a awm lo; he Kaihhruaina Bu hian a ruat chhan chu, Sairang, Bairabi, Vairengte, Chawngte leh Tlabung-a phai leh lui kam zawl-ah leh Champhai phaiah, luipui-in tlang pang zawi tak chungah tui a dang let ṭhinnaah, leh dil leh reservoir kamah, kawng sang, lei vur paih emaw bang hniam tein phai sir khat aṭanga tui luan chhuak chu sir lehlamah a hawitir theihnaah, lei sang zawng dik lo tê-in tuilian ri chu hla takah a sawn thei a, BSMP aṭanga 1% zau zawng chuan floor level (Bung 6) leh setback (tui kam aṭanga hmun kalhlen tur) (Bung 7) a ruat a ni. Hun kal tawha tuilian chhinchhiahna hi model ang bawkin a pawimawh. May ni 28, 2024 (Cyclone Remal: Melthum leh Hlimen inkara lung laihna (quarry) hman tawh loh chu zing dar 6 velah a chim a, Aizawl-ah leimin dang a awm bawk; May ni 29 thlengin Aizawl district-ah mi 29 an thi a, mi 7 an bo tih report a ni a, a hnuah quarry-ah mi 15 leh Hlimen-ah mi 5, emaw Aizawl hmun pasarihah mi 34, leh State pumah mi 27–29 tih a ni (a zavaia chanchin tlangzarh angin); May ni 27–28, 2024-a Aizawl ruahtui tlak zat hmuh a ni lo a, May ni 28-a IMD thuchhuaha Mizoram University-a 20 mm chu hun eng chhunga mi nge tih a chiang lo), May ni 24, 2025 aṭanga June ni 3, 2025 thleng (leimin 598, mi panga thi, in 171 chhe leh kawng tihtawp hmun 257, Champhai 209, Serchhip 116, Khawzawl 75, Lunglei 61 leh Aizawl 21, DM&R chhiarna (chanchin tlangzarh angin); ni khatah Serchhip 104.6 mm, Kolasib 98.3 mm leh Aizawl 97.4 mm, chu ni chu chiang lo (chanchin tlangzarh angin); he ruahpui tan IMD series hmuh a ni lo), June 2018 (ni khatah Aizawl-ah 148 mm, June ni 12 a ni maithei, leh June ni 1 aṭanga 13 thleng Serchhip district-ah 677 mm, June ni 5-ah leiminah mi sawm an thi, Tiperabagh, Serhuan leh Tlabung-ah in tuilianin a chim a, Sairang-ah chhungkua an tang (a zavaia chanchin tlangzarh angin)), July 2019 (Tlabung-ah Khawthlangtuipui tuilianin in 400 vel a chim, a zinga 150 chu khawpui chhungah, leh State-ah mi pathum an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) leh June 2017 (Tlabung-a Khawthlangtuipui tuilian, chhiarna pakhatin sub-division-ah in 350 vel tuiin a chim a ti a, chhiarna dangin in 9 a kim vek leh 60 aia tam a ṭhen a chim a ti, mi 8–10 an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) chanchinte hi Mizoram calibration data ṭha ber a neihte an ni a, hriatna tam tak chu thlalak, chanchinbu report leh khawtlang mite record-ah a awm a, a bo hmaa khawn khawm a ṭha.

11.6 Level of service

11.6.1 BSMP tin chuan heng level of service tlem ber hi a hman tur a ni. BSMP chuan level khauh zawk a hmang thei.

Table 11.2 — Level of service tlem ber

Thil	Level of service tlem ber
Tui luanna system tenau (minor system)	Bung 6-a design AEP (Table 6.1)
Mihring chenna in	1% AEP (kum 100) chanchinah floor level chung thlengin tuilian a awm lo
Thil pawimawh (damdawi in, emergency services, substation, tui leh ek tui plant)	0.2% AEP (kum 500) chanchinah facility tuilianin a chim lo; 1% AEP chanchinah a kawng kal theih
Evacuation route (hlauhawm laia mipui sawn chhuahna kawng) leh kawngpui lian	1% AEP chanchinah kal theih (hlauhawmna class H2 emaw a aia ṭha zawk, Bung 6)

Thil	Level of service tlem ber
Tui tling tihkan hun	10% AEP (kum 10) chanchinah ruah a reh hnu **darkar 6** chhungin kawng chunga tui tling tihfai
Tank leh dil khawlna	Basin chhunga MWL hnuaia tuilian khawlna a bo lo (no net loss), survey hmasa ber hriat theih nena tehkhin
Outfall	Bung 5-a joint leh outfall khar dinhmunah a hna a thawk

> **Hrilhfiahna.** In leh kawng level-te hi Bung 6-a mi nawn a ni, chutiang chuan basin plan leh site design-te chuan rah chhuah inang an tum. Thil pawimawh tana 0.2% AEP, darkar 6 tui tling tihkan hun leh dil khawlna tana no-net-loss dan hi a entirna hmasa chiang a awm lo a, he Kaihhruaina Bu-in a ruat a ni. Tihkan hun hian ruahpui hnua khawtlang mite hriat nasat ber a lantir. No-net-loss dan hi Mizoram-ah tank aiin tui vawngtu hmun tlemte atan a pawimawh zawk: a reservoir-te, a dil tlemte, a phai-te leh a tuikhur-te; irrigation dil cascade (tank cascade) a nei lo. NEEPCO Tuirial reservoir hian full reservoir level 90.5 m leh minimum drawdown level 68.0 m a nei a (CERC, Petition No. 125/MP/2021), Serlui B level-te hmuh a ni lo [TBC]; an leidip khatna survey hmuh a ni lo [TBC]. Dil hriat lar berte chu Palak Dil, Siaha district-a Pala Wetland, Mara Autonomous District Council area-a awm, Ramsar site No. 2484, a Ramsar information sheet angin (thu lak chhawn angin) August ni 31, 2021-ah thlan a ni a, July ni 26, 2022-ah puangchhuah a ni (chanchin tlangzarh angin), ha 1,850 zau, a tui awmna ha 135 vel (thu lak chhawn angin); leh Tam Dil, Saitual aṭanga km 6-a awm, Fisheries Department-in sangha vulhna reservoir atan a siam ṭha leh (chanchin tlangzarh angin; a zau zawng hmuh a ni lo). Master Plan for Aizawl: Vision 2030 chuan luipui, lui leh tui awmnate chu ha 585, a area 3.83% a ni a ti a, tuikhur, dil tê, dil leh wetland-te chu a "W" use zone-ah a dah a, tui awmnaa bawlhhlawh paih leh lei vur tihtawp a rawt; Mizoram Water Resources (Management and Regulation) Act, 2024 chuan "tuikhur, dil tê, dil lian, dil, tui khawl khawmna structure hlui, tuikhur laih" ("springs, ponds, lakes, tanks, traditional water harvesting structures, wells") chu "khawtlang tui hnar" ("community water resources") zingah a chhiar (s.2(1)(i)), leh "tuikhur" chu dan-ah "tui pekna lak theihna hmun reng reng" ("any place wherein water supply is obtained") tia hrilhfiah a ni (Mizoram (Village Councils) Act, 2025, s.2(29)). State Wetland Authority notification, Ramsar site bak wetland notify reng, Aizawl tuikhur inventory leh dil emaw phai reng khawlna survey hmuh a ni lo [TBC].

11.7 Model siam leh scenario

11.7.1 **Model.** BSMP tin chuan heng coupled 1D–2D hydraulic model hi a hman tur a ni:

- tui luanna system tenau;
- tui luanna system lian (lei chung luang);
- luipui, canal leh dil; leh
- outfall-te.

Kalphung chu Bung 3 zawm tur a ni. Tidal leh luipui boundary-te chu Bung 5 zawm tur a ni.

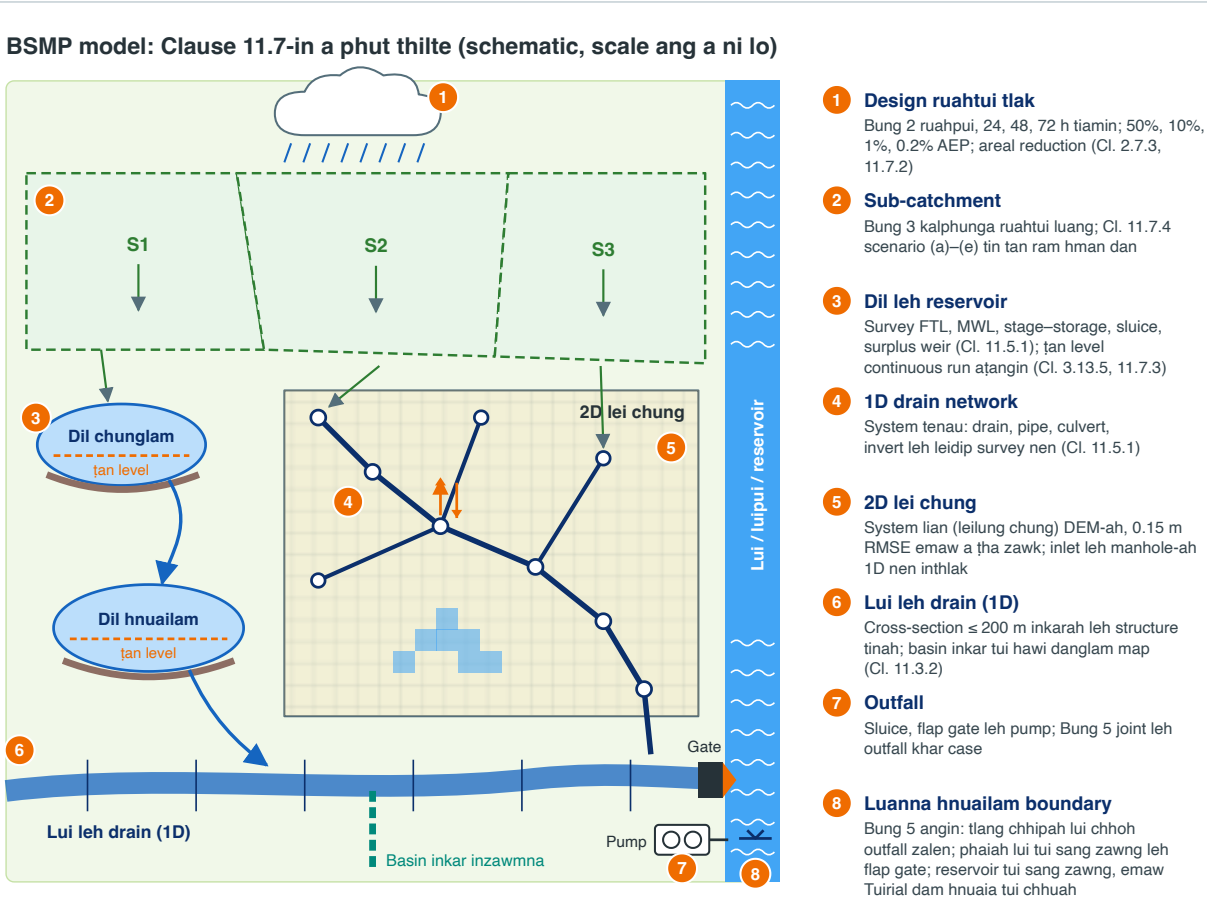
11.7.2 **Design ruahpui.** Model chu Bung 2-a design ruahpui, darkar 24, 48 leh 72 ruahpui te pawh tiamin, a tlem berah 50%, 10%, 1% leh 0.2% AEP tan tlan tur a ni. Areal reduction chu Clause 2.7.3 hnuaiah hman tur a ni.

11.7.3 **Continuous simulation.** Dil cascade nei basin-te chu continuous simulation (kum tam tak ruahtui hmanga model) (Clause 3.13) hmangin tlan bawk tur a ni, IMD grid daily record pumpui a awm chuan, a tlem berah kum 30, Belhchian 2D-a temporal pattern (ruahtui tlak dan) hmanga ṭhen darh. Hei hian design ruahpui a lo thlen laia dil-te an khat dan, leh ruahpui leh outfall khar a inrual fo dan a lantir. Clause 3.13.5-a step pahnih kalphung hman theih a ni: record pumpui tan storage model awlsam zawk tlan a ni a, Clause 11.7.1-a coupled 1D–2D model chu design ruahpui tan chauh tlan a ni, continuous run-in a pek dil level aṭangin ṭanin. 1D–2D model pumpui continuous run a ngai lo.

11.7.4 **Scenario.** BSMP tin chuan a tlem berah heng hi a model tur a ni:

- (a) **Tunlai:** tunlai ram hman dan, network, dil leh outfall;
- (b) **Nakin, thunun lo:** dan anga master plan hnuaia nakin ram hman dan, site control engmah nei lo;
- (c) **Nakin, thunun:** Bung 4-a site control nena nakin ram hman dan;
- (d) **Nakin, plan nen:** scenario (c) leh CIP hna-te; leh
- (e) **Climate:** scenario (a) leh (d), Clause 2.8-a climate factor nen, thlak danglam lovin: Mizoram tan ruahpui projection reng design factor nen hman a ni lo; NAFCC tana Agriculture Department project report (2016) chuan, "State remote sensing center report" a tarlanna, district ṭhenkhatah "ruahtui tlak 25% deuhthaw a pung ang" ("nearly 25% increase in rainfall") leh kumtin ruahpui nasa zat "26% vel" ("about 26%") pung a ruat lawk a, chu chu a lo thlen fo dan sawina a ni a, a chakna sawina a ni lo, factor atan hman a ni lo; State Action Plan on Climate Change ngei chu chhiar a ni lo [TBC]; leh sub-area tinah Clause 2.3.6(e)-a darkar 72 ruahpui leh Clause 11.3.3-a hlauhawmna endikna chu scenario tin-ah tlan a ni, State leimin ruahpui hi ni tam tak a daih ṭhin avangin.

11.7.5 **Calibration.** Model chu Clause 3.15 hnuaiah calibrate leh validate tur a ni, data a awmnaah May ni 28, 2024 (Cyclone Remal: Melthum leh Hlimen inkara lung laihna (quarry) hman tawh loh chu zing dar 6 velah a chim a, Aizawl-ah leimin dang a awm bawk; May ni 29 thlengin Aizawl district-ah mi 29 an thi a, mi 7 an bo tih report a ni a, a hnuah quarry-ah mi 15 leh Hlimen-ah mi 5, emaw Aizawl hmun pasarihah mi 34, leh State pumah mi 27–29 tih a ni (a zavaia chanchin tlangzarh angin); May ni 27–28, 2024-a Aizawl ruahtui tlak zat hmuh a ni lo a, May ni 28-a IMD thuchhuaha Mizoram University-a 20 mm chu hun eng chhunga mi nge tih a chiang lo), May ni 24, 2025 aṭanga June ni 3, 2025 thleng (leimin 598, mi panga thi, in 171 chhe leh kawng tihtawp hmun 257, Champhai 209, Serchhip 116, Khawzawl 75, Lunglei 61 leh Aizawl 21, DM&R chhiarna (chanchin tlangzarh angin); ni khatah Serchhip 104.6 mm, Kolasib 98.3 mm leh Aizawl 97.4 mm, chu ni chu chiang lo (chanchin tlangzarh angin); he ruahpui tan IMD series hmuh a ni lo), June 2018 (ni khatah Aizawl-ah 148 mm, June ni 12 a ni maithei, leh June ni 1 aṭanga 13 thleng Serchhip district-ah 677 mm, June ni 5-ah leiminah mi sawm an thi, Tiperabagh, Serhuan leh Tlabung-ah in tuilianin a chim a, Sairang-ah chhungkua an tang (a zavaia chanchin tlangzarh angin)), July 2019 (Tlabung-ah Khawthlangtuipui tuilianin in 400 vel a chim, a zinga 150 chu khawpui chhungah, leh State-ah mi pathum an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) leh June 2017 (Tlabung-a Khawthlangtuipui tuilian, chhiarna pakhatin sub-division-ah in 350 vel tuiin a chim a ti a, chhiarna dangin in 9 a kim vek leh 60 aia tam a ṭhen a chim a ti, mi 8–10 an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) chanchinte zinga a tlem berah pahnih hmangin.



Milem 11.2 — Clause 11.7-in a phut BSMP model thilte: sub-catchment, 1D drain leh channel network, 2D lei chung, continuous simulation aṭanga ṭan level nei tank leh dil, leh outfall-a tidal emaw luipui boundary (schematic, scale ang a ni lo). He Kaihhruaina Bu tana milem siam thar, coupled 1D–2D urban tuilian model siam hmanna pangngai aṭanga siam danglam.

> **Hrilhfiahna.** Scenario (b) leh scenario (c) khaikhinna hian site dan-te chauhin an hlen chhuah a lantir. Scenario (d) hian public hna-in a belh a lantir. He khaikhinna hi flood-sensitive catchment notify nan (Clause 4.5.4) leh basin release rate khauh zawk ruat nan (Clause 11.8.3) hriatna bul a ni bawk.

11.8 Thlan theihte, a rah chhuahte leh Capital Improvement Programme

11.8.1 **Thlan theih indawt dan.** Thlan theihte chu heti indawt hian ngaihtuah tur a ni, Clause 1.2-a indawt dan basin-scale anga siam:

1. **Khawlna humhalh leh siam ṭhat leh:** dil, tank, marsh leh floodplain (tuilian luanna phai), a bed hmasa thlenga leidip laih chhuah leh luah hneh area lak let te pawh tiamin (Bung 7);
2. **Regional retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) leh detention**, model hmanga hmun thlan, tui chhuah tir chu lui lian peak nen a inrual loh nan (Clause 4.13);
3. Drain, canal leh culvert-a **tui luan tirna** siam ṭhat;
4. **Outfall hna:** drain emaw down-drain-in lui a thlenna apiangah energy dissipator (tui chakna tihnemna), stepped chute, drop structure leh outfall humhim, chutiang chuan pakhatin mah tlang pang humhim lohah a luang chhuak lo, leh tui dawngtu lui kam a tlak tih Clause 5.8.5(a)-a endiknain a lantir chuan lui inzawmna dawt thleng tihnghet; lui-in culvert leh drain khuh a luhnaah debris rack, sediment trap leh debris basin, a tihruaktu machine tan ramp

nen, leh Master Plan for Aizawl: Vision 2030-a check dam rawt-te BSMP-in a finfiah chuan; Sairang leh Bairabi-a Tlawng leh Tlabung-a Khawthlangtuipui lama phai leh lui kam zawl outfall-ah flap gate leh penstock, luipui tuilianin outfall a khar thei chuan a hnungah khawlna emaw pumping nen; Chite, Tuikual leh Lawibual lui leh Tuipui, dil reng reng, leh tuikhur chung lama outfall hmaa ruah sur lohna hun tui luang dan leh screen (Bung 8, Clause 8.9); leh tui dawngtu level ruattu Tuirial leh Serlui B dam tui chhuah tir dan, NEEPCO leh State power department nena inremna;

5. Hna-in level of service a thlen theih lohnaah **in leh ram humhimna (property-level protection)**; leh
6. **Structure ni lo hmalakna:** tuilian hriattirna (entirnan IMD district ruahtui hriattirna leh a Meteorological Centre Aizawl-in a chhuah nowcast, IMD leh Mz-SWIC automatic gauge aṭanga ruahtui alarm, Tlabung-a Khawthlangtuipui leh Sairang leh Bairabi-a phai luipui-ah alarm nei level gauge, tunah engmah a awm lo, Tuirial dam aṭanga tui chhuah tir hmaa NEEPCO hriattirna [TBC], "2015 aṭanga State Plan-a ngaihtuah" ("envisaged in the State Plan since 2015") automated leimin enna, la din loh (CAG), leh District Disaster Management Authority-te), tuilian hlauhawmna zoning, emergency ruahmanna leh mipui hriattirna.

11.8.2 **Thlan theih tehna.** Thlan theih tin chu heng hian teh tur a ni:

- tuilian hlauhawmna tihtlem (in leh mi tuilianin a chim; kumtin chhiatna beisei);
- capital leh kum 30 enkawlna senso;
- ram mamawh;
- khua leh khawpui ṭhenkhat tui petu tuikhur (spring) leh tuikhur aṭanga tui chhuahna hmun-te, leh tui chhuahna chung lama an catchment, he Kaihhruaina Bu hian lung phah leh kawng ruahtui luh tir lohvin a vawng (Bung 8-a tuikhur dan), chunga nghawng; tlang pang nghehna, shale, colluvium, lei vur emaw leimin bal-a tui luh tir chuan pore pressure a tihsan a, SD&SM 2017-in a vaukhan ang leh Hlimen leh Laipuitlang leimin-in a lantir ang; test-a lui kam lei (alluvium) leh lui kam zawl-a recharge, phal chhunna hmun (Clause 4.11, recharge dan), leihnuai tui lak a tlem hle na a (2011-ah stage of extraction 3.52%, CGWB, leh 2024-ah 3.95%, thu lak chhawn angin); leh ruahtui luangin a thlen tuikhur, lui, luipui, dil leh reservoir-te tui ṭhatna, a ṭhenkhatin ek tui an phur (Bung 8, Clause 8.9) (Bung 8);
- luanna hnuailam (downstream) basin leh tui dawngtu luipui, lui, dil emaw reservoir chunga nghawng; leh
- tu nge hlawkpui.

11.8.3 **Basin release rate.** Scenario (c)-in level of service a thlen loh chuan, BSMP chuan Bung 4 aia khauh zawk basin bik **permissible site discharge** (site aṭanga luan chhuah phal zat; m³/s/ha) chu AEP leh sub-catchment zelin a ruat thei. Rate chu Clause 4.5.4-a notification kalphung hnuaiah hman ṭan a ni.

11.8.4 **A rah chhuah.** BSMP tin chuan heng hi a siam tur a ni:

- (a) 10%, 1% leh 0.2% AEP tan tuilian hlauhawmna map (zau zawng, thuk zawng, chak zawng, hlauhawmna class), tunlai leh nakin-plan nen. **1% AEP nakin-plan nen map** chu floor level (Bung 6) leh setback (Bung 7) tan reference map a ni ang;
- (b) flood-sensitive catchment rawt leh basin release rate a awm chuan (Clause 4.5.4 leh 11.8.3);
- (c) regional facility hmun, khawlna tui zat, ram mamawh leh an rawngbawl site-te nen;
- (d) basin tan fee-in-lieu unit rate (Clause 4.13.3);
- (e) **Capital Improvement Programme**: cheng khata hlauhawmna tihtlem zat indawtin hna, senso, phase leh agency nen;
- (f) fûr hma **enkawlna programme**: leidip laih chhuah, gate leh pump test, leh dil kalpui dan (Bung 10); leh
- (g) enna mamawh: ruah tehna thar, level sensor leh tuilian chhinchhiahna survey hmun.

> **Hrilhfiahna.** Mizoram-ah khawlna hi phai rama chhan aia chhan dangin a hmasa ber: tlang chhipah siam ṭhat leh tur tuilian khawlna a tlem hle, mahse site-a litre khat vawn apiang chu lei laih pang emaw "fûr hun chhungin tui luan chak tak nen an luang buai" ("turbulent with high velocities of currents during the monsoon season") leh "a tichhe nasa hle" ("very destructive") lui-a luang lo litre khat a ni (Master Plan for Aizawl: Vision 2030), leh Tlabung, Sairang leh Bairabi phai-ah luipui a san laiin outfall-te a khar. Tlang ramah khawlna chu tank lined emaw terrace (tlang panga hmun zawl siam) lung phah a ni a, leia lut dil a ni ngai lo (Clause 4.11, tlang dan). AMCBR-in tui zat

sawi lovin "in zawng zawngah … ruahtui khawl khawmna hmanrua ṭha" ("a suitable rain water harvesting facility … in all buildings") a phutna (reg. 33)-ah, Clause 4.11-in a ruat in chung m² khatah litre 25 tal khawlna hi a hmasa ber a ni a, tui supply atan pawh a ṭangkai: Aizawl Urban Area chhungkaw 27.16%-in ruahtui an hmang (plan bawk), leh PHED supply chu mi pakhat ni khatah litre 44 a ni tih report a ni a, 35% chu chhiar theih loh (chanchin tlangzarh angin; ni chiang lo). Master plan-a check dam riat rawt, Zuangtui, Sakawrtuichhun, Government Complex, Mission Vengthlang, Tlangnuam, Saikhamakawn, Melthum leh Hlimen hnuaia awm tur chuan tui bakah leidip leh bal a dang thei ang a, BSMP-in a finfiah emaw a thlak ang. Bawlhhlawh, lungpui, leimin bal leh ek tui phur luiah concrete channel chauh chu a ṭangkai lo. Design bul sawi lo drain-te tan ruahpui a lian: Aizawl-ah ni khatah 148 mm a sur a, June ni 12, 2018 a ni maithei, leh June ni 1 aṭanga 13, 2018 thleng Serchhip district-ah 677 mm (chanchin tlangzarh angin), leh NIH-DHAARA Aizawl cell kum 50 darkar 72 thuk zawng chu 318.9 mm a ni. Tui luan tirna siam ṭhat chauh chuan tui chu a phur bal leh bawlhhlawh nena a bed leh kam tla leh min lui chhuk nasaah, Tlawng, Khawthlangtuipui emaw luipui dang tuilianin a khar thei phai outfall-ah, emaw tui chhuah tirin a level ruat Tuirial emaw Serlui B dam hnuai lui chhungah a tihrang mai. Mizoram-a leihnuai tui chuan recharge ni lovin khawlna leh tuikhur humhalh a phut. Leihnuai tui lak stage chu 2011-ah 3.52% a ni a, "leihnuai tui hmasawnna thunun tura notify hmun: NIL" ("Areas Notified for Regulation of ground water development: NIL") (CGWB, State profile), leh 2024-ah 3.95%, unit 26 teh zawng zawng him (CGWB, thu lak chhawn angin); Lunglei district-ah "leihnuai tui hi in tur atan chauh hman a ni" ("Ground water is used for drinking purpose only") a, "leihnuai tui lak chhuah a tlem avangin" ("due to lack of ground water abstraction") tui sang zawng trend a awm lo (CGWB). Ruahtui tlem tein lei a lut: Surma group shale, siltstone leh sandstone tlang chhip-te chu "tui luh theihna leh infiltration hniam" ("characterized by low permeability and infiltration") an ni a, "ruahtui luang chhuahna zone" ("run off zone") angin an awm (CGWB, Lunglei). Khawpui tui chu luipui, in chung leh tuikhur aṭangin a lo chhuak: "Aizawl tui supply hnar ber chu Tlawng River aṭanga a ni" ("the main source of water supply for Aizawl is from Tlawng River"), Aizawl Urban Area chhungkaw 27.16%-in ruahtui leh 1.01%-in tuikhur tui an hmang (Master Plan for Aizawl: Vision 2030, Table 8.2), leh "Mizoram hi tuikhur awmna a ni" ("Mizoram is an abode of springs") (CGWB), January aṭanga March thleng "ni khatah liter 3,000 aṭanga 20,000 thleng" ("3,000 to 20,000 liters per day") a chhuah chuan thal hun a chhawm nung (CGWB, Lunglei). Tuikhur-te chu harsatna an tawk: "Khawpui ṭhanna hian tuikhur ang chi tui hnar hlui-te a tihro" ("Urbanisation has led to drying up of traditional water sources, like tuikhur") (chanchin tlangzarh angin), leh spring-shed hna chu GIZ ṭanpuina tuikhur 20 zirchianna hnuaiah, tuikhur 100 pilot tan Forest Department nodal agency-ah, leh Serchhip leh Lunglei district-ah NEIDA leh Tata Trusts-in an thawk tih report a ni (a zavaia chanchin tlangzarh angin); Aizawl tuikhur chhiarna hmuh a ni lo [TBC]. Tlang ramah leia tui luh tir hian chhiatna a thlen: SD&SM 2017 chuan "tlang panga leihnuai tui lut zat tihpun" ("increasing the amount of groundwater penetrating into slopes") chu tlang pang nghet lohna chhan zingah a sawi a, Roadmap to Stability (2014) chuan "Aizawl City chhunga septic tank, leach field leh soak pit zawng zawng" ("all septic tanks, leach fields and soak pits within Aizawl City") paih bo a phut. State leihnuai tui Act hmuh a ni lo; Mizoram Ground Water (Control and Regulation) Bill, 2023 hi a title page chauh hriat a ni. Mizoram Water Resources (Management and Regulation) Act, 2024 chuan IWRD chu "leihnuai tui recharge tihpun nan ruahtui khawl khawm tihchak" ("promote rain water harvesting to augment ground water recharge") tur a ti (s.14(1)(b)(viii)); tlang ramah he Kaihhruaina Bu hian chu mawhphurhna chu recharge ni lovin khawlna leh hman nawnna angin a chhiar (Clause 4.11). Hei vang hian tuikhur leh an catchment, tlang pang nghehna, a la thei chhun leia recharge, leh ruahtui luangin a thlen tui ṭhatna hi tehna criteria vek an ni. He Kaihhruaina Bu hian project-te chu cheng khata hlauhawmna tihtlem zat indawtin a dah, chutiang chuan sum tlemte chu mi tam ber humhimna hmunah a hmasa berin a kal theih nan.

11.9 Ram hman dan ruahmanna nena inzawmna

11.9.1 BSMP phalna pek chu dan anga ram hman dan plan-ah dah luh tur a ni: Master Plan for Aizawl: Vision 2030, OBPAS-in rawtna tin a endikna (a phalna notification hmuh a ni lo [TBC]), leh a hnua lo awm tur zonal leh ward development plan-te, an regulation-te chu May ni 17, 2023-ah sawrkar hnenah thawn a ni a, September 2023 thleng phalna pek a ni lo (CAG), AMCBR leh SD&SM nen; UD&PA-in a buatsaih urban area leh notify a nih khawpui dangte

master plan-te, Lunglei Development Planning Area tana plan a awm chuan, a notification hming chauh hriat [TBC]; Autonomous District Council area-ah, District Council plan emaw regulation reng, District Council-in Kaihhruaina Bu a pawm chuan; leh chung hnuaia phalna pek layout leh in-te. A bik takin:

- (a) regional facility hmun, dil tuilian khawlna siam ṭhat leh leh tui luanna lian-te chu plan-ah dah hran tur a ni;
- (b) 1% AEP hlauhawmna map chu tarlan tur a ni a, Bung 7 setback chu a chungah hman tur a ni;
- (c) 1% AEP chanchinah hlauhawmna class H5–H6-a ram chu mihring chenna development thar tan zone loh tur a ni; leh
- (d) basin chhunga layout-te open space chu theih chinah BSMP-a tui luanna lian emaw regional storage tarlan ṭhen atan dah a ṭha.

11.9.2 BSMP phalna pek a nih hmaa ram hman dan plan siam ṭhat a nih chuan, planning authority chuan tuilian map ṭha ber awm chu a hmang tur a ni a, BSMP chu buatsaih mek angin a chhinchhiah tur a ni.

> Hrilhfiahna. Mizoram tui ri-te chu plan, regulation leh court-in an zawn a, pakhat mah dan anga lui setback a ni lo. Master Plan for Aizawl: Vision 2030 chuan drainage channel lian-te "a sir lehlam zawngin metre 15 zau green buffer" ("a 15 meters wide green buffer on both sides") a rawt a, chu chu plan rawtna a ni, leh Tlawng sir lehlamah "Mizo District (Forest) Act, 1955, section 14 leh section 21 chhiar kawpin" ("as per the Mizo District (Forest) Act, 1955, section 14 read with section 21") 800 m green belt a vawng; chu belt dan bul, 1965-a Riverine Reserved Forest notification chu Gauhati High Court-in January ni 27, 2021-ah a hlihsak a, 800 m restricted zone ruat nia report April 2021 notification chu chhiar a ni lo (chanchin tlangzarh angin), chuvangin he Kaihhruaina Bu hian 800 m chu dan anga a ngai ngai lo a, a hmang lo. SD&SM 2017 chuan lui pianphung bula plot-te tan "riverine reserve chu vawn tur a ni" ("the riverine reserve shall be maintained") a ti a (reg. 28), hrilhfiah lovin, lei laih chhuah chu "tui luan kawng emaw riverine reserve" ("drainage courses or riverine reserves") aṭangin a dah hlat (reg. 29), leh site plan-ah "Aizawl Municipal Corporation-in a ruat leh a hrilhfiah tuilian hlauhawm hmun" ("flood hazard areas as designated and defined by Aizawl Municipal Corporation") tarlan a phut (reg. 6), mahse chutiang area ruat a ni lo. Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, hnuaia River Conservation Zone-te chuan State Authority phalna tel lovin in sak leh tui luanna dan emaw hawitir a khap ang, mahse pakhat mah notify a ni lo. AMCBR chuan septic tank leh soak pit chu "tui hnar" ("a water source") aṭanga m 15-ah a dah (reg. 33), leh tlang pang ri-te chu lui ri aiin an nghet zawk: 60° chungah site development permit a awm lo (SD&SM reg. 14), Moderate, High leh Very High hlauhawm zone-ah leh map loh hmunah 24° aṭangin engineer-in site development, leh master plan "SL" zone 36° chunga tlang pang leh "drainage line lian bula hmun" ("areas adjacent to major drainage lines"), a "W" zone luipui, lui, tuikhur, dil tê, dil, wetland leh tui catchment area tan nen; plan chuan hlauhawmna zoning kimchang, "development loh zone" ("no development zone") pawh tiamin, chu zonal development plan-ah a dah a, September 2023-ah phalna pek a la ni lo (CAG). State chuan National Green Tribunal hnenah "Mizoram hi tlang ram a nih avangin, catchment area-ah flood plain zone a awm lo" ("Mizoram being a hilly state, there is no flood plain zone in the catchment area") a ti a (MPCB, O.A. No. 593 of 2017 leh O.A. No. 673 of 2018-ah), mahse Khawthlangtuipui chuan Tlabung chu 2017, 2019 leh 2023-ah a chim a, 2018-ah Sairang-ah chhungkua an tang a, Tlawng kama Bairabi leh Tiau kama Champhai chu phai rama tuilian khawpui zingah report a ni (a zavaia chanchin tlangzarh angin), chuvangin chu thusawi chu chung phai-ah a dik lo; flood plain zoning dan hmuh a ni lo. Ri notify a nih emaw master-plan ri-in a thunun chuan, chu chu hman a ni; a dang chuan Bung 7-a corridor chu he Kaihhruaina Bu rawtna angin hman a ni, dan reng aia khauh zawk: ha 8 emaw a aia tam luang khawm channel tin kam chhip aṭanga m 15 aia tlem lo Zone 1, a kam chu 10° aia pang zawk tlang pang a nih lui laih thukah chu tlang pang chhip aṭanga teh, leh 1% AEP zau zawng leh m 10 thleng Zone 2, a zau zawk zawk chu, Kaihhruaina Bu hnuaia phalna pek development thar leh siam ṭhatna (redevelopment) tan, mimal ram emaw land pass-a chelh Zone 1 ram chu master plan-ah dah hran emaw inremna hmanga humhim, lak ni lovin, leh Autonomous District Council area-ah District Council kaltlangin chauh [TBC]. BSMP hian master plan, zonal plan leh UD&PA chu an mamawh phai ram leh lui corridor 1% AEP map, a bul hnaia bal luanna kawng leh leimin hlauhawm zone nen a pe. Open space ram chu khawlna emaw tui luanna atana hman hi a entirna hmasa chiang a awm lo; he Kaihhruaina Bu hian a hmang, a chhan chu AMCBR-in in tinah ruahtui khawl khawmna hmanrua ṭha a phut a (regs. 5(6)(ix) leh 33) leh, 2025 aṭangin, m² 100 chung plot-ah ruahtui khawl khawm leh "hardscape tihtlem" ("Reduction of Hardscape") tan incentive a pe a, SD&SM 2017 chuan site

> dang hnuai lama site siam tin chuan a chung lam site tui chu "drainage kawng hnai ber, hman theih ber thlengin him takin" ("in a safe manner to the nearest practicable drainage way") a phur tir a (reg. 27), leh Master Plan for Aizawl: Vision 2030 chuan "urban area zawng zawng 52% vel" ("Around 52% of total urban area") chu urban hman loh atan a vawng, tui awmna leh tlang pang development theih loh pawh tiamin, mahse detention emaw peak-runoff limit ruattu dan a awm lo; layout open space-a khawlna dah hi heng mawhphurhna-te chunga innghat a ni a, chu ram chu open space atan a la ṭangkai avangin khawlna chu open space angin hman theih reng tur a ni, leh tlang ramah chu tank lined emaw terrace lung phah thuk lo, drain lined-a luang chhuak a ni a, infiltration basin a ni ngai lo (Clause 4.11, tlang dan). Tui luanna kawnga dah hian developer tan senso belh a awm lo a, basin chu a lei loh chuan a lei ngai tur khawlna a pe.

11.10 Rawnna leh tlangzarhna

11.10.1 BSMP draft chu mipui ngaihdan dawn nan a tlem berah **ni 60** chhung tlangzarh tur a ni, local body nghawng tinah mipui inkhawmna nen.

11.10.2 Phalna pek hnuah, heng hi open data angin tlangzarh tur a ni:

- model file-te;
- tuilian hlauhawmna map-te;
- Clause 11.5.1-a data, security lam pawimawh asset chanchin chauh lo chu; leh
- CIP.

Public map viewer-ah pawh tarlan tur a ni bawk.

> **Hrilhfiahna.** Map tlangzarh hian lei duhtu, sum puktirtu, insurance-tu leh khawtlang mite chu in an sak emaw an lei hmain tuilian hlauhawmna an hmu thei. Model tlangzarh hian designer-te chu Authority boundary condition ang chiah an hmang thei a, chutiang chuan site design leh basin plan a inmil reng. Hei hi Bung 10-a tlangzarh dan nen a inmil.

11.11 Phalna, endikna leh report

11.11.1 **Phalna.** BSMP-te chu model leh mipui ngaihdan endik hnuah State Stormwater Technical Committee (Bung 1)-in phalna a pe tur a ni.

11.11.2 **Endikna.** BSMP tin chu heng hunah endik tur a ni:

- **kum 10** tin;
- basin-ah 1% AEP design thuk zawng aia nasa chanchin a thlen hnu **kum 2** chhungin (Clause 2.14); leh
- dan anga ram hman dan plan siam ṭhat a nih hunah.

11.11.3 **Kumtin report.** Lead Authority chuan fûr hun tin hmain (March ni 31 thlengin) kumtin hmalakna report a tlangzarh tur a ni. Report chuan heng hi a lantir tur a ni:

- CIP hmasawnna;
- fee-in-lieu ledger (Clause 4.13.4);
- enkawlna zawh tawh; leh
- level of service nena tehkhin tuilian a awm chuan.

11.12 Hun lai ruahmanna

11.12.1 Basin pakhat tan BSMP phalna pek a nih hma chu:

- (a) Bung 4 aṭanga 8 thleng site criteria zawng zawng chu a kimin hman a ni;
- (b) Clause 4.13 hnuaia regional detention leh fee-in-lieu chu a awm lo, Clause 4.5.6.3 hnuaia fee vawn chauh lo chu;
- (c) floor level leh setback-te chuan map ṭha ber awm an hmang a, map a awm lohnaah Bung 6 leh 7-a kalphung; leh
- (d) public drain project-te chuan an outfall leh luanna hnuailam lui chhung-te chuan Bung 5 tailwater (outfall hnuailama tui sang zawng) dinhmun hnuaiah design tui luang an la thei tih basin-level endikna an huam tur a ni.

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- EastMojo, Down To Earth, Senhri Journal, PTI, Morung Express, Business Standard leh regional thu hnar dangte (2017–2026). Tlabung tuilian, June 2018 ruahpui, Aizawl tuikhur, PHED supply, spring-shed programme, Tam Dil, Pala Wetland puangchhuahna, Tuirial dam-break zirchianna leh drainage ṭha lo chungchanga Directorate of Geology and Mineral Resources hmuhchhuah report-te (thu hnar pahnihna).

Belhchian leh Form

Belhchian / Form	A chhunga thu
11A	BSMP tan terms of reference (hna tur tarlanna) template
11B	Tier A pawl-te tan basin tarlanna leh ramri
11C	Mizoram in chi hrang hrang tan depth–damage curve
11D	BSMP data leh model tlangzarh standard
Form 11-1	Kumtin hmalakna report

BUNG 1 BELHCHIAN

Policy, A Huam Chin leh Pawmna

Heng belhchiante hian Bung 1 an ṭanpui. Kaihhruaina Bu huam chin ruattu list leh map-te, Policy Supplement leh Kaihhruaina Bu hman tir thei tur dan thuziak (legal instrument) entirna thuziak-te, leh Bung 1 hnuaia dilna thehluhtu (applicant)-in a thehluh tur form pahnih-te an keng. Kaihhruaina Bu hi draft a ni a; sawrkar emaw agency reng rengin pawm a ni lo: dan thuziak entirna chu competent authority ngaihtuah turin pek a ni a, hman a ni lo, form-te hi draft form an ni. "Buatsaih tur" ("To be prepared") tia chhinchhiah belhchian chuan a mamawh data leh a tlangzarh hma chhunga dan hman tur a tarlang (Clause 1.11.5).

Belhchian 1A — Tier A authority-te list, Aizawl Municipal Corporation leh Master Plan for Aizawl: Vision 2030 Aizawl Development Plan Area ri nen

Bung 1-a Clause 1.6.1 aṭanga 1.6.5 thleng a ṭanpui.

1A.1 Clause 1.6.1 hian Tier A chu authority chi (class) zelin a hrilhfiah. Table 1A.1-in class-te leh Clause-a authority hming tarlante chu Bung 1-in a hrilhfiah angin a tarlang. Table 1A.1-a awm lo authority zawng zawng chu Tier B an ni (Clause 1.6.2).

Table 1A.1 — Clause 1.6.1-a hrilhfiah anga Tier A authority-te

Thil	Tier A authority	Clause
(a)	Aizawl Municipal Corporation, a area pum tan	1.6.1(a)
—	Council thutlukna (resolution) hmanga Tier A-a lut thlang Tier B authority, emaw sawrkar-in Tier A atana a notify (Gazette-a tarlan)	1.6.4

1A.2 Tier eng pawh ni se, tuilian hlauhawm catchment (ruahtui luan khawmna hmun, flood-sensitive)-ah design-aid route leh Clause 1.7 thlan dang-te hman theih a ni lo (Clause 1.6.5; Belhchian 1B).

Buatsaih tur. He belhchian hian Aizawl Municipal Corporation leh a ward leh locality-te ri, leh Master Plan for Aizawl: Vision 2030-a Aizawl Development Plan Area ri, a planning zone sawmte nen, map leh GIS layer angin, leh pawl tin Tier A a nih ṭan ni a keng ang. Corporation ri notify a nih leh a Local Council area ri-te (Corporation, UD&PA); Aizawl Development Plan Area ri leh 2005-a din Aizawl Urban Area ri (UD&PA); Lunglei Municipal Council ri leh urban local body nei lo khawpui notify a nihte ri (UD&PA), chungte ri chu he Kaihhruaina Bu tan lak a ni lo [TBC]; leh district leh sub-division ri-te (Land Revenue & Settlement Department, Survey of India) a mamawh. Lunglei Municipal Council hi Tier B a ni (Clause 1.6.2), a lut thlan emaw Clause 1.6.4 hnuaia notify a nih emaw hma chu. A tlangzarh hma chuan, tier chu Clause 1.6.1 class-te hmangin thu tlukna siam a ni a, Form 1-1-ah chhinchhiah a ni a, Authority-in pre-application stage-ah a finfiah (Clause 1.5.9).

Table 1A.2 — Tier A authority-te register (layout)

No.	Authority	Class (Municipal Corporation / Municipal Council / Village Council / Autonomous District Council / a dang)	District	Innghahna (Clause 1.6.1(a), (b), (c) emaw 1.6.4)	Tier A a nih ṭan ni	Notification emaw resolution reference
1						
2						
3						

1A.3 Aizawl Municipal Corporation leh Aizawl Development Plan Area ri map chu machine-readable format-a open data angin tlangzarh tur a ni (Clause 10.17.4), a lantir notification ni nen.

Belhchian 1B — Tuilian hlauhawm catchment map-te

Bung 1-a Clause 1.4, 1.6.5 leh 1.10.3(d), leh Bung 4-a Clause 4.5.3 leh 4.5.4 a ṭanpui.

1B.1 Tuilian hlauhawm catchment-te chu Clause 4.5.3.2-ah tarlan an ni. Table 1B.1-in chu list chu a tarlang nawn. He belhchian map-te leh Belhchian 4A ri-te hi data set inang an ni a, a kawpin tlangzarh tur a ni.

Table 1B.1 — Clause 4.5.3.2-a tuilian hlauhawm catchment tarlante

Thil	Catchment	Bung 4-a a huam chin sawi dan
(a)	Aizawl chhak: Chite lui	Tuirial thlenga Chite lui catchment, Aizawl "chhak lam ṭhena thum ṭhena hnih aia tam" ("more than two-third of eastern portion") huam, a lui peng-te nen, Chanmari, Ramthar, Mirawng, Tlak, Bangla, Taite, Bethlehem veng, Lawibual, Hmawngkawn, Zemabawktuikhur, Zuangtui leh Kawmthlang lui (Master Plan for Aizawl: Vision 2030). Chite, Chanmari, Bethlehem, Mirawng leh Bangla luite hi "fûr hun chhungin tui luan chak tak nen an luang buai a, an tichhe nasa hle" ("turbulent with high velocities of currents during the monsoon season and they are very destructive") (master plan). SIPMIU ek tui tihfaina plant (sewage treatment plant) aṭanga Armed Veng thleng Chite lui hi Priority II tui bawlhhlawh lui chhung a ni (BOD 29 mg/L; CPCB, 2025)
(b)	Aizawl thlang: Ser lui	Tlawng thlenga Ser lui catchment, Ramri, Tuikal, Vai leh Zawngkawt lui leh Khatla, Tuikual, Vaivakawn leh Chanmari west lui nen, "lui leh nullah tichhe nasa ber" ("the worst destructive streams and nullahs") (Master Plan for Aizawl: Vision 2030); master plan-a Aizawl W-I, a area ṭhena thum ṭhena khat "ni engemaw zat emaw darkar engemaw zat emaw" ("for several days or for hours") tui a ding reng ṭhinna. CPCB chuan Reiek Kai-a Tuikual lui pakhat chu Priority II lui chhung atan a tarlang (CPCB, 2025); he lui hi a nih leh nih loh chu NEER chhiar dan a ni a, finfiah tur a ni [TBC]
(c)	Hlimen–Melthum lung laihna belt	Aizawl chhim lam kama Hlimen leh Melthum tlang pang leh lung laihna (quarry)-te: August ni 9, 1992-a South Hlimen lung laihna chim (mi "100 dawn vel" ("almost 100") an thi, MIRSAC, 2013, hna hmasa a tarlan angin) leh May ni 28, 2024-a Cyclone Remal-a Melthum leh Hlimen inkara lung laihna hman tawh loh chim (chanchin tlangzarh angin; mi thi zat an inkalh, Clause 1.1 Hrilhfiahna); master plan chuan Melthum leh Hlimen hnuaiah check dam a rawt
(d)	Hunthar Veng leh NH-6 corridor	Aizawl Hunthar Veng ram, 2017-a a lei test lei kun hmun (CAG), leh Hunthar-a NH-6 lei laih pang, "ruahpui tam berah a dang ṭhin" ("blocks in most storms") (2018 leh 2024, chanchin tlangzarh angin)
(e)	Durtlang leh Bawngkawn–Durtlang kawng	Durtlang ram, July ni 2, 2019-ah BSUP in-luah complex block pathum a chimna (CAG), leh Bawngkawn–Durtlang (Leitan) kawng sir lehlam leh lehlama tlang pang, July 2024-ah High Court-in in sak thar a khapna (chanchin tlangzarh angin)
(f)	Tlawng kama Sairang	Tlawng kama Sairang phai ram, June 2018-a chhungkuate an danna (chanchin tlangzarh angin); CWC chuan Sairang-ah Tlawng a enkawl (monitor), level sang ber chhut lovin (CWC data, SANDRP-in a ziah chhawn angin)
(g)	Bairabi leh Vairengte	Belhchian 2A sub-area MZ-A1 (Hmar lam phai), Bairabi leh Vairengte-a lui kam zawl leh phai, he Kaihhruaina Bu zirchianna-a "State-a khawpui hniam ber" ("the lowest-lying towns in the State"), Clause 2.3.6(c)(ii) Barak phai floor-te hman a nihna; September 2026-ah Vairengte-ah leiminin naupang mipa pakhat a hlum (chanchin tlangzarh angin)

Thil	Catchment	Bung 4-a a huam chin sawi dan
(h)	Khawthlangtuipui kama Tlabung	Sub-area MZ-D1 (Tlabung phai), Tlabung-a Khawthlangtuipui (Karnaphuli) floodplain (tuilian luanna phai), luipui tuilian khawpui: June 2017-ah in 350 vel (emaw 9 a kim zawngin leh 60 aia tam a then zawngin) tuiin a chim, June 2018-ah in 30, July 2019-ah in 400 vel leh August 2023-ah chhungkua 40 sawn chhuah (chanchin tlangzarh angin)
(i)	Lunglei khawpui	Lunglei khawpui ram, State municipal area pahnihna, CGWB-in "ruahtui luang chhuahna zone" ("run off zone") a tih Surma group shale, siltstone leh sandstone tlang chhipah (CGWB, Lunglei)
(j)	Serchhip khawpui	Serchhip khawpui ram, a area 89% awn zawng 30° aia sang (MIRSAC, 2013; NEER chhutna), MIRSAC-in leimin hlauhawm zonation a buatsaihna; Serchhip district-ah June ni 1–13, 2018-ah 677 mm a sur (SANDRP, chanchin tlangzarh angin)
(k)	Champhai khawpui leh Champhai phai	Champhai khawpui ram leh sub-area MZ-C1 (Champhai phai), Champhai phai buh lo zawl; May ni 24, 2025 aṭanga June ni 3, 2025 thleng leimin 598 zingah Champhai district-ah 209 a thleng (DM&R zat, chanchin tlangzarh angin), Champhai hi Tiau tuilianin a nghawng ṭhin (chanchin tlangzarh angin)
(l)	Siaha leh Lawngtlai	Siaha leh Lawngtlai ram, Mara leh Lai Autonomous District Council headquarters, he Kaihhruaina Bu hi District Council-te kaltlang chauhin an hnenah a thleng thei (Clause 1.3 Hrilhfiahna)
(m)	Tuirial dam hnuaia tui chhuah lui chhung	NEEPCO dam (tui khuahna) (full reservoir level 90.5 m, CERC) hnuaia Tuirial pana luang ram, dam-break zirchianna chuan "lui inkawpna bulah" ("near the confluence") peak 3,035.34 m³/s a route (chanchin tlangzarh angin)
(n)	Catchment notify a nihte	Clause 4.5.4 hnuaia catchment notify a nih reng reng

Buatsaih tur. He belhchian hian Table 1B.1-a catchment tin map, plot pakhat a chhunga a awm leh awm loh thu tlukna siam theihna scale-ah, leh ri inang GIS layer angin a keng ang. Digital elevation model leh drain (tui luanna) network aṭanga catchment ri zawn (Aizawl Municipal Corporation, Lunglei Municipal Council, kawng sir drain tan PWD, khawpui dangte tan Village Council leh District Council-te, Survey of India); Table 1.5 drain register, drain chhung tin neitu, a thlen lui, leimin hlauhawmna map-a a class leh a outfall (drain tui luan chhuahna) nen; Corporation Landslide Hazard Maps (leimin hlauhawmna map) 1:5,000-a mi leh MIRSAC Aizawl leh khawpui thlan atlas leh a Serchhip zonation (Corporation, MIRSAC); MSDMA, DM&R leh Directorate of Geology and Mineral Resources leimin inventory-te [TBC]; CWC Sairang leh Turial site level-te, an gauge zero leh datum nen (CWC), leh Tlabung, Sairang, Bairabi, Vairengte leh Champhai-a tuilian chhinchhiahna survey (IWRD, Deputy Commissioner-te); leh Tuirial dam tui chhuah record leh dam-break tui chim map (NEEPCO) [TBC] a mamawh. Kolasib, Mamit, Khawzawl, Saitual, Hnahthial leh Chawngte hi an catchment ri leh record-te ziah a nih veleh Clause 4.5.4 hnuaia notify tur thlan theih an ni [TBC]. Bung 7 corridor-te chu he list aiin Bung 7 leh chutah thuneitu dan thuziak-te hian an thunun. A tlangzarh hma chuan, site chu catchment tarlan chhungah a awm leh awm loh chu Authority-in pre-application stage-ah ri awm ṭha ber aṭangin thu a tlukna siam a, thu tlukna leh a innghahna chu Form 1-1-ah leh drainage report-ah chhinchhiah a ni (Clause 1.5.9 leh 1.11.5).

Table 1B.2 — Tuilian hlauhawm catchment layer attribute-te (layout)

Field	A chhunga thu	Unit emaw format
catchment_id	Mahni bik identifier	text
name	Catchment hming	text
basis	Clause 4.5.3.2 item (a) aṭanga (m) thleng, emaw Clause 4.5.4 hnuaia notification	text
notification_ref	Gazette notification number, notify a nih chuan	text
notified_on	Notification ni	date

Field	A chhunga thu	Unit emaw format
applies_from	Dilna-te chunga dan hman ṭan ni (Clause 4.5.4.2, step 5)	date
boundary_source	Ri thu hnar leh a ni	text
area_km2	Catchment area	km²

Belhchian 1C — Policy Supplement: thlan dang S-1 aṭanga S-5 thleng thu leh council thutlukna (resolution) entawn tur

Bung 1-a Clause 1.6.3, 1.6.5 leh 1.7.1 aṭanga 1.7.3 thleng a ṭanpui.

> **Competent authority ngaihtuah tura entirna thuziak. Hman a ni lo.** A hnuaia thuziak hian Clause 1.7 Policy Supplement ziah dan theih a lantir. Sawrkar-in a chhuah a, Clause 1.7.3 hnuaia Approving Authority (phalna petu Authority)-in a pawm hma chuan thiltihtheihna a nei lo.

Part 1 — Dan tlangpui

P1.1 **A huam chin.** He Supplement hian Mizoram Ruahtui Luanna Design Kaihhruaina Bu (Kaihhruaina Bu) mamawh, thlan dang tinah hming tarlan, aiah thlan dang S-1 aṭanga S-5 thleng a tarlang. Thlan dang chu Approving Authority (Authority) area chhungah, Authority-in P1.3 hnuaiah a pawm ni aṭang chauhin hman a ni.

P1.2 **Criterion hniam zawk a awm lo.** Thlan dang reng rengin Kaihhruaina Bu criterion reng reng a tihniam lo. S-1 leh S-2 hi criterion inang tlin nan kalphung awlsam zawk an ni (Clause 1.7.3(a)).

P1.3 **Pawmna.**

- (a) Tier B authority chuan Part 3 form-a council thutlukna hmangin thlan dang a pawm a, resolution hnu ni 30 chhungin State Stormwater Technical Committee (Committee) hnenah a copy a thawn.
- (b) Tier A authority chuan Committee-in ziaka inremna a pek hnu chauhin thlan dang a pawm thei.
- (c) Authority chuan a thlan dang pawmte chu a website-ah leh Clause 10.17 register-ah a tlangzarh.

P1.4 **Retention.** Thlan dang reng rengin retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) mamawh (Belhchian 2E zat) a thlak lo, S-5 hnuaia fee-in-lieu chuan basin inangah retention tluk a sum a pek hmun bak chu (Clause 1.7.3(d)).

P1.5 **Table-te.** S-1, S-2 leh S-3-in table an hman chu Committee-in a chhuah an ni a, Kaihhruaina Bu Bung 2 nen endik an ni (Clause 1.7.3(e) leh 2.14). Table innghatna thlan dang chu chu table chhuah a nih hma chu hman theih a ni lo.

P1.6 **Record.** Thlan dang hmangtu dilna thehluhtu chuan Form 1-1-ah leh drainage report-ah a tarlang a, a pawmna resolution emaw inremna emaw nen.

Part 2 — Thlan dangte

S-1 — Khawlna tana design-aid route

S-1.1 *A thlak:* Bung 3 hnuaia hydrograph (hun hrang hranga tui luang zat) kalphung hmanga khawlna lian zawng ruat.

S-1.2 *Thlan dang:* retention leh detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) tui zat chu Belhchian 4B tana unit-storage table chhuah (ha khatah m³, ruahtui zone, hydrologic soil group leh impervious fraction zelin) leh compliance calculator aṭangin, Clause 4.14.2 kalphung hmangin lak theih a ni.

S-1.3 *Hman theihna:* tuilian hlauhawm catchment pawna ha 2 emaw a aia tlem site-te, leh a chhunga ha 0.5 emaw a aia tlem site-te (Table 1.2; Clause 4.14.1).

S-1.4 *Thuthlung:* hmasawnna hnu imperviousness hman chu plan phalna pekah a lan ang a ni tur a ni; Clause 4.14.2 outlet, spillway, RWH chhutna leh himna dan-te hman a ni; compliance calculator chu chhutna awm chhun a ni thei (Table 1.1).

S-2 — Site aṭanga luan chhuah phal zat (PSD)

S-2.1 *A thlak:* site tana chhut luan chhuah tir zat Q_post(T) ≤ 0.9 × Q_pre(T) (Clause 2.11.2).

S-2.2 *Thlan dang:* AEP tin tana luan chhuah tir zat chu site zone leh AEP tana unit-area luan chhuah tir zat table-a mi, site area-in puntir, lak theih a ni. Table-a rate-te hi 0.9 × Q_pre dan aṭanga siam an ni (Table 1.2).

S-2.3 *Hman theihna:* tuilian hlauhawm catchment pawna site reng reng.

S-2.4 *Thuthlung:* chutichuan khawlna chu PSD-ah Clause 2.5.2 duration tin dah theih turin lian zawng ruat a ni; Bung 4 drawdown, orifice tê ber leh spillway dan-te chu thlak lovin hman a ni.

S-3 — Zau zawng nghet tui awmna setback

S-3.1 *A thlak:* map-a lang 1% AEP tuilian zau zawng leh margin thlenga tui awmna (waterbody) setback (tui kam aṭanga hmun kalhlen tur) (Bung 7).

S-3.2 *Thlan dang:* 1% AEP zau zawng map-a a lan loh chuan, setback chu Clause 7.4.6 table-ah (leh Belhchian 7B-ah) tui awmna class tana zau zawng nghet a ni tur a ni, Clause 7.4.3-a ang a teh.

S-3.3 *Hman theihna:* 1% AEP zau zawng map-a lang lo tui awmna-te.

S-3.4 *Thuthlung:* he thlan dang hnuaia setback reng reng chu Clause 7.4.7 Zone 1 hniam ber (kam chhip (top of bank) aṭanga 15 m, emaw lui laih thuk kam chu awn zawng 10° aia a san chuan kam pang chhip (crest of the bank slope) aṭanga) aiin a tlem lo (Clause 1.10.3(c)); Bung 7 no-fill zone hman a ni; nakina 1% AEP zau zawng map-a dah leh pawm a nih chuan, dilna tharte chungah map-a lang setback hman a ni.

S-4 — Luanna hnuailam screening checklist

S-4.1 *A thlak:* Bung 5 hnuaia hydraulic model hmanga luanna hnuailam (downstream) zirchianna.

S-4.2 *Thlan dang:* Dilna thehluhtu chuan luanna hnuailam theihna leh tuilian hriatte screening checklist a siam kim a, Clause 5.3.4 dinhmun-te tal a huam: tui dawngtu public drain chuan a minor-system design tui luang (Bung 6) tan theihna ziak tawh a nei, leh luanna hnuailam 500 m chhungah tuilian hmun record a awm lo. Screen a hlawhchham chauhin Bung 5 hnuaia hydraulic model a ngai.

S-4.3 *Hman theihna:* ha 1 aia tlem site-te, tuilian hlauhawm catchment pawna, tidal outfall-a luang lo.

S-4.4 *Thuthlung:* checklist hi drainage report sign-tu registered professional-in a sign (Clause 10.6); tuilian hmun-te chu local body, Deputy Commissioner leh District Disaster Management Authority, MSDMA, Disaster Management & Rehabilitation Department (DM&R), IWRD emaw Village Council emaw-in an chhinchhiahte an ni (Clause 5.3.3(d)).

S-5 — Regional khawlna tana fee-in-lieu

S-5.1 *A thlak:* Bung 4 hnuaia site chhunga detention.

S-5.2 *Thlan dang:* detention mamawh pum emaw a ṭhenkhat emaw chu basin plan-a tarlan regional detention facility emaw dil siam ṭhat emaw dil (tank) khawlna emaw tana fee-in-lieu hmangin tihlawhtlin theih a ni (Clause 4.13.1).

S-5.3 *Hman theihna:* basin plan notify a nihna basin-a site-te (Table 1.2).

S-5.4 *Thuthlung:*

- (a) Clause 4.13.2 dinhmun-te hman a ni, regional facility emaw dil siam ṭhat emaw a hman theih hma chu site chhunga detention hman rih tur, leh site chhunga retention leh WQv tihfaina pawh tiamin;
- (b) fee chu Clause 4.13.3 hnuaiah chhut a ni a, ring-fence basin account-ah dah a ni;
- (c) tui zat credit leh fee chu Clause 4.13.4 public ledger-ah ziah luh a ni; leh
- (d) tuilian hlauhawm catchment-ah, fee-in-lieu chu Clause 1.10.3(d)-in a phal ang chauhin hman theih a ni.

Part 3 — Council thutlukna (resolution) entawn tur

> **Competent authority ngaihtuah tura entirna thuziak. Hman a ni lo.**

Resolution No. _____, _____ (Municipal Corporation / Municipal Council / Village Council / Autonomous District Council hming), ni _____

Thupui: Mizoram Ruahtui Luanna Design Kaihhruaina Bu Policy Supplement hnuaia thlan dang pawmna.

Council chuan, Municipal Commissioner / Council chief officer report ni _____ a ngaihtuah hnuin, heng a hriat chungin:

- (i) Mizoram Ruahtui Luanna Design Kaihhruaina Bu leh a Policy Supplement chu _____ (instrument leh ni) hmangin hman tir a ni tawh;
- (ii) he local body hi Kaihhruaina Bu Clause 1.6 hnuaiah Tier B / Tier A authority a ni; leh
- (iii) Tier A authority tan, State Stormwater Technical Committee chuan ni _____-ah inremna a pe (reference _____),

heti hian thu a tluk:

1. Kaihhruaina Bu Clause 1.7.3 thuthlung hnuaiah, a area chhungah Policy Supplement thlan dang a hnuaia mite pawm:

Table 1C.1 — He resolution-in thlan dang a pawmte

Thlan dang	Pawm (Aw / Aih)	A huam area (area pum, emaw ward / zone)	Hman ṭan ni
S-1 Design-aid route			
S-2 Site aṭanga luan chhuah phal zat			
S-3 Zau zawng nghet setback			
S-4 Luanna hnuailam screening checklist			
S-5 Fee-in-lieu			

2. tuilian hlauhawm catchment chhungah thlan dang pawm reng reng chu Kaihhruaina Bu-in a phal ang bak chu hman loh tur a ni (Clause 1.6.5);
3. he resolution copy chu ni 30 chhungin State Stormwater Technical Committee hnenah thawn tur a ni;
4. thlan dang pawmte chu local body website-ah tlangzarh a, Clause 10.17 register-ah ziah luh tur a ni; leh
5. Clause 1.7.3(e) table-te siam ṭhat a nih hunah he resolution hi endik tur a ni.

Belhchian 1D — AMCBR/SD&SM amendment entawn tur leh ULB bye-law entawn tur

Bung 1-a Clause 1.3.1, 1.3.4, 1.11 leh 1.12 a ṭanpui.

> **Competent authority ngaihtuah tura entirna thuziak. Hman a ni lo.** Thuziak hian Clause 1.3.1 dan thuziak-te siam dan theih kawng khat a lantir. Rule leh section number-te chu a ruakin dah a ni.

> **Ziahna hriat tur D1D.1.** Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017-a rule thar leh thuthlung-te dah luh tur rule number-te, leh Mizoram Urban and Regional Development Act, 1990 leh municipal leh panchayat Act-te-a thuneihna petu section-te chu sawrkar dan thiam (legal adviser)-te-in an finfiah tur a ni. Hetah pakhat mah tarlan a ni lo.

Part A — Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 amendment entawn tur

A.1 **Hming tawi leh hman ṭanna.**

- (1) Heng rule-te hi Aizawl Municipal Corporation Building and Site Development (Stormwater Management) (Amendment) Regulations, _____ tia koh theih a ni.
- (2) Mizoram Gazette-a an tlangzarh ni aṭanga thla ruk hnu ni-ah hman ṭan an ni ang (Clause 1.11.1).

A.2 **Rule thar dah luh.** Aizawl Municipal Corporation Board of Councillors-in Mizoram Municipalities Act, 2007 section 371 hnuaia a siam leh Urban Development & Poverty Alleviation Department-in a notify, building leh site-development regulation-te rule [_____] hnuah, a hnuaia rule hi dah luh tur a ni:

Rule [_____]. Ruahtui enkawlna.

(1) *Thumal awmzia.* He rule-ah, "Kaihhruaina Bu" ("the Manual") tih chu sawrkar-in a notify anga Mizoram Ruahtui Luanna Design Kaihhruaina Bu, a belhchian leh amendment-te nen, a ni; thumal dangte chu Kaihhruaina Bu Clause 1.4-a awmzia pek ang an ni.

(2) *Hman dan.* He rule hi heng rule-te hnuaia planning permission, building permit emaw layout phalna emaw ngai development tin chungah hman a ni.

(3) *Ruahtui luang thunun.* Development-in, a development plan pum (common plan of development) chhungah, 0.1 ha emaw a aia tam lei tihbuai (land disturbance) emaw 500 m² emaw a aia tam tui luh theih lohna hmun (impervious) thar emaw thlak emaw a huam chuan, development chuan Kaihhruaina Bu Bung 4 leh 5 (retention, detention, luanna hnuailam leh tailwater (outfall hnuailama tui sang zawng) zirchianna) a zawm tur a ni.

(4) *Development tin tana dan.* Development tin, a lian zawng eng pawh ni se, chuan Kaihhruaina Bu Clause 1.5.4 a zawm tur a ni: ruahtui drain-ah ek tui (sewage) connection a awm loh tur; floor sang zawng; tui awmna setback leh no-fill zone; leh tui luanna kawng dan loh.

(5) *Hmanlo theihna (exemption).* Sub-rule (3) threshold hnuaia a plot ngeia in pakhat chauh, leh tui luh theih lohna hmun belh lo kawng linear resurfacing chu sub-rule (3) aṭangin an chhuak a, mahse sub-rule (4) emaw heng rule-te ruahtui khawl khawm (rainwater harvesting) dan aṭangin emaw an chhuak lo.

(6) *Phalna thuthlung.* Competent authority chuan heng hi a pe loh tur a ni:

- (a) planning permission emaw layout phalna emaw, Kaihhruaina Bu hnuaia drainage report hmasa (preliminary) lo pawm a nih loh chuan;
- (b) building permit, emaw ṭan phalna, drainage design hnuhnung lo pawm a nih loh chuan; emaw
- (c) completion certificate, as-built certificate lo pawm a nih a, maintenance declaration register a nih emaw public asset-te hlan a nih emaw loh chuan,

sub-rule (3)-in a huam development tan (Kaihhruaina Bu, Clause 10.3).

(7) *Certification.* Drainage report leh design-te chu registered professional-in a sign tur a ni a, Kaihhruaina Bu Clause 10.6.1-in a phut chuan, empanelled Stormwater Design Professional-in a sign bawk tur a ni.

(8) *Ruahtui khawl khawm.* He rule-a thil reng rengin heng rule-te ruahtui khawl khawm (rainwater harvesting) dan a thlak lo.

(9) *Variance leh waiver.* Competent authority chuan Kaihhruaina Bu Clause 1.10-a chhan leh kalphung hmangin chauh variance emaw waiver emaw a pe thei a, thu tlukna tin a tlangzarh tur a ni.

(10) *Inthlak danglamna (transition).* He rule hman ṭan hmaa a kima thehluh dilna-te leh Tier B authority-te chu Kaihhruaina Bu Clause 1.11-in a thunun.

Part B — ULB bye-law entawn tur

B.1 **Hming leh hman ṭanna.** Heng bye-laws hi _____ (local body hming) Stormwater Management Bye-laws, _____ tia koh theih a ni. Ni _____-ah hman ṭan a ni ang.

B.2 **Kaihhruaina Bu pawmna.** Mizoram Ruahtui Luanna Design Kaihhruaina Bu, sawrkar-in a notify ang hian, heng chungah hman a ni:

- (a) local body-in phalna a pek development tin; leh

- (b) local body-in a kalpui drainage, kawng, culvert (kawng hnuaia tui kalna), tui awmna leh tuilian tihziaawmna hna tin, a drain leh kawng ngei pawh tiamin (Clause 1.3.1(b)).

B.3 **Public works.** B.2(b) hnuaia hna tana detailed project report leh contract tin chuan Clause 1.11 ni-te aṭangin Kaihhruaina Bu zawm a phut tur a ni (Clause 1.3.4).

B.4 **Tier leh thlan dang.** Local body hi Kaihhruaina Bu Clause 1.6 hnuaiah Tier _____ authority a ni. Local body-in Policy Supplement thlan dang a pawmte chu Schedule-ah tarlan a ni, a pawmna resolution tin nen.

B.5 **Thehluh leh endikna.** Thehluh tur-te chu Kaihhruaina Bu Clause 10.3 stage-ah thehluh tur a ni a, Clause 10.7 hun chhungin endik tur a ni.

B.6 **Enkawlna, endikna leh dan zawm tirna.** Maintenance declaration, endikna, public asset hlanna leh dan zawm tirna (enforcement) chu Kaihhruaina Bu Clause 10.10 aṭanga 10.15 thleng a zui tur a ni.

B.7 **Tlangzarhna.** Local body chuan Kaihhruaina Bu Clause 10.17 register leh report-te a tlangzarh tur a ni.

B.8 **Endikna.** Clause 1.12 hnuaia Kaihhruaina Bu amendment a nih apiangin heng bye-laws hi endik tur a ni.

Table 1D.1 — Schedule: thlan dang pawmte (layout)

Thlan dang	Resolution number leh ni	Committee inremna (Tier A chauh)	Hman ṭan ni	Area

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Form 1-1 — A Huam leh Huam Loh Thutlukna

Bung 1-a Clause 1.5.1 aṭanga 1.5.9 thleng leh 1.6, leh Bung 10-a Clause 10.3 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Clause 10.3.2-in a phut angin, pre-application meeting (Stage 0)-ah emaw drainage report hmasa (Stage 1) nen emaw thehluh a ni.

Table 1F.1 — Form 1-1: A Huam leh Huam Loh Thutlukna

No.	Thil (clause)	Ziah luh tur
	A. Dilna thehluhtu leh site	
A1	Dilna thehluhtu (neitu, developer emaw Department)	_____
A2	Site address leh survey number-te	_____
A3	Site coordinates (latitude, longitude)	_____
A4	Approving Authority (Clause 1.4)	_____
A5	Authority tier: A / B (Clause 1.6; Belhchian 1A)	_____
A6	Phalna dil: planning permission / building permit / layout phalna / public work (DPR)	_____
A7	Development chi: building / layout / sub-division / kawng / paving / ram hman dan thlak / a dang (Clause 1.4)	_____
A8	He form thehluh stage: Stage 0 / Stage 1 (Clause 10.3)	_____
	B. A huam chin (Clause 1.5.1)	
B1	Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 hnuaia phalna ngai development — 1.5.1(a): Aw / Aih	_____
B2	ULB, State Department, board emaw State undertaking-in public work — 1.5.1(b): Aw / Aih	_____
B3	Authority phalna emaw no-objection emaw ngai Central agency hnathawh — 1.5.1(c): Aw / Aih	_____
	C. Development plan pum chhunga area-te (Clause 1.4, 1.5.5)	
C1	Phase, plot leh sub-division tel (layout phalna pakhat emaw neitu pakhat)	_____
C2	Site area pumpui (ha)	_____
C3	Lei tihbuai (ha)	_____
C4	Tuna tui luh theih lohna hmun (m²)	_____
C5	Tui luh theih lohna hmun thar (m²)	_____
C6	Tui luh theih lohna hmun thlak, subgrade thlenga paih leh siam thar (m²)	_____
C7	Thar leh thlak tui luh theih lohna hmun, C5 + C6 (m²)	_____
C8	RWH mamawh tana plot area (m²) (Clause 1.5.3)	_____
	D. Threshold leh hmanlo theihna (exemption)	
D1	Lei tihbuai 0.1 ha emaw a aia tam — 1.5.2(a): Aw / Aih	_____
D2	Tui luh theih lohna hmun thar emaw thlak emaw 500 m² emaw a aia tam — 1.5.2(b): Aw / Aih	_____
D3	Siam ṭhatna (redevelopment) (site-a tuna tui luh theih lohna hmun awm) — 1.5.6: Aw / Aih	_____

No.	Thil (clause)	Ziah luh tur
D4	Clause 4.5.6 constrained redevelopment route rawt: Aw / Aih	_____
D5	Linear public work: drainage catchment kal tlang tina tui luh theih lohna hmun belh Table 1F.2-ah pek — 1.5.7: Aw / Aih / a huam lo	_____
D6	Hmanlo theihna dil — 1.5.8(a) threshold hnuaia in pakhat chauh / 1.5.8(b) tui luh theih lohna hmun belh lo resurfacing / a awm lo	_____
D7	RWH mamawh a huam (AMCBR regs. 33 leh 5(6)(ix): Aizawl Municipal Corporation area chhunga building tin; AMCBR Chapter VIIIA (2025): incentive chauh, 100 m² aia lian plot; State hmun dangah: dan hmuh a ni lo) — 1.5.3: Aw / Aih	_____
	E. Site dinhmun	
E1	Tuilian hlauhawm catchment-a site (Belhchian 1B; Clause 4.5.3): Aih / Aw — hming	_____
E2	Catchment ri hman thu hnar	_____
E3	Site tana 1% AEP level map-a lang emaw hriat theih emaw (Clause 1.5.4(b)): Aw / Aih; thu hnar	_____
E4	Site chunga emaw a bula tui awmna (Clause 1.5.4(c); Bung 7): Aih / Aw — hming	_____
E5	Site kal tlang pianphung tui luanna kawng emaw major-system tui luanna kawng (Clause 1.5.4(d)): Aih / Aw	_____
E6	Site chu tidal outfall-ah a luang (Clause 10.3.2(d)): Aw / Aih	_____
E7	Variance, waiver, regional facility emaw fee-in-lieu rawt (Clause 10.3.2(c)): Aih / Aw — Form 1-2 belh	_____
	F. Thutlukna	
F1	Rah chhuah: (i) Bung 4 leh 5 hman a ni, Clause 1.5.4 leh RWH mamawh nen; (ii) Clause 1.5.4 leh RWH mamawh chauh (threshold hnuai); (iii) 1.5.8 hnuaiah hmanlo theih, Clause 1.5.4 leh RWH mamawh erawh hman a ni tho	_____
F2	Clause 10.3.2 hnuaiah Stage 0 ngei ngei tur: Aw (item (a) aṭanga (d) thleng tarlang rawh) / Aih	_____
F3	Khawlna kalphung: hydrograph kalphung (Bung 3) / design-aid route S-1 (Clause 1.7, pawm leh hman theih a nih chuan)	_____
F4	Policy Supplement thlan dang dang innghahna (S-2 aṭanga S-5 thleng), a pawmna resolution nen	_____
F5	Tier B phase hrang hranga ṭanna hman a ni (Clause 1.11.3): Aw / Aih	_____
	G. Puanchhuahna	
G1	Kei hian a chunga thu hi a dik a, development plan pum a huam tih ka puang e. Dilna thehluhtu: hming, signature, ni	_____
G2	Buatsaihtu (registered professional, Clause 1.4): hming, registration number, signature, ni	_____
	H. Authority tan (Clause 1.5.9)	
H1	Thutlukna finfiah / siam ṭhat	_____
H2	Siam ṭhatna leh a chhan	_____
H3	Officer: hming, designation, signature, ni	_____

Table 1F.2 — Form 1-1: drainage catchment zela tui luh theih lohna hmun belh, linear hna (Clause 1.5.7)

Drainage catchment kal tlang	Chainage aṭanga – thleng	Tui luh theih lohna hmun belh (m²)	500 m² emaw a aia tam (Aw / Aih)	Khawlna awmna: right of way / regional facility

Form 1-2 — Variance / Waiver Dilna

Bung 1-a Clause 1.10 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Drainage report hmasa nen thehluh a ni (Clause 1.10.4(a)), mamawh tin tan form pakhat zelin.

Table 1F.3 — Form 1-2: Variance / Waiver Dilna

No.	Thil (clause)	Ziah luh tur
	A. Dilna thehluhtu leh site	
A1	Dilna thehluhtu	_____
A2	Site address leh coordinates	_____
A3	Form 1-1 reference leh ni	_____
A4	Authority tier: A / B	_____
A5	Site area (ha)	_____
A6	Tuilian hlauhawm catchment-a site: Aw / Aih	_____
	B. Dilna	
B1	Chi: number mamawh aṭanga variance (1.10.1) / Bung 4 detention waiver (1.10.2)	_____
B2	Kaihhruaina Bu Clause chungchang	_____
B3	Kaihhruaina Bu-in value a phut	_____
B4	Value emaw ruahmanna emaw rawt	_____
	C. Variance emaw waiver theih loh thilte (Clause 1.10.3) — dilna hian an zinga pakhat mah a khawih lo tih finfiah rawh	
C1	(a) ruahtui drain-a ek tui (sewage) connection	A khawih lo: _____
C2	(b) Bung 6-a mi chenna chhuat sang zawng hniam ber	A khawih lo: _____
C3	(c) Clause 7.4.7 Zone 1 hniam ber hnuaia tui awmna setback (kam chhip aṭanga 15 m, emaw lui laih thuk kam pang awn zawng 10° aia sang kam pang chhip aṭanga), emaw Bung 7 no-fill zone-a lei vur emaw sakna emaw	A khawih lo: _____
C4	(d) tuilian hlauhawm catchment-a retention, Clause 1.7 hnuaia fee-in-lieu hmang loh chuan	A khawih lo: _____
	D. Variance: chhan (Clause 1.10.1(a))	
D1	Site dinhmun: leihnuai tui sang / lei bawlhhlawh (contaminated) / lungpui / facility mamawh tan site a tê lutuk / a dang	_____
D2	Finfiahna (test, survey, plan), reference nen	_____
D3	Thlan dan zirchian leh a tin tih theih loh chhan	_____
	E. Variance: hlawhtlinna inang emaw tihkimna (make-up) (Clause 1.10.1(b))	
E1	Luanna hnuailam hmun hman (Bung 5)	_____
E2	Chu hmuna hlawhtlinna, zawm kim leh variance nen (tui luang zat sang ber, tui sang zawng)	_____

No.	Thil (clause)	Ziah luh tur
E3	Emaw: catchment inanga fee-in-lieu emaw site pawn hnathawh emaw-a tlakchham tihkim — tui zat (m³), hnathawh emaw fee	_____
	F. Detention waiver: chhan (Clause 1.10.2)	
F1	Site chu tuifinriat-ah / tidal lui chhung, a hnuai lama tuilian hlauhawm property awm lo-ah, a luang nghal	_____
F2	Detention lo tui luang hian Bung 5 outfall khar dinhmun a tihchhiat loh tih lantirtu zirchianna — reference	_____
F3	Retention chu a kimin pek a ni tho: Aw	_____
	G. Belh tur (Clause 1.10.4(a))	
G1	Clause 10.6 hnuaia certify report	_____
G2	Drainage report hmasa	_____
	H. Certification leh puanchhuahna	
H1	Certifytu (registered professional; Clause 10.6.1 a huam chuan empanelled professional): hming, registration emaw empanelment number, signature, ni	_____
H2	Dilna thehluhtu: hming, signature, ni	_____
	I. Authority tan (Clause 1.10.4)	
I1	State Stormwater Technical Committee hnena thawn (Tier B, site ha 1 emaw a aia tam): Aw / Aih; ni	_____
I2	Thutlukna: pek / thuthlung nena pek / hnawl	_____
I3	Chhan leh thuthlung	_____
I4	Public register-a entry number (Clause 10.17)	_____
I5	Hriat tur: variance chu phalna nen a kal a, phalna a tawp chuan a tawp ve (Clause 1.10.4(d))	—
I6	Officer: hming, designation, signature, ni	_____

BUNG 2 BELHCHIAN

Design Ruahtui Tlak leh Design Ruahpui

Heng belhchiante hian Bung 2 an ṭanpui. Belhchian 2A aṭanga 2E thleng hian Bung 2-in a sawi State pum ruahtui tlak table-te an keng ang: benchmark endikna leh zone map, ni khat aia tawi ratio (sub-daily ratio), grid-to-point factor, temporal pattern (ruahtui tlak dan) leh retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) zat. A pakhat zelin he Kaihhruaina Bu tan la tih loh NIH-DHAARA leh IMD record zirchianna an mamawh a, chuvangin a pakhat zelin "Buatsaih tur" tih chhinchhiah an ni a, an ruangam tur leh an tlangzarh hma chuan hman tur dan an tarlang (Clause 1.11.5). Form 2-1 hi hydrology thehluh tur (submittal) tinin a tel ngei ngei tur Design Ruahtui Tlak Sheet draft form a ni (Clause 2.13). He Kaihhruaina Bu hi draft a ni a; sawrkar emaw agency emaw reng rengin pawm a ni lo.

Belhchian 2A — Benchmark hmuna NIH-DHAARA leh IMD station leh IMD grid endikna; zone map

Bung 2-a Clause 2.3.1 aṭanga 2.3.5 thleng a ṭanpui.

Buatsaih tur. He belhchian hian State hmun hrang hranga benchmark hmunah, NIH-DHAARA design zat-te chu IMD ni khat station record rei tak leh IMD grid ni khat data (Belhchian 2C hmanga hmun khat value-a thlak) frequency analysis-te nen, darkar 24 leh a aia rei tan leh Table 2.1 AEP-te tan, a khaikhin ang. Belhchian 2B, 2C leh 2E-in leh Bung 4 Tier B table-te-in an hman ruahtui zone map pawh a keng ang. Heng a mamawh: benchmark coordinates-a NIH-DHAARA value (NIH), IMD ni khat leh recording-gauge station record leh IMD grid ruahtui tlak (IMD), State rain-gauge record (IMD Meteorological Centre Aizawl ni khat ruahtui tlak list-a gauge-te, an zingah Mz-SWIC network automatic rain gauge leh weather station 30 vel (operator hming thu hnar-in a kimchang a tarlang lo [U]), Serchhip, North Vanlaiphai, Lunglei, Haulawng leh Tlabung-a Agriculture Department rain gauge pangngaite, leh Bairabi, Dapchhuah, Mat-1, Tlabung, Tuichawng, Tuipui D, Shitlangpui leh site dangte-a CWC rain gauge-te, leh Directorate of Science and Technology (DST) hnuaia State Meteorological Centre series-te, an chi, an ṭan kum leh an record rei zawng finfiah tur [TBC]), leh district leh basin ri (Survey of India, IWRD). A tlangzarh hma chuan, design zat-te chu Clause 2.3.1 hnuaiah NIH-DHAARA aṭanga lak a ni a, Clause 2.3.3 khaikhinna-te chu Form 2-1-ah report a ni a, site zone chu Authority nena inremna siam leh Form 2-1-a chhinchhiah a ni.

Table 2A.1 — Benchmark hmuna design zat khaikhinna (layout)

Benchmark hmun	IMD station ID	Latitude, longitude	Record kum zat	Duration (h)	AEP	NIH-DHAARA (mm)	IMD station analysis (mm)	IMD grid, hmun khat value (mm)	NIH-DHAARA / IMD station	Hriat tur
				24						
				48						
				72						

2A.1 A hnuaia zone hmingte hi Bung 4 Tier B table template-a hman hming hman rih tur (working name) an ni (Clause 4.14.2). An ri-te, leh zone dang a ngai em tih chu he belhchian zirchianna-in a ruat tur a ni.

Table 2A.2 — Ruahtui zone (layout)

Zone (hming hman rih tur)	A huam chin (district, basin)	Station entirna	Hriat tur
MZ-Z1 Hmar lam tlang (Northern hills)	State hmar lam Barak lam hawi, Kolasib district leh Mamit district thlang lamah: Tlawng, Tuirial, Serlui leh Langkaih basin leh Barak pan Tuivai; CWC subzone 2(c)-ah, chu tan report a awm lo (Clause 2.3.6(b)); zone ri kal tlang catchment (ruahtui luan khawmna hmun)-in zone value sang zawk a la	IMD station a awm lo; Kolasib-a IMD automatic weather station; Bairabi leh Dapchhuah-a CWC rain gauge; Buhchangphai, North Hlimen, Kawnpui leh Chemphai-a leh West Phaileng-a Mz-SWIC gauge [TBC: record rei zawng]	AEP tina darkar 24 zat chu NIH-DHAARA cell leh Mizoram floor (a hniam ber tur zat) hman rih tur (Clause 2.3.6(c)(i)) zinga a sang zawk, 50% / 20% / 10% / 4% / 2% / 1% AEP-ah 130 / 190 / 230 / 285 / 320 / 360 mm aia tlem lo, Barak phai dan hnaih floor kengtu table (Clause 2.3.6(c)(ii)); Mizoram ratio hman rih tur, darkar 1 ratio 0.33 (Clause 2.3.6(f)); darkar 72 zat = darkar 24 × 1.70 (Clause 2.3.6(e)). NIH-DHAARA kum 50 darkar 24 303–338 mm, darkar 1 88–89 mm. A hnuai lama phai chu edition hnaih-in a thunun. Clause 4.11 tlang dan
MZ-Z1 Hmar lam tlang: MZ-A Hmar lam tlang (Kolasib–Kawnpui–Bilkhawthlir)	Mamit district thlang lam tlangte (Dapchhuah, West Phaileng) leh Bairabi leh Vairengte chunga tlang pangte pawh; Tlawng, Tuirial, Serlui leh Langkaih pana outfall (drain tui luan chhuahna); NEEPCO Tuirial reservoir (tui khuah) (full reservoir level 90.5 m, CERC) leh Serlui B dam (tui khuahna); ri [TBC]	Kolasib-a IMD automatic weather station; Kolasib gauge pangngai (AMFU); Mz-SWIC gauge [TBC]	Clause 2.3.6(c)(ii) Barak phai table-in Kolasib-ah AEP tinah thu a nei (cell 120.8 / 218.0 / 303.3 / 339.3 mm kum 2 / 10 / 50 / 100-ah); kum 50-ah darkar 1-ah 106 mm vel. Railway leh NH-306 lei laih pang. Tuirial leh Serlui B dam hnuaia tui chhuah lui chhung (Clause 2.3.6(i)). May ni 1 aṭanga October ni 31 thleng AMC III, leh outfall chu reservoir emaw tui chhuah lui chhung emaw a nih hmunah hun reng rengah (Clause 2.11.4)
MZ-Z1 Hmar lam tlang: MZ-A1 Hmar lam phai (Bairabi–Vairengte)	Bairabi leh Vairengte-a lui kam zawl leh phai, he Kaihhruaina Bu zirchianna-a "State-a khawpui hniam ber" ("the lowest-lying towns in the State"), leh Sairang hnuaia Tlawng phai; 1% AEP tuilian sang zawng hnuaia phai ram; ri [TBC]	Bairabi-a CWC rain gauge; IMD station a awm lo [TBC]	Barak phai table-in Bairabi-ah thu a nei (kum 50-ah cell 315.0 mm); Vairengte-ah cell-in thu a nei (kum 10 / 50 / 100-ah 241.5 / 337.9 / 378.7 mm; kum 50-ah darkar 1 112 mm vel). Record endikna: record pakhat mah a tling lo; Barak phai IMD record-te chu a hnuai lamah, km 25 aia hla takah an awm (Clause 2.3.6(h)). Clause 5.8.5(c) luipui tailwater (outfall hnuailama tui sang zawng); 1% AEP level chunga lui kam zawl test tawhah Clause 4.11 recharge dan; phai ramah April ni 1 aṭanga October ni 31 thleng AMC III
MZ-Z2 Laili tlang chhip (Central ridges)	Tlawng leh Tuirial inkar tlang chhipte leh chhim lam Mat thleng, Aizawl, Serchhip, Hnahthial leh Mamit chhak lam district-ah; subzone 2(c)-ah (Clause 2.3.6(b))	IMD Meteorological Centre Aizawl (ORG) leh Lengpui (ORG), IMD *Extremes*-ah awm lo (Aizawl 42726, Aizawl-Lengpui 42727, city-weather ID); Mizoram University, Serchhip leh Hnahthial-a IMD automatic weather station; Serchhip leh North Vanlaiphai-a Agriculture Department gauge; CWC Mat-1 leh Tuipui D; Mz-SWIC gauge [TBC]	Darkar 24 zat chu cell leh Mizoram floor hman rih tur 85 / 130 / 160 / 195 / 225 / 250 mm zinga a sang zawk (Clause 2.3.6(c)(i)); Mizoram ratio hman rih tur; darkar 72 = darkar 24 × 1.70. NIH-DHAARA kum 50 darkar 24 211–260 mm, darkar 1 55–68 mm. Middle Bhuban shale leh sandstone; Serchhip khawpui 89% hi 30° aiin a chho zawk (MIRSAC; NEER chhutna): Clause 4.11 tlang dan. Leimin-in thu a nei (Clause 2.3.6(i))

Zone (hming hman rih tur)	A huam chin (district, basin)	Station entirna	Hriat tur
MZ-Z2 Laili tlang chhip: MZ-B Laili tlang chhip (Aizawl–Sairang–Serchhip–Thenzawl–Hnahthial–Mamit)	Aibawk, Sialsuk, Darlawn leh North Vanlaiphai pawh; Tlawng leh Tuirial phai inkara Aizawl tlang chhipte, chhak lamah Chite lui hmangin Tuirial-ah leh thlang lamah Ser lui hmangin Tlawng-ah a luang chhuak; Tlawng kama Sairang hi ruahtui tlak tan MZ-B-ah a awm a, Bung 4 leh 5 hnuaiah phai ram a ni; ri [TBC]	Zone ang bawk	Aizawl-ah (cell 84.8 / 156.9 / 220.1 / 246.8 mm), Mamit leh Serchhip-ah floor-in thu a nei (Serchhip-a kum 2 bak chu, cell 85.4 mm); Thenzawl (kum 50-ah 260 mm) leh Hnahthial (244 mm)-ah cell-in thu a nei. Kum 50-ah Aizawl-ah darkar 1-ah 74 mm vel (cell 62.6 mm). Flag: Aizawl ni khatah 148 mm (June ni 12, 2018 a ni mai thei, chanchin tlangzarh angin) leh 97.4 mm (2025, chanchin tlangzarh angin); Serchhip district June ni 1–13, 2018-ah 677 mm (chanchin tlangzarh angin). Sairang-a CWC level site (level sang ber chhut a ni lo). Clause 2.3.6(i) hlauhawmna hmasa site: Corporation Landslide Hazard Maps (leimin hlauhawmna map), Hlimen–Melthum, Hunthar Veng, Bawngkawn–Durtlang kawng
MZ-Z3 Chhak lam tlang sang (Eastern uplands)	State chhak lam, Tiau leh Tuipui leh Tuivai hnar lam pan, Champhai, Khawzawl leh Saitual district-ah; subzone 2(c)-ah (Clause 2.3.6(b)); Tiau hi Myanmar-ah Manipur luipui system-ah a luang lut	Champhai leh Khawzawl-a IMD automatic weather station; Neindawn-a IMD gauge; Saitual, Phullen, Teikhang, Ngopa, Hnahlan, Vaphai leh Khawhai-a Mz-SWIC gauge [TBC]	Clause 2.3.6(c)(i) Mizoram floor hman rih tur-in AEP tinah thu a nei (Clause 2.3.6(c)(iii)); Mizoram ratio hman rih tur; darkar 72 = darkar 24 × 1.70. NIH-DHAARA kum 50 darkar 24 157–181 mm, State-ah a hniam ber, darkar 1 52–57 mm, darkar 1 ratio 0.31–0.33. Khawzawl ni thumah 248.3 mm leh Champhai January–July 2025-ah 1,084 mm (chanchin tlangzarh angin); Champhai district-ah May ni 24, 2025 aṭanga June ni 3, 2025 thleng leimin 209 (DM&R zat, chanchin tlangzarh angin)
MZ-Z3 Chhak lam tlang sang: MZ-C Chhak lam tlang sang (Champhai–Khawzawl–Saitual–Ngopa–Zokhawthar)	Khawbung pawh; Champhai phai pawn lama zone tlang sang leh tlang pangte; Tiau kama Zokhawthar; ri [TBC]	Zone ang bawk	Floor 85 / 130 / 160 / 195 / 225 / 250 mm (cell: kum 50-ah Saitual 180.7, Champhai 174.4, Khawzawl 156.7 mm); a him zawk lam (conservative) a ni mai thei, Champhai leh Khawzawl record-te fit a nih hma chu (Clause 2.3.6(a)). Clause 4.11 tlang dan. Tiau pana ram ri kal tlang outfall, a hnuai lama level awm lo (Clause 5.8.5(f))
MZ-Z3 Chhak lam tlang sang: MZ-C1 Champhai phai	Champhai phai buh lo zawlte; 1% AEP tuilian sang zawng hnuaia phai ram; ri [TBC]	Champhai-a IMD automatic weather station [TBC]	Floor MZ-C ang. Clause 5.8.5(c) luipui tailwater; 1% AEP level chunga alluvium test tawhah Clause 4.11 recharge dan; phai ramah April ni 1 aṭanga October ni 31 thleng AMC III. Champhai hi Tiau aṭangin tuiin a lian ṭhin (chanchin tlangzarh angin); phai zawlah tui a tlin em tih ziak a ni lo [TBC]
MZ-Z4 Chhim lam tlang (Southern hills)	State chhim lam, Karnaphuli (Khawthlangtuipui) leh Kaladan (Chhimtuipui) pan, Lunglei, Lawngtlai leh Siaha district-ah, Lai, Mara leh Chakma Autonomous District Council-te area nen; subzone 2(c)-ah (Clause 2.3.6(b)); Karnaphuli hi Bangladesh-ah leh Kaladan hi Myanmar-ah a luang	Saiha leh Chawnhu-a IMD automatic weather station leh Chawngte-a gauge; Lunglei, Haulawng leh Tlabung-a Agriculture Department gauge; Tlabung, Tuichawng, Tuichang, Shitlangpui leh a dang-a CWC gauge; Mz-SWIC gauge [TBC]	Darkar 24 zat chu cell leh Mizoram floor hman rih tur zinga a sang zawk (Clause 2.3.6(c)(i)); zawh khawpuiah cell-in thu a nei; Mizoram ratio hman rih tur; darkar 72 = darkar 24 × 1.70. NIH-DHAARA kum 50 darkar 24 271–305 mm, darkar 1 71–80 mm. Flag: Chawngte October 2025-ah ni khatah 130 mm (chanchin tlangzarh angin). He Kaihhruaina Bu hian District Council area-te chu District Council-te kal tlangin chauh a thleng (Bung 1)

Zone (hming hman rih tur)	A huam chin (district, basin)	Station entirna	Hriat tur
MZ-Z4 Chhim lam tlang: MZ-D Chhim lam tlang (Lunglei–Lawngtlai–Siaha–Chawngte–Tuipang)	Tlabung pawn lama zone tlangte, Lai, Mara leh Chakma Autonomous District Council-te area nen; Kau leh Tuichawng kama Chawngte hi 1% AEP level hnuaia phai ram a ni; ri [TBC]	Zone ang bawk	Cell-in thu a nei: kum 50-ah Lunglei 107.5 / 207.3 / 294.9 / 331.9 mm, Siaha 304.5 mm leh Lawngtlai 270.6 mm; kum 50-ah Lunglei-ah darkar 1-ah 97 mm vel (cell 73.1 mm). Surma-group shale, siltstone leh sandstone, "ruahtui luang chhuahna zone" ("run off zone") (CGWB, Lunglei): Clause 4.11 tlang dan. Mara District Council area chhunga Pala Wetland (Palak Dil) (Bung 7)
MZ-Z4 Chhim lam tlang: MZ-D1 Tlabung phai (Tlabung)	Tlabung-a Khawthlangtuipui floodplain (tuilian luanna phai); 1% AEP tuilian sang zawng hnuaia phai ram; ri [TBC]	Tlabung-a Agriculture Department leh CWC gauge [TBC]	Cell-in thu a nei (kum 2 / 10 / 50 / 100-ah 113.4 / 210.2 / 295.0 / 330.9 mm). Luipui tuilian khawpui: June 2017-ah in 350 vel (emaw 9 a kim zawngin leh 60 aia tam a then zawngin), July 2019-ah in 400 vel leh August 2023-ah chhungkua 40 (chanchin tlangzarh angin). Luipui tuilian level-ah flap gate nen, India-a a hnuai lama thununna awm lo (Clause 5.8.5(d)); 1% AEP level chunga lui kam zawl test tawhah Clause 4.11 recharge dan; April ni 1 ataṇga October ni 31 thleng AMC III

Belhchian 2B — Zone zela ni khat aia tawi ratio P(t)/P(24h): NIH-DHAARA (darkar tin innghat) leh one-third rule

Bung 2-a Clause 2.6.1 ataṇga 2.6.4 thleng a ṭanpui.

Buatsaih tur. He belhchian hian Belhchian 2A zone tin tan, darkar t leh darkar 24 design zat inzawmna ratio, NIH-DHAARA ataṇga, darkar tin record ataṇga siam, chu IMD Das et al. (2022) leh one-third rule-in an entir ratio-te nen table-ah a dah ang. Zone tina hmun entirnaah duration tin tana NIH-DHAARA zat (NIH), IMD recording-gauge data leh Das et al. (2022) IDF value (IMD) a mamawh. A tlangzarh hma chuan, ni khat aia tawi zat-te chu NIH-DHAARA emaw station IDF phalna pek emaw ataṇga direct-in chhiar a ni (Clause 2.6.1). Ni khat zat chauh a awm hmunah, ratio hman chu Authority nena inremna siam a ni a, Mizoram-ah chungte chu Clause 2.3.6(f) Mizoram ratio hman rih turte, Table 2B.1 sub-area tinah inang, site-a chu duration tana NIH-DHAARA zat ngei aia hniam zat awm lovin, Clause 2.3.6(h) record endikna hmaa Clause 2.3.6(c) emaw (d) emaw darkar 24 zat chungah hman an ni; ruahpui tawi tana floor nghet a awm lo (Clause 2.3.6(g)) (Clause 2.6.2), leh Form 2-1-ah chhinchhiah an ni. One-third rule hi hman a ni lo (Clause 2.6.4).

2B.1 Table 2B.1 row hmasa ber hian one-third rule P(t) = P(24)·(t/24)^(1/3) ratio-te a pe, khaikhinna atan chauh. Darkar 1, 3, 6 leh 12 value-te hi Clause 2.6 Hrilhfiahna-a tarlante an ni; darkar 2 value hi formula inang ataṇga chhut a ni. Zone chungchang tan he belhchian hian a finfiah loh chuan dan hi design atan hman loh tur a ni (Clause 2.6.4).

Table 2B.1 — Zone zela ratio P(t)/P(24h) (layout)

Zone	Hnar	1 h	2 h	3 h	6 h	12 h	24 h
A zavai (khaikhinna chauh, design atan ni lo)	One-third rule	0.35	0.44	0.50	0.63	0.79	1.00

Zone	Hnar	1 h	2 h	3 h	6 h	12 h	24 h
Sub-area tin (MZ-A, MZ-A1, MZ-B, MZ-C, MZ-C1, MZ-D, MZ-D1)	Mizoram ratio hman rih tur (design ratio hman rih tur, Clause 2.3.6(f), he Kaihhruaina Bu-in a ruat): edition hnaih Barak-hnar edition set ang chiah, State hmar chhak ri kal tlanga IMDAA cell sawm leh pakhat kum 50 ratio-te leh CWC FER 2(a) ratio-te upper envelope (a sang ber ri), 0.01 zela sang lam pana tihkim; site-a duration tana NIH-DHAARA zat ngei aia hniam zat awm lo; darkar 9-ah 0.81, darkar 15-ah 0.89 leh darkar 18-ah 0.94 pawh	0.33	0.51	0.59	0.74	0.85	1.00
Sub-area tin, AEP tin	Ratio-te hman nana darkar 24 zat, he Kaihhruaina Bu-in a ruat (Clause 2.3.6(c)), 50% / 20% / 10% / 4% / 2% / 1% AEP-ah mm-in: sub-area tin, NIH-DHAARA cell leh Mizoram floor hman rih tur 85 / 130 / 160 / 195 / 225 / 250 zinga a sang zawk (Aizawl cell, kum 5 leh 25 value Gumbel variate-ah, mm 5 zela sang lam pana tihkim); MZ-A leh MZ-A1 pawh 130 / 190 / 230 / 285 / 320 / 360 aia tlem lo (2% leh 1%-ah Barak phai floor 320 leh 351 mm kengtu table); MZ-C leh MZ-C1 floor; ruahpui tawi tana floor nghet a awm lo (Clause 2.3.6(g)); darkar 72 zat = darkar 24 × 1.70 (Clause 2.3.6(e))						
Sub-area tin (khaikhinna)	CWC FER 2(a), NB/18/1991, §3.1.2, p. 24 leh Fig. 10, kum 50 innghat, IMD recording gauge 12 (Mizoram ratio-te ri hniam ber; amah chauhin hman a ni lo, a darkar 1 ratio hi chhak lam leh Mamit cell-te aiin a hniam avangin)	0.260	0.370	0.457	0.615	0.805	1.000
Mizoram-ah hman a ni lo (khaikhinna)	CWC FER 2(b), Table 4.1, kum 10 innghat, recording gauge 6 (State hmun reng reng 2(b)-ah a awm lo; darkar 1 ratio hi Mizoram cell sang ber let 1.45)	0.48		0.62	0.74	0.87	1.00
MZ-Z1: Kolasib, Bairabi leh Vairengte cell	NIH-DHAARA, IMDAA, kum 50 (14 Nov 2026-a zawh; darkar 2–18 zawh a ni lo [TBC]; Clause 2.3.6(c) hnuaia design thu hnar)	0.29 / 0.28 / 0.26					1.00
MZ-Z2: Aizawl, Mamit, Serchhip, Thenzawl leh Hnahthial cell	NIH-DHAARA, IMDAA, kum 50 (a chunga ang khan)	0.28 / 0.32 / 0.25 / 0.25 / 0.26					1.00
MZ-Z3: Champhai, Khawzawl leh Saitual cell	NIH-DHAARA, IMDAA, kum 50 (a chunga ang khan; Khawzawl 0.334 tihkim loh)	0.32 / 0.33 / 0.31					1.00
MZ-Z4: Lunglei, Tlabung, Lawngtlai leh Siaha cell	NIH-DHAARA, IMDAA, kum 50 (a chunga ang khan)	0.25 / 0.24 / 0.28 / 0.26					1.00

2B.2 Chhinchhiahna inkar hun nghet aṭanga zat-te chu Clause 2.6.3 factor-te, Table 2B.2-a nawn, hmangin true-interval zat-ah thlak a ni. Chungte hi WMO (Hershfield) value pangngai an ni a, hman rih tur an ni lo.

Table 2B.2 — Fixed-interval siam remna factor (Clause 2.6.3)

Duration chhunga chhinchhiahna inkar hun nghet zat	Factor
1	1.13
2	1.04
3–4	1.02

Belhchian 2C — Grid-to-point factor-te

Bung 2-a Clause 2.7.1 leh 2.7.4 a ṭanpui.

Buatsaih tur. He belhchian hian grid average design zat (entirnan 0.25° cell aṭanga) chu hmun khat zat-a thlaktu factor-te, zone, duration leh AEP zelin, a pe ang. IMD grid ruahtui tlak leh cell tin chhunga IMD leh State gauge-te frequency analysis kawp (IMD, Directorate of Science and Technology (DST) hnuaia State Meteorological Centre, Agriculture Department rain gauge pangngaite, Mz-SWIC network (operator hming thu hnar-in a kimchang a tarlang lo [U]) leh CWC rain gauge-te, an record rei zawng finfiah tur [TBC]), Belhchian 2A benchmark hmunte, leh factor siam chhuah dan tarlan a mamawh. A tlangzarh hma chuan, design zat-te chu NIH-DHAARA emaw station IDF phalna pek emaw aṭanga hmun khat value angin lak a ni (Clause 2.3.1 leh 2.3.2). Authority nena inremna siam thlak dan chu Form 2-1-ah chhinchhiah a nih loh chuan grid average value-te hi design zat atan hman a ni lo (Clause 1.11.5).

2C.1 Clause 2.7 Hrilhfiahna chuan factor-te a pawimawh chhan a lantir. Mizoram-ah he Kaihhruaina Bu tan NIH-DHAARA chu hmun 15-ah zawh a ni a, an zavaiin data an pe; a reanalysis cell-te, km 12 vel zau, chuan kum 50 darkar 24 zat Khawzawl-a 157 mm aṭanga Vairengte-a 338 mm thleng an pe (NIH-DHAARA, 14 Nov 2026-a zawh), State-a gauge pakhat mah cell-in a hnuaia hmun khata ruahtui tlak aia a sang emaw a hniam emaw lantir turin fit a ni lo: he series-a edition hnaih phai khawpuiah platform chu station fit aiin 1.3 aṭanga 1.5 vel a sang a, North-East edition dang pakhatah extremes nen khaikhin chuan a hniam. Hetiang value-te hi grid emaw area average value an ni a, hmun khat zat atan hman hmain heng factor-te an mamawh. Clause 2.3.6 hnuaiah Mizoram-ah design zat atan hman an ni tho, thu hnar dang a awm loh avangin, a hnuaiah Clause 2.3.6(c)(i) leh (c)(ii) floor-te nen, he belhchian leh Belhchian 2A tlangzarh a nih hma chu.

Table 2C.1 — Grid-to-point factor-te (layout)

Zone	Grid product leh cell zau zawng	Duration (h)	AEP	Factor (point / grid)	Station hman	Record kum zat
		24				
		48				
		72				

Belhchian 2D — Mizoram temporal pattern (Huff curve)

Bung 2-a Clause 2.9.3 leh 2.9.4 leh Bung 11-a Clause 11.7.3 a ṭanpui.

Buatsaih tur. He belhchian hian Mizoram ruahpuite hun sem dan (mass) curve, dimensionless, Huff (1967)-in a hman ṭan ang chiah, zone, ruahpui duration class leh quartile zelin, probability level tarlanah a pe ang. Recording gauge leh automatic weather station aṭanga ruahpui hyetograph (hun hrang hranga ruahtui tlak zat) (IMD, State chhunga Meteorological Centre Aizawl automatic weather station-te, an zingah Mizoram University, Kolasib, Champhai, Khawzawl, Serchhip, Hnahthial, Saiha leh Chawnhu-a mi, leh Mz-SWIC network automatic rain gauge leh weather station-te (operator hming thu hnar-in a kimchang a tarlang lo [U]), an ṭan kum leh chhinchhiah inkar hun (logging interval) finfiah tur [TBC]), dan tarlan hmanga ruahpui inzawm lo-ah ṭhen hran, leh May ni 28, 2024 (Cyclone Remal), May ni 24, 2025 aṭanga June ni 3, 2025 thleng, June 2018, July 2019 leh June 2017 ruahpuite, a hnuhnung pahnih hi Tlabung-a luipui tuilian chhan, pakhat mah tan recording-gauge hyetograph emaw IMD ruahtui tlak series emaw he Kaihhruaina Bu tan hmuh a ni lo [TBC], an zingah a mamawh. A tlangzarh hma chuan, design ruahpui-te chuan Clause 2.9.1 alternating-block pattern leh Clause 2.9.2 darkar 48 leh 72 pattern an hmang; km² 25–5,000 catchment (ruahtui luan khawmna hmun) tan, CWC Flood Estimation Report curve-te chu Clause 2.9.1 hnuaia sensitivity run nen hman phal a ni (Clause 2.9.4). SCS Type distribution-te hman a ni lo (Clause 2.9.3). Continuous simulation (kum tam tak ruahtui hmanga model)-a ni khat record ṭhen chhuah (disaggregation) tan (Clause 11.7.3), kalphung chu Authority nena inremna siam leh chhinchhiah a ni (Clause 1.11.5).

Table 2D.1 — Ruahpui hun ṭhen belhkhawm nena ruahpui zat ṭhen belhkhawm (layout, zone, duration class leh quartile tinah table pakhat)

Ruahpui hun ṭhen	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
10% probability curve	0										1.0
50% probability curve	0										1.0
90% probability curve	0										1.0

2D.1 Table tinin zone, duration class, quartile (ruahpui chanve li zinga ruah tam ber sur lai), ruahpui zirchian zat leh record hun chhung an tarlang tur a ni.

Thu hnar: Huff, F.A. (1967). Time distribution of rainfall in heavy storms. *Water Resources Research* 3(4), 1007–1019.

Belhchian 2E — Zone zela retention percentile zat

Bung 2-a Clause 2.8.3 leh 2.10.1 aṭanga 2.10.2 thleng, Bung 4-a Clause 4.4 leh Bung 8 a ṭanpui.

Buatsaih tur. He belhchian hian Belhchian 2A zone tin tan retention design zat P_R a pe ang: record rei takah ruah sur ni (≥ 2.5 mm) 90%-ah pel loh darkar 24 ruahtui tlak zat (Clause 2.10.1). Zone tina station-ah ni khat record rei tak (IMD, Directorate of Science and Technology (DST) hnuaia State Meteorological Centre, Agriculture Department rain gauge pangngaite, Mz-SWIC network (operator hming thu hnar-in a kimchang a tarlang lo [U]) leh CWC rain gauge-te, an record rei zawng finfiah tur [TBC]) leh station a tlem hmunah Belhchian 2C factor-te nen IMD grid data a mamawh. A tlangzarh hma chuan, P_R chu Authority nena inremna siam station ni khat record rei tak aṭanga Clause 2.10.1 hrilhfiahna angin, 2E.1-a step-te hmangin chhut a ni a, Form 2-1-ah chhinchhiah a ni (Clause 1.11.5).

2E.1 **Ni khat record aṭanga P_R chhut dan.**

1. Station ni khat (darkar 24) ruahtui tlak series chu a record zawng zawng tan la rawh.
2. Ruah 2.5 mm emaw a aia tam sur ni (ruah sur ni) chauh vawng rawh.
3. Ruah sur ni zat-te chu indawtin dah la, an 90%-ah pel loh zat (90th percentile) chu la rawh.
4. Climate factor (Clause 2.8.3) emaw fixed-interval factor emaw hmang suh; P_R hi ni tin ruahtui tlak statistic a ni a, AEP design zat a ni lo.
5. Station, record hun chhung, ruah sur ni zat leh P_R chu Form 2-1-ah chhinchhiah rawh.

Table 2E.1 — Zone zela retention zat P_R (layout)

Zone	Station emaw grid cell hman	Record hun chhung	Ruah sur ni zat (≥ 2.5 mm)	P_R, 90th percentile (mm)	Tlangzarh ni
MZ-Z1 Hmar lam tlang					
MZ-Z2 Laili tlang chhip					
MZ-Z3 Chhak lam tlang sang					
MZ-Z4 Chhim lam tlang					

Form 2-1 — Design Ruahtui Tlak Sheet

Bung 2-a Clause 2.3 aṭanga 2.13 thleng leh Bung 10-a Clause 10.4.1(d) a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Hydrology thehluh tur tinah sheet pakhat. Step-te hian Bung 2 Milem 2.3 an zui.

Table 2F.1 — Form 2-1: site, thu hnar leh ruahpui

No.	Thil (clause)	Ziah luh tur
	A. Site (Clause 2.13, item 1)	
A1	Project leh site	_____
A2	Site coordinates (latitude, longitude, decimal degrees)	_____
A3	Ruahtui zone (Belhchian 2A, emaw Authority nena inremna siam angin)	_____
A4	Tui luan khawm catchment area (km²) (Clause 2.7)	_____
A5	Design life: kum 25 aia rei / hnathawh hman rih tur, kum 5 emaw a aia tlem (Clause 2.8.2)	_____
A6	Outfall (drain tui luan chhuahna) chu tidal emaw luipui backwater emaw nghawng hnuaiah: Aw / Aih (Clause 2.5.3, 2.12)	_____
	B. Thu hnar (Clause 2.3, 2.3.5; item 2)	
B1	NIH-DHAARA: version emaw lak ni	_____
B2	Coordinates zawh	_____
B3	Value lak chhuah screenshot emaw export emaw belh: reference	_____
B4	Station IDF hman (Clause 2.3.2): Aih / Aw — station, ID, site aṭanga hlat zawng (km)	_____
B5	Station IDF: recording-gauge data kum zat (30 emaw a aia tam); tlangzarhtu emaw phalna petu	_____
B6	Station IDF: gauge leh site inkara ram pianphung emaw tuifinriat kam hnaihna (coastal exposure) danglamna: A awm lo / sawi rawh	_____
	C. AEP leh duration (Clause 2.4, 2.5)	
C1	Element design leh an AEP (Table 2.1)	_____
C2	Tui luan tirna (conveyance): Tc leh design duration (minute 10 aia tlem lo) (Clause 2.5.1)	_____
C3	Khawlna: duration endik {1, 2, 3, 6, 12, 24, 48, 72 h} aṭanga; darkar 24, 48 leh 72 tel (Clause 2.5.2)	_____
C4	Khawlna element tin tana duration pawimawh ber (critical duration) hmuh	_____
	D. Thlakna	
D1	Ni khat aia tawi zat: direct-in chhiar / Belhchian 2B ratio aṭanga / Authority nena inremna siam ratio aṭanga (Clause 2.6.1, 2.6.2)	_____
D2	Fixed-interval factor hman: a awm lo (true-interval thu hnar) / 1.13 / 1.04 / 1.02 (Clause 2.6.3)	_____
D3	Grid-to-point factor: a ngai lo (hmun khat thu hnar) / Belhchian 2C / inremna value (Clause 2.7.1)	_____
D4	ARF: 1.0 (km² 10 emaw a aia tê; site pakhat khawlna) / CWC curve / interpolate (Clause 2.7.2–2.7.4)	_____
D5	Climate factor: 1.20 (≤ 6 h) leh 1.10 (> 6–72 h) / 1.0 hnathawh hman rih tur / Clause 2.8.4 hnuaia hmalam zat	_____
	E. Khaikhinna (Clause 2.3.3; item 4)	

No.	Thil (clause)	Ziah luh tur
E1	Darkar 1–24 tana IMD Das et al. (2022) value: Table 2F.2-ah report	_____
E2	CWC subzone 2(c) (report a awm lo; "a awm lo" ziak rawh) darkar 24 hmun khat value, km² 25–5,000 catchment: subzone hman	_____
E3	AEP reng rengah CWC floor-in thu a nei: Aih / Aw — AEP-te	_____
	F. Retention zat (Clause 2.10)	
F1	P_R (mm) leh a thu hnar: Belhchian 2E zone value / Belhchian 2E, 2E.1 hnuaia chhut — station leh hun chhung	_____
F2	P_R-ah climate factor hman a ni lo (Clause 2.8.3): finfiah	_____
	G. Design ruahpui (Clause 2.9, 2.11, 2.12; item 5 leh 6)	
G1	Darkar 24 thleng ruahpui: alternating block, 50%-ah peak; time step (≤ Tc/3 leh ≤ minute 15)	_____
G2	Darkar 48 leh 72 ruahpui: Clause 2.9.2 hnuaia siam (Table 2F.3)	_____
G3	Pattern dang hman: a awm lo / Belhchian 2D / sensitivity run nen CWC FER (Clause 2.9.3, 2.9.4)	_____
G4	Design ruahpui tin tan hyetograph-te table leh plot angin belh: reference	_____
G5	AMC: sub-area tinah May ni 1–October ni 31 design ruahpui tin tan, a duration eng pawh ni se, III; 1% AEP tuilian sang zawng hnuaia phai ramah leh dil kamah April ni 1–October ni 31 design ruahpui tin tan III; Tuirial emaw Serlui B reservoir (tui khuah) emaw, a backwater emaw dam pahnih zinga pakhat hnuaia tui chhuah lui chhung emaw pana luang catchment-ah hun reng rengah III; site emaw hun emaw dangah, ni 5 zat 53 mm aia tam hnung zui emaw a keng emaw ruahpui tan III; a nih loh chuan II (Clause 2.11.4)	_____
G6	Hmasawnna hma lam (pre-development) dinhmun: greenfield, map-a lang HSG tan dinhmun ṭha taka ram ruak (Clause 2.11.5)	_____
G7	Luan chhuah tir tehna: pangngai, Q_post ≤ 0.9 × Q_pre (Clause 2.11.2) / tuilian hlauhawm (flood-sensitive), mixed-frequency dan (Clause 2.11.3)	_____
G8	Tailwater (outfall hnuailama tui sang zawng) kawp case run (Clause 2.12): case (a) MHWS + sea-level allowance; case (b) 10% AEP darkar 48 ruahpui 1% AEP still-water level + sea-level allowance nen; thu neitu case	_____
	H. Buatsaihtu	
H1	A chunga value-te hi thehluh turah lak chhuah leh hman an ni tih ka finfiah. Hming, registration number, signature, ni	_____

Design zat = thu hnar zat × fixed-interval factor × grid-to-point factor × ARF × climate factor. Design zat chu AEP inang tana CWC floor aia a hniam chuan, floor chu hman a ni (Clause 2.3.3).

Table 2F.2 — Form 2-1: zat table (Clause 2.13, item 3)

AEP (kum T)	Duration	Thu hnar zat (mm)	Fixed-interval factor	Grid-to-point factor	ARF	Climate factor	Design zat (mm)	IMD Das et al. (2022) (mm)	CWC floor (mm)	Zat hman (mm)

Table 2F.3 — Form 2-1: darkar 48 leh 72 ruahpui siam dan (Clause 2.9.2)

AEP (kum T)	Duration (h)	Design zat zawng zawng (mm)	Darkar 24 design zat, darkar 24 hnuhnung ber (mm)	A la bang (mm)	Darkar 24 hnuhnung ber hmaa darkar zat	Darkar 24 hnuhnung ber hmaa intensity inang (mm/h)
	48				24	
	72				48	

BUNG 3 BELHCHIAN

Hydrology Kalphungte

Heng belhchiante hian Bung 3 an ṭanpui. Belhchian 3C-ah software lo pawm nan benchmark test problem (software enchhinna atana chhut tur) a tarlang a, Form 3-1 leh 3-2 hi Clause 3.17-in a phut thehluh tur form an ni. Belhchian 3A, 3B, 3D leh 3E hian survey, gauging emaw report tlangzarh data, he draft-in a la neih loh, a mamawh a; belhchian tinin a ruangam tur leh a tlangzarh hma chuan Bung 3-a interim dan hman tur a tarlang. Form-te hi draft form an ni a, dan anga dinhmun (statutory status) an nei lo.

Belhchian 3A — Mizoram soil series leh HSG inmilna (lookup); hun bik-a leihnuai tui sang ber map

Bung 3-a Clause 3.7 leh 3.10 a ṭanpui.

Buatsaih tur. He belhchian hian (a) Mizoram-a soil series map-a lang tin hydrologic soil group (HSG) an nihna, tui luan chhuah tir (drained) leh tui luan chhuah tir loh (undrained) dinhmun pahnihah, hriatna table (lookup), leh (b) fûr hunah (April–October) hun bik-a leihnuai tui sang ber (seasonal high water table), lei chung aṭanga a thuk zawng map a keng ang. Heng hi a mamawh: NBSS&LUP leh State soil survey (agency hi finfiah tur [TBC]) series map-te, an scale nen; series tin saturated hydraulic conductivity tehfiah leh impermeable layer thlenga a thuk zawng; Central Ground Water Board leh IWRD observation-well record-te, piezometer-te belhchhah nen: Sairang, Bairabi leh Vairengte-a phai leh lui kam zawl-ah, Khawthlangtuipui kama Tlabung-ah leh Kau kama Chawngte-ah, leh Champhai phai-ah, chutah chuan leihnuai tui hi lei chung aṭanga 2 m chhungah a awm thei (Lunglei district-a phai dil tê-ah tui hi "lei chung aṭanga 2.0 m hnuai chhungah" (within 2.0 m below ground level) a awm, CGWB); dil (lake emaw pond; dil tê, dil tê emaw tank tê) kam leh Tuirial leh Serlui B reservoir (tui khuah) kamah; leh tlang site, perched water, tuikhur (tuikhur, tui chhuahna) emaw lei laih pang (cut slope) emaw retaining wall hnuaia tui chiar awmna hmunah. A tlangzarh hma chuan Bung 3-a interim dan hmang rawh: HSG chu saturated hydraulic conductivity tehfiah leh impermeable layer emaw leihnuai tui sang zawng thlenga a thuk zawng aṭangin NEH Part 630, Ch. 7 criteria angin ruat rawh (Clause 3.7.2); retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw)-in infiltration (lei-a tui luh) a innghahna apiangah site infiltration test hmangin finfiah rawh (Clause 3.7.3); hun bik-a leihnuai tui sang ber chu site piezometer, trial pit emaw observation well hnai ber aṭangin la rawh (Clause 3.10.2); leh chu tui sang zawng chu lei chung aṭanga 0.6 m chhunga a awm apiangah HSG D ruat rawh (Clause 3.10.1).

Table 3A.1 — Soil series leh HSG inmilna (layout)

Soil series	District	Taxonomic class	Lei chung texture	Saturated hydraulic conductivity (mm/h)	Impermeable layer thlenga a thuk zawng (m)	HSG, drained	HSG, undrained	Map hnar leh scale

Table 3A.2 — Hun bik-a leihnuai tui sang ber, mapping unit zelin (layout)

Mapping unit emaw grid cell	Observation well hman	April–October record kum zat	April–October-a lei chung hnuaia tui sang ber (m)	Lei chung aṭanga 0.6 m chhungah (Clause 3.10.1)?	Data hnar

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Belhchian 3B — Mizoram CN calibration leh land cover dangte (tlang ramngaw leh hnim, lo neihna ram (shifting cultivation), leimin hnuhma leh leimin bal, tlang kawng leh rel kawng lei laih leh lei vur, terrace nei lei laih leh lei vur pang, lung laihna (quarry) hmai leh a bal, Champhai phai buh chinna zawl, leh dil leh reservoir kam)

Bung 3-a Clause 3.8 leh 3.15 a ṭanpui.

Buatsaih tur. He belhchian hian (a) Mizoram catchment (ruahtui luan khawmna hmun)-a ruahtui tlak leh ruahtui luang (runoff) hmuh tak nena calibrate curve number-te, Table 3.5-a TR-55 value nena khaikhin, leh (b) Table 3.5-in a tarlan loh land cover-te curve number a keng ang: tlang ramngaw leh hnim, shale, siltstone leh sandstone chunga lei thuk lo-ah; Mizoram Water Resources (Management and Regulation) Act, 2024 thuhmahruai (preamble)-in luipui catchment-a "tui hnar tlahniam leh tui tlakchham" (depletion and scarcity of water resources) chhan zinga a sawi lo neihna ram, a vah kum chhinchhiah nen; leimin hnuhma thar leh a bal, May ni 24, 2025 aṭanga June ni 3, 2025 thleng leimin 598-te ang (DM&R figure, chanchin tlangzarh angin); tlang kawng leh Bairabi–Sairang rel kawng lei laih leh lei vur, Aizawl-a Hunthar-a NH-6 lei laih ang; Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 regulation 27-a terrace (tlang panga hmun zawl siam) nei lei laih leh lei vur pang, terrace swale (terrace kawnga ruahtui luanna) leh building pad-te; lung laihna (quarry) hman mek leh hman tawh loh hmai leh a bal, Aizawl chhim lam kawna Hlimen–Melthum quarry-te ang; Champhai phai buh chinna zawl, a bund-te nen; leh dilte leh Tuirial reservoir kam, NEEPCO-in full reservoir level 90.5 m leh minimum drawdown level 68.0 m inkara a kalpui (CERC order, Petition 125/MP/2021), ruahpui ṭan laia a lang chhuak emaw tui a tlahniam emaw. Heng hi a mamawh: catchment tê, cover leh lei hriat sa, gauge nei, paired rainfall–runoff record, IWRD gauging site, agricultural research station leh tank gauge aṭanga, event tin leh antecedent moisture zelin zirchian. A tlangzarh hma chuan: site tin tan pre-development reference chu open space dinhmun ṭha a ni reng (Clause 3.3.2), chuvangin heng cover-te hi pre-development run-ah a lut lo; site pawn lam dinhmun awm mek tan Table 3.5 emaw TR-55 cover row hnai ber hmang rawh, cultivated row-te tiamin (Clause 3.8.3(c)), leh row thlan leh a chhan chu Form 3-1-ah sawi rawh; design ruahpui ṭan laia tui ding chhunga ram chu loss nei lo water surface angin model a ni (Table 3.5; Clause 3.10.4(b)). Heng default-te kalsanna reng reng chuan Clause 3.15 hnuaia calibration a mamawh (Clause 3.15.1(d)).

Table 3B.1 — Land cover dangte, AMC II (layout)

Cover chi	HSG A	HSG B	HSG C	HSG D	Ia ratio	Innghahna (catchment, event, kum)
Tlang ramngaw emaw hnim, shale, siltstone emaw sandstone chunga lei thuk lo, lei thuk zawng chhinchhiah nen; lo neihna ram (shifting cultivation), a vah kum chhinchhiah nen						
Leimin hnuhma thar emaw leimin bal; tlang kawng emaw rel kawng lei laih pang emaw lei vur						

Cover chi	HSG A	HSG B	HSG C	HSG D	Ia ratio	Innghahna (catchment, event, kum)
Terrace nei lei laih emaw lei vur pang, terrace swale lined leh building pad nen (Site Development and Slope Modification Regulations, 2017, regulation 27)						
Lung laihna (quarry) hmai emaw a bal, hman mek emaw hman tawh loh						
Champhai phai buh chinna zawl, bund-te chhinchhiah nen						
Dil emaw reservoir (Tuirial, Serlui B) kam, ruahpui ṭan laia a lang chhuak emaw tui a tlahniam						
A dang (sawi rawh)						

Table 3B.2 — CN calibration catchment-te (layout)

Catchment	District	Zau zawng (km²)	HSG leh cover tam ber	Event hman	Table 3.5 CN	CN calibrate	Calibrate ÷ Table 3.5

Belhchian 3C — Software lo pawm nan benchmark test problem-te

Bung 3-a Clause 3.5, 3.6, 3.8, 3.9, 3.11, 3.12 leh 3.16 a ṭanpui.

Tum. Clause 3.16.1-a tarlan loh software chuan a hnuaia problem panga result-te chu a chhuah ve tur a ni (Clause 3.16.3). Problem tin hi a kimin sawi a ni a, Bung 3 kalphung leh table chauh a hmang a, chuvangin chhanna tin kutin endik theih a ni. Lo pawm theihna tolerance chu table-a result tinah ±5% a ni, Clause 3.16.2-a inanna tehna (equivalence threshold); closed-form result-te (Problem 3C-1 aṭanga 3C-4 thleng) tan chuan software chu a lantir ang tihkimna (rounding) thlengin a inmil a ṭha. Thehluh tur (submittal)-in a hnuaia chhanna tin bulah software result chu a tarlang tur a ni.

Entirna chauh — design value a ni lo. Input-te (zau zawng, intensity, ruahtui tlak zat, tlang pang leh basin) hi enchhin nan chauh thlan an ni. Site eng mah tan design data an ni lo.

Problem 3C-1 — Rational Method hmanga tui luang zat sang ber (Clause 3.5)

Input-te. Inlet pakhatah luang lut 2.0 ha catchment: concrete paving leh in chung 1.2 ha, C = 0.90 (Table 3.2, 0.80–0.95 chanve chung lam); lei sandy chunga hlobet (lawn) 0.8 ha, tlang pang pangngai, C = 0.15 (Table 3.2, 0.10–0.15 chanve chung lam). Design AEP 1% (kum 100). Tc-a ruahtui tlak chakna (intensity), climate factor tiamin: i = 120 mm/h.

Ṭhen (b): catchment hrang 0.5 ha, a zawng zawng paved, C = 0.90, design AEP 1%, i = 150 mm/h.

Table 3C.1 — Problem 3C-1 chhanna

Step	Chhutna	A chhuah
Composite C (Clause 3.5.4)	(1.2 × 0.90 + 0.8 × 0.15) / 2.0	0.60
Frequency factor (Table 3.3)	1% AEP	Cf = 1.25
C · Cf (≤ 1.0)	0.60 × 1.25	0.75

Step	Chhutna	A chhuah
Tui luang zat sang ber (Clause 3.5.1)	0.75 × 120 × 2.0 / 360	**Q = 0.500 m³/s**
Ṭhen (b): C · Cf	0.90 × 1.25 = 1.125, 1.0-ah a chin (Clause 3.5.3)	1.00
Ṭhen (b): tui luang zat sang ber	1.00 × 150 × 0.5 / 360	**Q = 0.208 m³/s**

Problem 3C-2 — Segment method hmanga time of concentration chhut dan (Tc, catchment hla ber aṭanga tui lo thlen hun) (Clause 3.6)

Input-te. Pre-development tui luanna kawng: greenfield chunga sheet flow, n = 0.15 (Clause 3.6.3), L = 30 m, S = 0.01; P2 (50% AEP darkar 24 ruahtui tlak, climate factor tel lo) = 80 mm. Shallow concentrated flow, unpaved, L = 200 m, S = 0.01. Channel flow, L = 400 m, bank-full velocity V = 1.0 m/s (pek sa).

Table 3C.2 — Problem 3C-2 chhanna

Segment	Chhutna	Tui kal hun (travel time)
Sheet flow (Clause 3.6.2(a))	0.091 × (0.15 × 30)^0.8 / (80^0.5 × 0.01^0.4) = 0.2138 h	12.83 min
Shallow concentrated (Clause 3.6.2(c))	V = 4.918 × 0.01^0.5 = 0.4918 m/s; 200 / (3,600 × 0.4918) = 0.1130 h	6.78 min
Channel (Clause 3.6.2(d))	400 / (3,600 × 1.0) = 0.1111 h	6.67 min
Tc (Clause 3.6.1; ≥ 10 min)	12.83 + 6.78 + 6.67	**26.27 min**
Lag (Clause 3.6.5)	0.6 × 26.27	15.76 min

Problem 3C-3 — SCS-CN ruahtui luang thuk zawng, AMC leh Ia sensitivity (Clause 3.8)

Input-te. HSG C chunga pre-development reference: AMC II-ah CN = 74 (Table 3.5), a zawng zawng tui luh theihna hmun (pervious). Ruahtui tlak belhkhawm P = 100 mm; case pahnihna P = 25 mm.

Table 3C.3 — Problem 3C-3 chhanna

Case	S (mm)	Ia (mm)	Ruahtui luang Q (mm), P = 100 mm	Ruahtui luang Q (mm), P = 25 mm
(a) AMC II, Ia = 0.2S: S = 25,400 / 74 − 254	89.24	17.85	**39.38**	**0.53**
(b) AMC III, Ia = 0.2S: CN(III) = 23 × 74 / (10 + 0.13 × 74) = 86.75	38.80	7.76	**64.93**	—
(c) AMC II, Ia = 0.05S: S0.05 = 25.4 × 1.33 × (89.24 / 25.4)^1.15	143.31	7.17	**36.49**	**1.97**

Ruahtui luang chu Q = (P − Ia)² / (P − Ia + S) a ni. Case (c) hian 100 mm-ah case (a) aiin ruahtui luang a tlem zawk a, 25 mm-ah erawh a tam zawk, Clause 3.8.5 leh Milem 3.3-in a sawi ang hian.

Problem 3C-4 — Impervious hrang leh composite-a entir dan, leh SCS unit hydrograph (hun hrang hranga tui luang zat) peak (Clause 3.9 leh 3.11.2)

Input-te, ṭhen (a). Site, 50% directly connected impervious (CN 98) leh 50% HSG B chunga open space (CNp = 61), AMC II, Ia = 0.2S, P = 25 mm.

Input-te, ṭhen (b). A = 2.5 km² sub-area, Tc = 1.0 h leh computation interval Δt = 0.1 h nen.

Table 3C.4 — Problem 3C-4 chhanna

Step	Chhutna	A chhuah
(a) Impervious chanve (Clause 3.9.2)	S = 5.18 mm, Ia = 1.04 mm; Q = 23.96² / (23.96 + 5.18)	19.70 mm
(a) Pervious chanve	S = 162.39 mm, Ia = 32.48 mm > P	0 mm
(a) Area-weighted ruahtui luang, sub-area hrang hrang	0.5 × 19.70 + 0.5 × 0	**9.85 mm**
(a) Composite CN (Clause 3.9.4)	61 + 0.50 × (98 − 61)	79.5
(a) Composite CN hmanga ruahtui luang	S = 65.50 mm, Ia = 13.10 mm; Q = 11.90² / (11.90 + 65.50)	**1.83 mm**
(b) Interval endikna (Clause 3.11.3(a))	0.133 × 1.0 = 0.133 h ≥ Δt = 0.1 h	a tling
(b) Lag leh peak thlen hun (Clause 3.11.2)	tL = 0.6 × 1.0 = 0.60 h; tp = 0.1 / 2 + 0.60	tp = 0.65 h
(b) Unit hydrograph peak, Q = 1 mm	0.208 × 2.5 × 1 / 0.65	**qp = 0.800 m³/s per mm**

Ṭhen (a) hian Clause 3.9 hrilhfiahna-a khaikhinna (9.9 mm vel leh 1.8 mm) a chhuah ve.

Problem 3C-5 — Level-pool (modified Puls) hmanga storage routing (Clause 3.12.1)

Input-te. Detention basin (ruahtui dah rihna, a luan chhuah zat tihhniam nan), a sir ding tlat (vertical) leh plan area 500 m², Table 3C.5-a stage–storage–discharge inzawmna nen. Triangular inflow hydrograph: t = 0-ah 0, t = 30 min-ah 0.50 m³/s thlengin a sang zel (linear), t = 90 min-ah 0 thlengin a hniam zel. t = 0-ah basin a ruak. Routing interval Δt = 10 min (600 s). Tailwater (outfall hnuailama tui sang zawng) a awm lo.

Table 3C.5 — Problem 3C-5 stage–storage–discharge inzawmna

Stage (m)	Khawlna S (m³)	Luan chhuah O (m³/s)
0.0	0	0.00
0.5	250	0.05
1.0	500	0.10
1.5	750	0.15
2.0	1,000	0.20
2.5	1,250	0.25

Kalphung. Storage-indication equation chu (I1 + I2) + (2S1/Δt − O1) = (2S2/Δt + O2) a ni. Table-in O = S / 5,000 (S chu m³-in, O chu m³/s-in) a pe a, chuvangin 2S/Δt + O = 17.667 O leh 2S/Δt − O = 15.667 O a ni a, step tin chu O2 = [(I1 + I2) + 15.667 O1] / 17.667 a ni. Table 3C.5-a linear interpolate software chuan result inang chiah a chhuah tur a ni.

Table 3C.6 — Problem 3C-5 route hnua luan chhuah

Hun (min)	Luan lut I (m³/s)	Luan chhuah O (m³/s)	Khawlna (m³)	Stage (m)
0	0.0000	0.0000	0.0	0.000
10	0.1667	0.0094	47.2	0.094
20	0.3333	0.0367	183.3	0.367

Hun (min)	Luan lut I (m³/s)	Luan chhuah O (m³/s)	Khawlna (m³)	Stage (m)
30	0.5000	0.0797	398.4	0.797
40	0.4167	0.1226	612.8	1.226
50	0.3333	0.1511	755.7	1.511
60	0.2500	0.1670	835.2	1.670
70	0.1667	**0.1717**	**858.6**	**1.717**
80	0.0833	0.1664	832.1	1.664
90	0.0000	0.1523	761.5	1.523
120	0.0000	0.1062	531.1	1.062
180	0.0000	0.0517	258.3	0.517

A chhuah. Luan chhuah sang ber 0.172 m³/s, min 70-ah; khawlna sang ber 859 m³; stage sang ber 1.72 m. Luan lut sang ber 0.50 m³/s chu a value 34%-ah tihhniam a ni.

Table 3C.7 — Dilna thehluhtu (applicant)-in a tarlan tur benchmark result

Problem	A chhuah	Benchmark	Software result	Danglamna (%)	±5% chhungah?
3C-1	Q, case bulpui (m³/s)	0.500			
3C-1	Q, ṭhen (b) (m³/s)	0.208			
3C-2	Tc (min)	26.27			
3C-3	Q, case (a), P = 100 mm (mm)	39.38			
3C-3	Q, case (b), P = 100 mm (mm)	64.93			
3C-3	Q, case (c), P = 100 mm (mm)	36.49			
3C-3	Q, case (c), P = 25 mm (mm)	1.97			
3C-4	Ruahtui luang, sub-area hrang hrang (mm)	9.85			
3C-4	Ruahtui luang, composite CN (mm)	1.83			
3C-4	qp (m³/s per mm)	0.800			
3C-5	Luan chhuah sang ber (m³/s)	0.172			
3C-5	Khawlna sang ber (m³)	859			

Belhchian 3D — Tuifinriat kam ram zawl (flat coastal land) tan peak rate factor zirchianna

Bung 3-a Clause 3.11.5 leh 3.15 a ṭanpui.

Mizoram-ah mamawh a ni lo. Mizoram hi tuifinriat a hnaih lo (landlocked) a, a zawng zawng deuhthaw hi tlang pang chhoh nasa a ni a, chuvangin State-ah ram engmahin Clause 3.11.5(a) a tlin lo va, standard factor 484 (PRF' = 0.208) hi ram zawng zawngah hman a ni (Clause 3.11.5). Bairabi, Vairengte, Sairang, Tlabung leh Chawngte-a phai leh lui kam zawl leh Champhai phai hi hmun ṭhenkhatah a zawl a, mahse tuifinriat kam phai (coastal plain) an ni lo; an tui chhan muanna hi khawlna leh luipui tailwater (Clause 3.10.4 leh 3.12.4) leh Bung 5-a outfall (drain tui luan chhuahna) khar endikna hmangin entir a ni a, peak rate factor hniam zawk hmangin a ni lo; tlang chhip erawh minute rei lo te chhungin a chhang. Belhchian leh Table 3D.1 ruangam hi belhchian number thlak danglam loh nan chauh vawn a ni.

Table 3D.1 — Calibrate peak rate factor-te (layout)

Catchment	Zau zawng (km²)	Tlang pang mean (m/m)	Drainage dinhmun	Event hman	Calibrated PRF (US customary)	PRF' (SI)	Hman theihna huam chin

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Belhchian 3E — Subzone 2(b) CWC SUH parameter-te, subzone 2(c)-ah endikna atana hman, entirna chhutna nen

Bung 3-a Clause 3.4.3 leh 3.11.4 a ṭanpui.

Buatsaih tur. He belhchian hian CWC subzone 2(b) (South Brahmaputra), subzone 2(c) (Barak and others) report tlangzarh loh aiah he Kaihhruaina Bu-in a report a hman, tan synthetic unit hydrograph parameter-te regression inzawmna, design ruahpui duration, loss rate, base flow, areal reduction leh time distribution, tin te Flood Estimation Report-a a awmna nen, leh catchment pakhat entirna chhutna a table-in a tarlang ang. Heng hi a mamawh: Mizoram zawng zawng huamtu subzone 2(c) (Barak and others) CWC Flood Estimation Report, hmar lam tlangte, Tlawng, Tuirial, Serlui leh Tuivai kaltlanga Barak-a luang; chhim leh chhak lam, Chhimtuipui (Kaladan, CWC subzone list-a "Kalden") kaltlanga luang; leh chhim leh thlang lam, Khawthlangtuipui (Karnaphuli) kaltlanga luang, list-in a sawi loh luipui, "a dangte" (others) hnuaia tel (NEER chhiar dan), huamtu, CWC-in a la tlangzarh ngai loh; CWC aṭanga a awm lo emaw buatsaih mek a ni lo tih ziaka finfiahna, leh Khawthlangtuipui leh Tiau subzone finfiahna [TBC]; chu hma chuan, South Brahmaputra subzone 2(b) report (Revised; Design Office Report No. SB-2(b)/R-4/44/99, March 2000), Mizoram ṭhenkhat mah a huam lohna (a chhim lam ri chu 25°15' N vel a ni a, Mizoram hmar lam ri chu 24°35' N; NEER chhutna), a Figs 12(a) leh 12(b)-a areal reduction curve-te, copy hmanah a value chhiar a ni lo [TBC], leh a unit-hydrograph inzawmna, he Kaihhruaina Bu-in endikna atan chauh a hman (Bung 3 Thu hnar en rawh); leh State-a CWC level-monitoring site pasarih level leh discharge record-te (Tlawng-a Sairang, Tuirial-a Turial, Bailley Bridge Tuipui, Chhimtuipui-a Sihthangpui, Tlawng-a Keitum, Tuichang leh Tuichawng; 2018-ah panga hman loh, chanchin tlangzarh angin), Tuirial reservoir tan NEEPCO luan lut leh level record-te, leh Bairabi–Sairang rel kawng bridge-catchment data, heng zinga pakhat mah hmuh a ni lo [TBC], ziak chhawn leh report tlangzarh nena endik; leh survey emaw DEM aṭanga physiographic parameter teh catchment pakhat. A tlangzarh hma chuan, SUH input zawng zawng chu Flood Estimation Report hman tur aṭangin la nghal rawh (Clause 3.11.4(a)), Clause 2.3.3(b) leh 2.7.3-a darkar 24 design ruahtui tlak chu Clause 2.8 climate factor nen hmang rawh (Clause 3.11.4(b)), SUH result chu dinhmun pangngai awm mek tan HEC-HMS emaw SWMM result bulah tarlang rawh (Clause 3.11.4(c)), leh hydrograph model-in 1% AEP peak hniam zawk a pek chuan, Clause 3.15 hnuaia calibration hmangin a chhan sawi emaw SUH peak hmang emaw rawh (Clause 3.11.4(d)).

Table 3E.1 — Subzone zela SUH inzawmna (layout)

Parameter	Symbol	Unit	Subzone 2(b) (South Brahmaputra) inzawmna, Mizoram-ah endikna atan chauh hman
Darkar 1 unit hydrograph tui luang zat sang ber	Qp	m³/s	Qp = 0.905 A^0.758 (Eq. 3.4.3.2); peak hi catchment zau zawng chauh a innghat
Zau zawng unit tin tui luang zat sang ber	qp	m³/s per km²	qp = Qp / A
Unit ruahtui tlak laili aṭanga peak thlen hun	tp	h	tp = 2.87 qp^−0.839
Peak 50%-a UH zau zawng	W50	h	W50 = 2.304 qp^−1.035
Peak 75%-a UH zau zawng	W75	h	W75 = 1.339 qp^−0.978
Peak 50%-a rising limb zau zawng	WR50	h	WR50 = 0.814 qp^−1.018
Peak 75%-a rising limb zau zawng	WR75	h	WR75 = 0.494 qp^−0.966
UH bul zau zawng (base width)	TB	h	TB = 2.447 tp^1.157
A sang ṭan aṭanga peak thlen hun	Tm	h	Tm = tp + tr/2
Unit duration	tr	h	1
Design ruahpui duration	TD	h	TD = 1.1 tp
Design loss rate	—	mm/h	3.5 ("0.35 cm/hr" tia chhuah, tuilian event 100-a modal value); 2(b) SUH endikna run atan chauh, HSG ruat nan emaw urban model-ah emaw hman ngai loh tur (Clause 3.7); Mizoram Surma shale, CGWB-in "tui luh theihna leh infiltration hniam lutuk" (very low permeability and infiltration) nei anga a sawi, tan a sang lutuk ang (NEER chhiar dan)
Design base flow	—	m³/s per km²	0.05 (event 100 zinga 68 chu 0.01–0.09 chhungah)
Darkar t leh darkar 24 ruahtui tlak ratio	—	—	Kum 10, partial duration, report-a self-recording gauge (amah ngeiin a chhinchhiah ruah tehna) parukte mean: 1 h 0.48; 3 h 0.62; 6 h 0.74; 9 h 0.81; 12 h 0.87; 15 h 0.91; 18 h 0.95; 24 h 1.00 (Table 4.1). **Mizoram-ah hman a ni lo**, subzone 2(b)-ah a awm loh avangin: sub-area tinah Clause 2.3.6(f)-a Mizoram interim ratio hman a ni
Ruahtui tlak time distribution	—	darkar zela cumulative fraction	Fig. 11 leh Annex 4.4 chhiar a ni lo [TBC]
Ni 1 ruahtui tlak darkar 24-a chantirna	—	factor	1.15 (§4.3.1); Mizoram-ah hman a ni lo, darkar 24 design ruahtui tlak zat chu Clause 2.3.6 aṭanga lak a nih avangin
Areal reduction factor	ARF	point ruahtui tlak %	Figs 12(a) (1, 3 leh 6 h) leh 12(b) (12 leh 24 h); curve value chhiar a ni lo [TBC]. Mizoram-ah 25–5,000 km² catchment tan, 2(c) report tlangzarh loh aiah hman a ni (Clause 2.7.3)

Parameter	Symbol	Unit	Subzone 2(b) (South Brahmaputra) inzawmna, Mizoram-ah endikna atan chauh hman
Mizoram khawpui-a kum 50 darkar 24 point ruahtui tlak	—	mm	Awm lo: report plate-te chu a chhim lam ri, 25°15' N vel-ah a tawp a, Mizoram hmar lam ri 24°35' N aia latitude 40' vel hmar lamah (NEER chhutna); Mizoram khawpui pakhat mah an chungah a awm lo
Mizoram tui luan chhuahna, gauge nei catchment	—	—	Hman 14 zinga pakhat mah a awm lo
Inzawmna hman theihna catchment zau zawng	A	km²	50 chuang aṭanga 1,500 thleng; 5,000 thleng "fimkhur takin" (judiciously)
Report-a awmna	—	—	Annexure 1.1, §§3.4–3.7, Table 3.3, Table 4.1, §4.3, entirna chhutna

Hriat tur: inzawmna-te hi CWC subzone 2(b) report (Bung 3 Thu hnar)-a an chhuah angin, scan copy aṭanga chhiar a ni a, Table 3.3 hi he series-a North-East edition hmasa zawkte tan a phêk milem nena endik a ni. A hi catchment zau zawng km²-a a ni. **Huam chin.** Report subzone list-in subzone 2(c), "Barak and others", chu "Barak, Kalden leh Manipur luipuite" (Barak, Kalden and Manipur rivers) huamtu angin a pe (Annexure 1.1). "Kalden" hi Kaladan a ni a, Mizoram-ah chuan Chhimtuipui a ni (NEER chhiar dan). Chuvangin Mizoram luipui zawng zawng hi subzone 2(c)-ah an awm: hmar lam tlangte chu Tlawng (Dhaleswari), Tuirial (Sonai), Serlui, Langkaih leh Tuivai kaltlangin Barak-ah a luang; chhim leh chhak lam chu Chhimtuipui kaltlangin Kaladan-ah a luang; chhim leh thlang lam chu Khawthlangtuipui (Karnaphuli) kaltlangin Bangladesh-ah a luang, list-in a sawi loh luipui, hnawl chhuahna (elimination) avanga "a dangte" (others) hnuaia tel; leh chhak lam ri-a Tiau chu Myanmar-a Manipur luipui system-ah a zawm (heng zawng zawng hi NEER chhiar dan, CWC subzone map-ah finfiah tur [TBC]). State ṭhenkhat mah subzone 2(b)-ah a awm lo, a chhim lam ri chu 25°15' N vel a ni a, Mizoram hmar lam ri erawh 24°35' N a ni (NEER chhutna). CWC-in subzone 2(c) tan report a tlangzarh lo: 2(b) report-a 2000 thlenga report tlangzarh 21 list-ah a awm lo va, CWC download phêk 2024-ah pawh a awm lo; CWC aṭanga ziaka finfiahna mamawh a la ni [TBC]. **Innghahna.** Unit hydrograph hi Mizoram pawn lama rel kawng leh national-highway bridge-a gauge catchment 14 chungah a innghat a, a vaiin bridge-kum 100 record; pakhat mah Mizoram tui a luan chhuahna a ni lo va, pakhat mah Surma shale tlang chhip pang catchment a ni lo. Report-in kum 50 peak a chhuah ve dan hi "+ 40.72% − 57.84%" a dik lo va, "catchment tê tak takte hi an danglamna a lian zawk" (very small catchments have larger variation). **Zau zawng chauh.** 2(b) peak hi A chauh a innghat: tlang pang hi khawiah mah a lut lo, chuvangin SUH hian catchment zau zawng inang, 30°–45°-a tlang inkar thuk (gorge) kaltlanga luang emaw phai kaltlang emaw, unit hydrograph inang a pe. **Entirna chhutna.** Report entirna chu Mizoram pawn lama rel kawng bridge 160 a ni (470 km², L 56.35 km, Lc 31.40 km, S 2.02 m/km): Qp = 96.00 m³/s, qp = 0.20 m³/s per km², tp = 11.07 h, 11.50 h-ah siam rem, W50 = 12.19 h, W75 = 6.46 h, WR50 = 4.19 h, WR75 = 2.34 h leh TB = 41.00 h, loss 0.35 cm/h leh base flow 0.05 × 470 = 23.50 m³/s nen. **State-a hman dan.** 2(b) SUH hi Mizoram-ah Clause 3.11.4 endikna atan chauh hman a ni, Tlawng, Tuirial, Serlui, Tuichang, Tuichawng, Khawthlangtuipui leh an lui pengte-a 50 km² chuang rural catchment tan; design model chu site study, SCS-CN emaw HEC-HMS-a Clark emaw Snyder unit hydrograph a ni a, Clause 3.15 hnuaiah CWC level-monitoring site-te (Tlawng-a Sairang, active hydrograph nei; Tuirial-a Turial; Chhimtuipui-a Sihthangpui; Tuichang leh Tuichawng), Bairabi, Dapchhuah, Tlabung leh hmun dangte-a CWC ruah tehna (rain gauge)-te, Tuirial reservoir tan NEEPCO record-te emaw State gauge-te nen, an awmna apiangah, calibrate a ni (Clause 3.7 Hrilhfiahna). Mizoram luipui eng mah tan discharge record, stage–discharge curve, gauge-a catchment zau zawng emaw unit hydrograph hmuh a ni lo [TBC]. Calibrate model-in 2(b) SUH aia 1% AEP peak hniam zawk a pek chuan, Clause 3.11.4(d) chu a ziak angin hman a ni. Tuirial leh Serlui B dam (tui khuahna) hnuaiah chuan tuilian hi release-in a ruat (Clause 5.8.5(e)), phai-ah chuan outfall-a luipui tui sang zawngin (Clause 5.8.5(c) leh (d)), unit hydrograph-in a ni lo. Aizawl, Lunglei, Serchhip, Champhai leh khawpui dangte urban catchment hi 50 km² aiin an tê fe a, Clause 3.4 hnuaiah Rational Method emaw SWMM hmangin design a ni. Cross-drainage structure leh outfall, catchment 1 km² chuang nei apiang hian Clause 2.3.6-a design ruahtui tlak hmangin site-specific hydrology study a mamawh. Design loss rate 3.5 mm/h hi subzone 2(b) phai leh tlang bul rural catchment tuilian-a fit φ-index a ni a; lei infiltration capacity a ni lo va, HSG ruat nan (Clause 3.7), urban SCS-CN emaw SWMM model-ah, emaw infiltration practice size nan (Bung 4) hman a ni lo.

Table 3E.2 — Entirna chhutna tlangpui (layout)

Step	A chhunga thu	Clause
1	Catchment zau zawng, lui bulpui sei zawng, centroid thleng sei zawng leh equivalent slope, survey emaw DEM aṭangin	3.11.4(a)
2	Table 3E.1 aṭanga SUH parameter-te leh unit hydrograph plot	3.11.4(a)
3	Design ruahpui duration, point leh areal darkar 24 ruahtui tlak climate factor nen, time distribution	3.11.4(a), (b)
4	Design loss rate hnua effective ruahtui tlak; SUH nena convolution; base flow belh	3.11.4(a)
5	1% AEP peak, dinhmun pangngai awm mek tan HEC-HMS emaw SWMM peak nena khaikhin	3.11.4(c), (d)

Form 3-1 — Hydrology Chhutna Tlangpui

Bung 3-a Clause 3.4, 3.6, 3.7, 3.8, 3.10–3.13, 3.15–3.17 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Thehluh tur (submittal) pakhatah form pakhat. Section H-a thuziak tarlante belh rawh.

A. Project

Table 3F.1 — Form 3-1: project

Field	Ziah luh tur
A1. Project hming leh dilna thehluhtu (applicant)	
A2. Hmun (khaw emaw ward, survey number, district)	
A3. Site zau zawng (ha) leh khaikhinna hmun (point of comparison, POC) zat	
A4. Catchment chi: standard (Clause 2.11.2) emaw tuilian hlauhawm (flood-sensitive) (Clause 2.11.3)	
A5. Design Ruahtui Tlak Sheet reference (Form 2-1)	

B. Kalphung leh software (Clause 3.4, 3.11, 3.12, 3.16)

Table 3F.2 — Form 3-1: kalphung leh software

Field	Ziah luh tur
B1. Chhutna tin tum (tui luan tirna, khawlna, khaikhinna, catchment study)	
B2. Tum tin tan ruahtui luan khawmna zau zawng (contributing area) (ha emaw km²)	
B3. Kalphung hman leh a phalna Table 3.1 row	
B4. Kalphung thlan chhan	
B5. Software leh a version; SWMM emaw HEC chunga siam package tan engine leh a version (Clause 3.16.1, 3.16.2)	
B6. Software dang tan: Belhchian 3C benchmark result belh (Table 3C.7) leh Clause 3.16.2-a 5% khaikhinna	
B7. Runoff transform (Clause 3.11.1)	
B8. Computation interval Δt (h), sub-area tê ber 0.133 Tc leh hyetograph (hun hrang hranga ruahtui tlak zat) time step nen (Clause 3.11.3(a))	
B9. Storage routing leh channel routing kalphung (Clause 3.12.1, 3.12.2)	
B10. Dynamic-wave routing a ngai em? A ngai chuan, Clause 3.12.4 condition khawi nge	
B11. CWC SUH benchmark a ngai em (25–5,000 km², Clause 3.11.4)? Result reference	
B12. Continuous simulation (kum tam tak ruahtui hmanga model) a ngai em (Clause 3.13.1)? Record hman leh dil (tank) tui sang zawng ṭanna (Clause 3.13.5)	
B13. Calibration a ngai em (Clause 3.15.1)? Calibration report reference	

C. Lei leh leihnuai tui (Clause 3.3.3(b), 3.7, 3.10)

Table 3F.3 — Form 3-1: lei leh leihnuai tui

Field	Ziah luh tur
C1. HSG map hnar, scale leh lookup hman (Clause 3.7.1, Belhchian 3A) emaw NEH Part 630, Ch. 7 ruatna (Clause 3.7.2)	
C2. Infiltration test: zat, hmun, thuk zawng, result (Clause 3.7.3)	
C3. Hun bik-a leihnuai tui sang ber: lei chung hnuaia a thuk zawng leh hnar (Clause 3.10.2)	
C4. 0.6 m chhunga hmun, HSG D ruat (Clause 3.10.1)	
C5. Tihbuai pervious hmun leh HSG tihhniam hman (Clause 3.3.3(b))	

D. Sub-area leh dinhmun zela parameter (Clause 3.3, 3.5, 3.8, 3.9; Clause 3.17 item 4)

Table 3F.4 — Form 3-1: sub-area leh dinhmun zela parameter

Sub-area	Dinhmun (pre / post)	Zau zawng (ha)	Impervious: in chung / paved / kawng (ha)	DCIA (ha)	Disconnected (ha)	HSG	CN, AMC II	CN, AMC III (pervious ṭhen)	C leh Cf (Rational a nih chuan)	Tc (min)

E. Time of concentration worksheet (Clause 3.6)

Sub-area leh dinhmun tin tan worksheet pakhat.

Table 3F.5 — Form 3-1: time of concentration chhut nan worksheet

Segment	Tui luan dan	Surface leh n (Table 3.4)	L (m)	S (m/m)	P2 (mm)	V (m/s)	Tt (min)
1	Sheet					—	
2	Shallow concentrated				—		
3	Channel emaw pipe				—		
	Tc (10 min aia tlem lo)						

E1. Post-development Tc hi pre-development Tc aiin a tawi zawk em? A tawi zawk loh chuan a chhan sawi rawh (Clause 3.6.6): _____

F. Ruahtui tlak leh loss (Clause 3.8.4, 3.8.5, 3.11.5, 3.12, 3.3.5)

Table 3F.6 — Form 3-1: ruahtui tlak, loss leh tui sang zawng ṭanna

Field	Ziah luh tur
F1. AEP leh duration run; climate factor hman (Bung 2)	

Field	Ziah luh tur
F2. Duration tin tan AMC hman (Clause 3.8.4)	
F3. Design run tan Ia ratio; Ia = 0.05S sensitivity run siam (Clause 3.8.5)	
F4. Peak rate factor hman; 484 aia hniam a nih chuan, Belhchian 3D value leh a hmanna ram (Clause 3.11.5)	
F5. Dil (tank) emaw tui awmna (waterbody) tin tui sang zawng ṭanna, leh a innghahna (Clause 3.12.5, 3.13.5)	
F6. Site pawn aṭanga tui luang lut (off-site run-on): tui luan tirna leh khaikhinna atana ram hman dan (land use) ngaih (Clause 3.3.5)	
F7. Incidental storage chhiar tel em? A tel chuan, authority lo pawmna (Clause 3.12.3)	

G. Kalsanna (departures)

Table 3F.7 — Form 3-1: Bung 3 kalsanna

No.	Clause kalsan	Bung 3 value aia hman value	A chhan
1			
2			

H. Thil belh (Clause 3.17)

Table 3F.8 — Form 3-1: thil belh

Thil	Belh (aw / aih / a huam lo)	Reference
H1. Catchment map, pre- leh post-development, sub-area, Tc tui luanna kawng, POC leh site pawn aṭanga tui luang lut nen		
H2. HSG map, leihnuai tui sang zawng data leh infiltration test result		
H3. Parameter table (Section D) leh Tc worksheet (Section E)		
H4. Design Ruahtui Tlak Sheet (Form 2-1) leh hyetograph		
H5. Hydrograph table leh plot; stage–storage leh stage–discharge table; route hnua luan chhuah; tui sang zawng sang ber		
H6. POC tin tan Form 3-2		
H7. Calibration report (Clause 3.15)		
H8. Model input leh output file pangngai (native) (Clause 3.16.4)		

I. Mawhphurtu engineer puanchhuahna (Clause 3.17 item 10)

Kei hian Mizoram Ruahtui Luanna Design Kaihhruaina Bu (Draft v1.0) Bung 3-a kalphung leh parameter-te hi he thehluh tur (submittal)-ah hian hman a ni a, kalsanna tin hi Section G-ah tarlan leh a chhan sawi a ni tih ka puang e.

Table 3F.9 — Form 3-1: mawhphurtu engineer puanchhuahna

Field	Ziah luh tur
Hming	
Thiamna leh registration number	
Hnathawhna pawl (organisation)	
Hmingziak	
Ni	

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

Form 3-2 — Hmasawnna Hma leh Hnu Khaikhinna

Bung 3-a Clause 3.8.5, 3.11.5 leh 3.14 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Khaikhinna hmun (point of comparison, POC) tin tan form pakhat. Tui luang chu m³/s-in, tui zat (volume) chu m³-in.

A. Khaikhinna hmun (Clause 3.14.2)

Table 3F.10 — Form 3-2: khaikhinna hmun

Field	Ziah luh tur
A1. POC hming chhinchhiahna leh hmun	
A2. POC-a luang lut zau zawng: site (ha) leh site pawn aṭanga tui luang lut (ha)	
A3. Site pawn aṭanga tui luang lut hi site khawlna kaltlangin a kal em? (Clause 3.14.2(c))	
A4. Catchment chi: standard (Clause 2.11.2) emaw tuilian hlauhawm (flood-sensitive) (Clause 2.11.3)	
A5. Tailwater hman, Clause 2.12 joint case-te tiamin (Clause 3.14.9(c))	
A6. Tuilian hlauhawm chauh: duration zawng zawnga 10% AEP pre-development peak lian ber, Clause 2.11.3 chin (cap) (Clause 3.14.7)	
A7. Tuilian hlauhawm chauh: pre-development critical duration-a 50% AEP pre-development peak (Clause 2.11.3)	

B. Tui luang zat sang ber (Clause 3.14.7–3.14.10)

Chin: standard catchment-ah AEP leh duration inang tan 0.9 × Q_pre (Clause 3.14.10(a)); tuilian hlauhawm catchment-ah chin A6 (1% AEP tan) leh A7 (50% AEP tan) (Clause 3.14.10(b)).

Table 3F.11 — Form 3-2: AEP leh duration zela tui luang zat sang ber

AEP	Duration (h)	AMC	Q_pre	Q_post, thunun loh	Q_post, route hnu	Chin	A tling em?
50% (kum 2)	1	II					
50% (kum 2)	2	II					
50% (kum 2)	3	II					
50% (kum 2)	6	II					
50% (kum 2)	12	III					
50% (kum 2)	24	III					
50% (kum 2)	48	III					
50% (kum 2)	72	III					
10% (kum 10)	1	II					
10% (kum 10)	2	II					
10% (kum 10)	3	II					

AEP	Duration (h)	AMC	Q_pre	Q_post, thunun loh	Q_post, route hnu	Chin	A tling em?
10% (kum 10)	6	II					
10% (kum 10)	12	III					
10% (kum 10)	24	III					
10% (kum 10)	48	III					
10% (kum 10)	72	III					
1% (kum 100)	1	II					
1% (kum 100)	2	II					
1% (kum 100)	3	II					
1% (kum 100)	6	II					
1% (kum 100)	12	III					
1% (kum 100)	24	III					
1% (kum 100)	48	III					
1% (kum 100)	72	III					

C. Tui zat leh khawlna (Clause 3.14.8–3.14.10)

Table 3F.12 — Form 3-2: tui zat leh khawlna

AEP	Duration ruat (governing) (h)	Ruahtui luang zat, pre	Ruahtui luang zat, post thunun loh	Retention volume	Detention storage mamawh	Khawlna-a tui sang zawng sang ber (m)
50% (kum 2)						
10% (kum 10)						
1% (kum 100)						

C1. Khawlna tan duration ruat (governing), leh darkar 24, 48 leh 72 result (Clause 3.14.10): _____

D. Sensitivity run (Clause 3.8.5, 3.14.11)

Table 3F.13 — Form 3-2: sensitivity run

Run	Ruahpui ruat (AEP, duration)	Q_post, route hnu danglamna (%)	Khawlna mamawh danglamna (%)	Retention volume emaw WQv ruat (Clause 3.8.5(c))
Ia = 0.05S				
Standard peak rate factor (factor hniam zawk hman a nih chauhin)				—

E. Endikna inzawmte (Clause 3.14.12)

Table 3F.14 — Form 3-2: endikna inzawmte

Endikna	A chhuah	Thehluh tur-a reference
Tui hniam hun (drawdown time) (Bung 4)		
Orifice (tui chhuahna khur tê) tê ber leh trash screen (Bung 4)		
Emergency spillway (Bung 4)		
Outfall khar endikna (Bung 5)		
Luanna hnuailam zirchianna (Bung 5)		

F. Mawhphurtu engineer puanchhuahna

Kei hian he khaikhinna hi Clause 3.14 kalphung angin, pre- leh post-development run-ah design ruahpui inang hmangin siam a ni a, tehna (criterion) tlin nan catchment pangngai pakhat aṭanga catchment dangah ruahtui luang engmah luan peng tir a ni lo tih ka puang e (Clause 3.14.2(b)).

Table 3F.15 — Form 3-2: mawhphurtu engineer puanchhuahna

Field	Ziah luh tur
Hming	
Thiamna leh registration number	
Hmingziak	
Ni	

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

BUNG 4 BELHCHIAN

Site Ruahtui Luang Thunun: Retention leh Detention

Heng belhchiante hian Bung 4 an ṭanpui. Belhchian 4C hi Tier A chhut dan entirna famkim, routing table nen, Clause 4.6.7 entirna chunga innghat a ni. Belhchian 4B-in Tier B table ruangam, fixed release coefficient (luan chhuah tir coefficient nghet) provisional-te leh Bung 4 orifice equation aṭanga chhut orifice table standard a tarlang; NIH-DHAARA thuk zawng mamawh value-te chu la chhut tur an ni. Belhchian 4A hian GIS leh leihnuai tui (groundwater) data, he draft-in tuna a la neih loh, a mamawh a; a ruangam tur leh Bung 4 interim dan-te a pe. Form 4-1 aṭanga 4-3 thleng hi Clause 4.17-in a phut thehluh tur form an ni. Draft form an ni a, dan anga dinhmun (statutory status) an nei lo.

Belhchian 4A — Tuilian hlauhawm catchment ramri (GIS); leihnuai tui thuk lohna zone map

Bung 4-a Clause 4.5.3, 4.5.4 leh 4.12 a ṭanpui.

4A.1 **Tuilian hlauhawm catchment ramri.** Catchment (ruahtui luan khawmna hmun)-te chu Clause 4.5.3.2-a tarlante an ni a, Clause 4.5.4 hnuaia notify (Gazette-a tarlan) catchment reng reng nen. An map leh GIS layer hi Belhchian 1B, catchment-te tarlangtu leh layer attribute ruangam petu, data set ang chiah a ni. Belhchian pahnih hi chhuah tlan tur a ni.

4A.2 **Leihnuai tui thuk lohna zone map.** He map hian Clause 4.12 hman tur hmunte a lantir: Sairang, Bairabi leh Vairengte-a phai (valley floor) leh lui kam zawl (river terrace), Khawthlangtuipui kama Tlabung leh Kau kama Chawngte, Champhai phai, dil (lake emaw pond; dil tê, dil tê emaw tank tê)-te kam leh Tuirial leh Serlui B reservoir (tui khuah) kam, leh perched water, tuikhur (spring, tui chhuahna) emaw tui chiar (seepage) nei tlang site-te, leh kum chhung hun reng renga leihnuai tui sang zawng (groundwater table) lei chung aṭanga 3 m chhunga a awmna hmun reng reng (Clause 4.12.1).

Buatsaih tur. He belhchian hian (a) tuilian hlauhawm catchment ramri-te GIS layer angin leh plot pakhat a chhunga a awm leh awm loh thu tlukna siam theihna scale-a map angin, leh (b) Clause 4.12.1-a leihnuai tui thuk lohna zone map, fûr hun chhung leh a hnua hun bik-a leihnuai tui sang ber thuk zawng nen, a keng ang. Heng hi a mamawh: digital elevation model leh drainage network aṭanga basin leh sub-basin ramri (IWRD, NRSC, Survey of India); IWRD tuilian dan hna (flood works) leh gauge-te, an level leh datum nen [TBC]; CWC level-monitoring site-te (Sairang, Turial, Bailley Bridge Tuipui, Sihthangpui, Keitum, Tuichang leh Tuichawng; chung zinga Turial chauhin tuilian sang ber (highest flood level) chhut a nei, June ni 17, 1995-a 149.0 m, SANDRP-in a ziak chhawn angin, datum sawi lovin [TBC]); NEEPCO aṭanga Tuirial reservoir level leh tui chhuah record-te, leh Serlui B reservoir ta [TBC]; Aizawl Municipal Corporation Landslide Hazard Maps (leimin hlauhawmna map) 1:5,000-a mi leh MIRSAC *Atlas of Micro-level Landslide Hazard Zonation of Aizawl City and Selected Towns*; Site Development and Slope Modification Regulations, 2017 regulation 6-in site plan-in a lantir tura a phut "tuilian hlauhawm area" ("flood hazard areas") (thlan a nih hmuh a ni lo); Mizoram (Protection of Rivers) Ordinance, 2023 (Ordinance No. 1 of 2023) leh Bill, 2023, enact a nih finfiah a ni lo, hnuaia River Conservation Zone reng reng (notify a nih hmuh a ni lo); EF&CC Department riverine reserve leh wetland-te; 2017, 2019 leh 2023-a Tlabung tuilian chhinchhiahna-te [TBC]; tuikhur leh an catchment inventory reng reng [TBC]; khawpui ramri-te (urban area leh notify khawpui master plan tan UD&PA, Master Plan for Aizawl: Vision 2030-a Aizawl Development Plan Area tan Aizawl Municipal Corporation, Lunglei Municipal Council, urban local body nei lo notify khawpuite Village Council-te, ram record tan Land Revenue & Settlement Department, leh an area tan Lai, Mara leh Chakma Autonomous District Council-te [TBC]); MSDMA-in a neih tuilian map-te; CGWB leh IWRD observation-well record-te; leh soil survey map (NBSS&LUP, State soil survey (agency hi finfiah tur [TBC])) aṭanga Surma group-a shale, siltstone leh mudstone, Bhuban leh Barail sandstone, tlang pang colluvium, Champhai phai, Tlabung, Bairabi, Vairengte leh Tlawng-a phai alluvium leh lui kam zawl, leh khawpui lei vur leh lei laih bal (cut-spoil) zau zawng, 10° aia nasa tlang pang leh tlang pang eng ang pawha Surma-group shale, Clause 4.11-a tlang dan (hill rule) hman turte, leh a recharge dan hman theih phai alluvium leh terrace test tawhte nen. A tlangzarh hma chuan: (a) Clause 4.5.3.2-a catchment hming tarlante hman a ni a, site pakhat chu chung zinga pakhatah a awm leh awm loh chu Belhchian 1B-a sawi angin thu tlukna siam leh chhinchhiah a ni; leh (b) Clause 4.12.1 a huam theih site tin chuan a design leihnuai tui level chu April–November hun pakhat chhunga site piezometer chhiar aṭangin, chu a theih loh chuan, CGWB emaw State observation well hnai ber level leh 0.5 m, leh a bula luipui, lui (stream), dil emaw reservoir design tuilian level aṭangin a ruat (Clause 4.12.1(b)). Tlawng, Tuirial leh Khawthlangtuipui phai leh lui kam zawl-ah (Sairang, Bairabi, Vairengte leh Tlabung-ah), Champhai phai, dil leh reservoir kam, leh piezometer chhiar nei lo tlang panga tuikhur hnuaia tui chiar zone-te-ah flotation endikna tan, design leihnuai tui level chu lei level awm mek a ni (Clause 4.12.1).

Table 4A.1 — Leihnuai tui thuk lohna zone layer attribute-te (layout)

Field	A chhunga thu	Unit emaw format
zone_id	Mahni bik identifier	text
zone_class	phai emaw lui kam zawl (Sairang, Bairabi, Vairengte, Tlabung, Chawngte emaw a dang); Champhai phai; dil kam (Tam Dil, Palak Dil emaw a dang); reservoir kam emaw backwater (Tuirial, Serlui B emaw a dang); tlang panga perched water, tuikhur emaw tui chiar; lei chung aṭanga 3 m chhunga leihnuai tui awmna area dang (Clause 4.12.1)	text
shgw_depth_m	Lei hnuaia hun bik-a leihnuai tui sang ber thuk zawng, fûr hun	m
shgw_basis	Well emaw piezometer hman, leh record hun chhung	text
tidal_influence	Leihnuai tui level-in a bula tidal tui awmna a zui em (Clause 4.12.1(b))	aw / aih
source	Data hnar agency leh ni	text
geometry	Zone ramri	polygon

Belhchian 4B — Tier B table-te: PSD leh SSR (Table 4.3), retention credit factor C_R, standard outlet lian zawng; fixed release coefficient nemnghet (Table 4.3A)

Bung 4-a Clause 4.4.6.3, 4.14.1, 4.14.2 leh 4.14.4 aṭanga 4.14.6 thleng a ṭanpui.

4B.1 He belhchian hian table pali a keng ang. He draft-a an dinhmun chu:

Table 4B.1 — Belhchian 4B chhunga thu awmte leh an dinhmun

Table	A chhunga thu	Clause	He draft-a a dinhmun
4B.2	Tier B site aṭanga luan chhuah phal zat (PSD) leh site khawl tur tui zat (SSR), Table 4.3 value-te	4.14.2	Buatsaih tur
4B.3	Retention credit factor C_R	4.4.6.3	Buatsaih tur; tlangzarh a nih hma chu C_R = 0
4B.4	Standard outlet lian zawng	4.14.2 step 4, 4.14.6	He belhchian-ah Clause 4.6.5.2-a orifice equation aṭanga chhut
4B.5	Fixed release coefficient C_10 leh C_2 (Table 4.3A)	4.14.4	Table 4.3A-a provisional value-te; value nemnghet buatsaih tur

4B.2 PSD leh SSR (Table 4.3)

Buatsaih tur. He table hian ruahtui zone, hydrologic soil group leh post-development imperviousness tin tan, kum 2 leh kum 100 stage tana PSD leh SSR, catchment pangngai leh tuilian hlauhawm catchment tan, Table 4.3 ruangamin a pe ang. Zone tin tana climate factor nena NIH-DHAARA design thuk zawng (Bung 2, Belhchian 2A), Belhchian 2B-a sub-daily ratio (ni khat aia tawi ratio)-te, leh Table 4.1-a AEP (kum khatah a lo thlen theih dan) leh duration tin tan Clause 4.6-a kalphung famkim hmanga standard site set routing a mamawh. PSD tin chu luan chhuah tir cap thu nei ber, leh SSR tin chu hectare khat zela khawlna thu nei ber a ni tur a ni, kalphung awlsam chu routing aiin engtikah mah a man a tlawm zawk loh nan margin nen. A tlangzarh hma chuan, Tier B site-te chuan Clause 4.6, emaw site chu ha 1 emaw a aia tê a nih chuan Clause 4.14.3-a fixed-coefficient route an hmang (Clause 4.14.1 leh 4.14.3).

Table 4B.2 — Tier B PSD leh SSR (Table 4.3 layout)

Zone (Belhchian 2A)	HSG	Imperviousness	PSD kum 2 (L/s/ha)	PSD kum 100 (L/s/ha), pangngai	PSD kum 100 (L/s/ha), tuilian hlauhawm	SSR (m³/ha), pangngai	SSR (m³/ha), tuilian hlauhawm
MZ-Z1 Hmar lam tlang: MZ-A Hmar lam tlang (Kolasib–Kawnpui–Bilkhawthlir), Clause 2.3.6(c)(ii)-a thuk zawngah; site NIH-DHAARA cell a san zawk chuan, Clause 4.6 hman a ni	C / D	50% / 70% / 90%	—	—	—	—	—

Zone (Belhchian 2A)	HSG	Imperviousness	PSD kum 2 (L/s/ha)	PSD kum 100 (L/s/ha), pangngai	PSD kum 100 (L/s/ha), tuilian hlauhawm	SSR (m³/ha), pangngai	SSR (m³/ha), tuilian hlauhawm
MZ-Z1 Hmar lam tlang: MZ-A1 Hmar lam phai (Bairabi–Vairengte), Clause 2.3.6(c)(ii)-a thuk zawngah; site NIH-DHAARA cell a san zawk chuan, Vairengte-ah ang hian, Clause 4.6 hman a ni	B / C / D	50% / 70% / 90%	—	—	—	—	—
MZ-Z2 Laili tlang chhip: MZ-B Laili tlang chhip (Aizawl–Sairang–Serchhip–Thenzawl–Hnahthial–Mamit), Clause 2.3.6(c)(i)-a hniam ber (floor)-ah; site NIH-DHAARA cell a san zawk chuan, Thenzawl leh Hnahthial-ah ang hian, Clause 4.6 hman a ni	C / D	50% / 70% / 90%	—	—	—	—	—
MZ-Z3 Chhak lam tlang sang: MZ-C Chhak lam tlang sang (Champhai–Khawzawl–Saitual–Ngopa–Zokhawthar), Clause 2.3.6(c)(i) leh (c)(iii)-a hniam ber (floor)-ah	C / D	50% / 70% / 90%	—	—	—	—	—
MZ-Z3 Chhak lam tlang sang: MZ-C1 Champhai phai, Clause 2.3.6(c)(i) leh (c)(iii)-a hniam ber (floor)-ah	B / C / D	50% / 70% / 90%	—	—	—	—	—
MZ-Z4 Chhim lam tlang: MZ-D Chhim lam tlang (Lunglei–Lawngtlai–Siaha–Chawngte–Tuipang)	—	—	Tarlan a ni lo: Clause 4.6 hman a ni (Clause 2.3.6(c)(i))	—	—	—	—
MZ-Z4 Chhim lam tlang: MZ-D1 Tlabung phai (Tlabung)	—	—	Tarlan a ni lo: Clause 4.6 hman a ni (Clause 2.3.6(c)(i))	—	—	—	—

4B.3 Retention credit factor C_R

Buatsaih tur. He table hian ruahtui zone, hydrologic soil group leh retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) hmanrua design infiltration (lei-a tui luh) emaw drawdown rate tin tan C_R a pe ang (Clause 4.4.3 leh 4.4.6.3). NIH-DHAARA thuk zawng nena Clause 2.5.2-a duration set famkim routing, retention hmanrua chu Clause 4.4.6.2-a angin model, leh credit chu retention siam cubic metre khat zela khawlna thu nei ber tihtlemna angin tarlan a mamawh. A tlangzarh hma chuan, **C_R = 0** a ni (Clause 4.4.6.3).

Table 4B.3 — Retention credit factor C_R (layout)

Zone (Belhchian 2A)	HSG	Design infiltration emaw drawdown rate (mm/h)	C_R (–)

Zone (Belhchian 2A)	HSG	Design infiltration emaw drawdown rate (mm/h)	C_R (–)

4B.4 Standard outlet lian zawng

4B.4.1 Table 4B.4-in head tarlanah discharge phal tarlan aia a discharge sang lo circular orifice lian ber, 5 mm step zelin, a pe. Clause 4.6.5.2-a discharge coefficient nena orifice equation aṭanga chhut a ni:

> Q = 0.60 × (π d² / 4) × √(2 g H)

heta Q chu discharge (m³/s), d chu orifice diameter (m), g = 9.81 m/s² leh H chu tui level aṭanga orifice laili thleng head (m) a ni. Lenzawng chu **hniam lamah** rounded a ni, orifice chuan discharge phal aia tam engtikah mah a luan tir loh nan. Lenzawng chhut chu 50 mm aia tê a nih chuan, Clause 4.8.2-a 50 mm hniam ber lantir a ni; Clause 4.5.5.1 hnuaiah a zawm angin ngaih a ni.

4B.4.2 Table hian free discharge a ngai. Tailwater (outfall hnuailama tui sang zawng) chu orifice chungah a chho thei chuan (Clause 4.6.6), H chu chunglam leh hnuailam tui level inkar a ni a, orifice chu routing hmangin endik tur a ni. State Stormwater Technical Committee chuan Belhchian 4B a chhuah hunah he table hi a thlak thei.

Table 4B.4 — Head pek-a discharge phal tan orifice diameter lian ber (mm) (Cd = 0.60, free discharge)

Discharge phal (L/s)	H = 0.5 m	H = 1.0 m	H = 1.5 m	H = 2.0 m
5	55	50	50	50
10	80	65	60	55
15	100	80	75	70
20	115	95	85	80
30	140	115	105	100
50	180	150	135	130
75	225	185	170	155
100	260	215	195	180
150	315	265	240	225
200	365	305	275	260
300	450	375	340	315

Endikna: H = 1.0 m-a 50 L/s tan, area chu 0.050 / (0.60 × √(2 × 9.81 × 1.0)) = 0.0188 m² a ni a, chuvangin d = √(4 × 0.0188 / π) = 0.155 m, hniam lamah 150 mm-ah rounded a ni.

4B.5 Fixed release coefficient (Table 4.3A)

4B.5.1 Table 4B.5-in Table 4.3A-a provisional coefficient-te a sawi nawn. Fixed-coefficient route (Clause 4.14.4) hnuaiah tuna hman theih an ni.

Table 4B.5 — Fixed release coefficient C_10 leh C_2 (provisional, Table 4.3A)

Hydrologic soil group	C_10	C_2	Clause	Dinhmun
A (sandy, tui liam ṭha)	0.05	0.02	4.14.4	Provisional
B	0.08	0.03	4.14.4	Provisional
C	0.15	0.08	4.14.4	Provisional
D (clay, tui liam ṭha lo)	0.25	0.15	4.14.4	Provisional

Buatsaih tur. Coefficient nemnghet-te chuan Table 4B.5 an thlak ang. Zone tin tana NIH-DHAARA thuk zawng leh Clause 3.3-a greenfield curve number-te an mamawh, Clause 4.14 Hrilhfiahna-in a sawi angin. An tlangzarh hma chuan, Table 4.3A-a provisional value-te hman a ni.

Belhchian 4C — Chhut dan entirna (Tier A), routing table famkim nen

Bung 4-a Clause 4.4 aṭanga 4.9 thleng, 4.15 leh 4.17 a ṭanpui.

Entirna chauh — design value a ni lo. He entirna hian Clause 4.6.7 entirna a chhunzawm. A inputs-te hi Lunglei khawpui-a tlang pang colony, tlang lui (lui)-a luang tan rinawm ang taka siam chawp an ni; NIH-DHAARA value an ni lo va, design atan hman ngei ngei tur a ni lo. Ṭhen 1-in inputs, hydrograph (hun hrang hranga tui luang zat) leh routing chu step zelin, outlet enchhinna (trial outlet) tan, a tarlang. Ṭhen 2-in outlet enchhinna chu Clause 4.8.3-a tihtawp (blockage) nen drawdown endikna-ah a hlawhchham tih a hmu a, Table 4.2-a outlet tarlan angin a siam ṭha. Ṭhen 3-in spillway, outlet, himna leh retention endikna a tifel. Lunglei khawpui tlang pang colony aṭanga tlang lui (lui)-a outfall (drain tui luan chhuahna)-a facility ang chiah tana Bung 5-a outfall khar endikna chu Belhchian 5C-ah a awm.

Ṭhen 1 — Inputs, hydrograph leh routing (Clause 4.6.1 aṭanga 4.6.4 thleng)

4C.1 **Inputs (chhutna thu).**

Table 4C.1 — Inputs (Entirna chauh — design value a ni lo)

Thil	Value	Innghahna
Site area A	2.0 ha (0.02 km²), outfall pakhat	Clause 4.6.7
Catchment class	Tuilian hlauhawm (Clause 4.5.3)	Clause 4.6.7
Lei khuhna leh curve number, AMC (ruahpui hma lei hnawnna dinhmun) II	Pre-development: pervious vek, CN 70. Post-development, sub-area pahnih angin: CN 98-a directly connected impervious 1.57 ha, leh CN 70-a pervious open space 0.43 ha (pre-development lei ang). Impervious fraction f = (92 − 70) / (98 − 70) = 0.786, chuvangin area-weighted CN chu 92 a ni	Clause 3.9.2, 4.6.7
AMC III-a thlak	Pervious area chauh, darkar 12 leh a aia rei ruahpui tan: CN_III = 23·CN / (10 + 0.13·CN) = 84.3. Impervious CN 98 chu thlak a ni lo	Clause 3.8.4
Initial abstraction	Ia = 0.2S; sensitivity run atan Ia = 0.05S	Clause 3.8.5
Time of concentration Tc (catchment hla ber aṭanga tui lo thlen hun)	Pre-development minute 45; post-development minute 15, sub-area pahnih tan hman, open space a tê a, site system ang chiah kal tlangin a luan avangin	Clause 4.6.7
Unit hydrograph	SCS triangular; tL = 0.6 Tc; tp = Δt/2 + tL; base 2.67 tp	Clause 3.6.5, 3.11.2
Time step Δt	Minute 5 (= post-development site Tc/3)	Clause 4.6.2, step 8

Thil	Value	Innghahna
Darkar 24 thuk zawng, kum 2, 10, 100	110, 200, 350 mm, climate factor tel angin lak	Clause 4.6.7
Duration tawi zawk	P(t) = P24 · (t/24)^0.40 (ratio set ngaih chawp, Belhchian 2B a ni lo)	Clause 4.6.7
Darkar 48 leh 72 thuk zawng	1.25 leh 1.40 × P24, darkar 24 thuk zawng chu ni hnuhnung berah	Clause 4.6.7, 2.9.2
Khawlna	Khuh lo, bang ding, plan area 2,500 m², laih, embankment (dai) awm lo, mipui luh theih loh	Clause 4.6.7
Outlet enchhinna	Stage 1: floor-a 120 mm orifice. Stage 2: 470 mm orifice, invert (tui luanna hniam ber) floor chungah 0.533 m. Stage 3 a awm lo	He belhchian tana enchhinna; Ṭhen 2-in a siam ṭha
Outfall	Level chu outlet invert hnuaia awm reng drain (tui luanna) dawngtu-ah free outfall	Entirna input

Entirna hian Clause 3.8.4 leh 3.9.2 a zui: sub-area tin ruahtui luang (runoff) chu hrang takin chhut a ni a, routing hmain pahnih chu belhkhawm a ni.

4C.2 **Design ruahtui tlak.** Table 4C.2-in thuk zawng-te a pe. Entirnan, kum 100 darkar 6 thuk zawng chu 350 × (6/24)^0.40 = 350 × 0.574 = 201.0 mm a ni.

Table 4C.2 — Design ruahtui tlak zat, mm (Entirna chauh — design value a ni lo)

Duration (h)	1	2	3	6	12	24	48	72
50% AEP (kum 2)	30.9	40.7	47.9	63.2	83.4	110.0	137.5	154.0
10% AEP (kum 10)	56.1	74.0	87.1	114.9	151.6	200.0	250.0	280.0
1% AEP (kum 100)	98.2	129.5	152.3	201.0	265.3	350.0	437.5	490.0

4C.3 **Hyetograph (hun hrang hranga ruahtui tlak zat).** Darkar 24 thleng ruahpui-te chuan minute 5 block-a alternating-block method an hmang, peak block chu ruahpui laiah dahin (Clause 2.9.1). Darkar 48 leh 72 ruahpui-te chuan darkar 24 thuk zawng aia tam chu darkar 24 emaw 48 hmasa chhungah a inangin an darh a, darkar 24 alternating-block ruahpui chu ni hnuhnung berah an dah (Clause 2.9.2). Kum 100 darkar 72 ruahpui tan: (490.0 − 350.0) / block 576 = darkar 48 hmasa chhung minute 5 zelah 0.243 mm; ni hnuhnung bera minute 5 peak block chu 350 × (5/1440)^0.40 = 36.3 mm a ni, 60:00–60:05 h-ah.

4C.4 **Loss.** Table 4C.3-in S = 25,400/CN − 254 (mm) leh Ia = 0.2S a pe. Ruahtui tlak zat P tana ruahtui luang thuk zawng chu P > Ia a nih chuan Q = (P − Ia)² / (P − Ia + S) a ni a, a nih loh chuan zero a ni.

Table 4C.3 — Curve number leh abstraction (Entirna chauh — design value a ni lo)

Dinhmun	AMC	CN	S (mm)	Ia = 0.2S (mm)
Pre-development	II (duration ≤ 6 h)	70	108.9	21.8
Pre-development	III (duration ≥ 12 h)	84.3	47.3	9.5
Post-development pervious open space (0.43 ha)	II (duration ≤ 6 h)	70	108.9	21.8
Post-development pervious open space (0.43 ha)	III (duration ≥ 12 h)	84.3	47.3	9.5
Post-development directly connected impervious (1.57 ha)	Duration zawng zawng (thlak loh)	98	5.2	1.0

Endikna: kum 100 darkar 24, post-development. Impervious: Q = (350.0 − 1.0)² / (350.0 − 1.0 + 5.2) = 343.9 mm. Pervious, AMC III: Q = (350.0 − 9.5)² / (350.0 − 9.5 + 47.3) = 299.0 mm. Site: 0.786 × 343.9 + 0.214 × 299.0 = 334.2 mm. Table 4C.4-a post-development column-te hi heng area-weighted site thuk zawng-te hi an ni.

Table 4C.4 — Ruahpui ruahtui luang thuk zawng Q, mm (Entirna chauh — design value a ni lo)

Duration (h)	AMC	kum 2 pre	kum 2 post	kum 10 pre	kum 10 post	kum 100 post
1	II	0.7	20.1	8.2	41.3	79.2
2	II	2.8	28.2	16.9	57.2	108.5
3	II	5.1	34.2	24.5	69.0	130.2
6	II	11.4	47.5	42.9	94.7	177.1
12	III	45.0	70.5	106.6	137.2	249.9
24	III	68.4	96.4	152.6	185.1	334.2
48	III	93.5	123.3	201.0	234.7	421.5
72	III	108.9	139.6	230.3	264.5	473.9

Ruahtui luang tui zat chu he 2.0 ha site tan 10 × Q × A = 20 × Q m³ a ni: entirnan, kum 100 darkar 72 ruahpui tan 9,478 m³. Hydrograph route-te hian 0.5% thleng a tlem zawk an phur, minute 5 alternating-block ruahpui chuan ni hnuhnung berah 350.0 mm ni lovin 349.5 mm a dah avangin.

4C.5 **Unit hydrograph.** Minute 5 block tina ruahtui luang (post-development site tan, sub-area pahnih belhkhawm) chu Table 4C.5-a triangular unit hydrograph nen convolve a ni. Peak chu qp = 0.208 × A × Q / tp a ni, A chu km²-in leh Q = 1 mm nen (Clause 3.11.2).

Table 4C.5 — Unit hydrograph parameter-te (Entirna chauh — design value a ni lo)

Dinhmun	Tc (h)	tL = 0.6 Tc (h)	tp = Δt/2 + tL (h)	Base 2.67 tp (h)	qp (ruahtui luang mm khat zelah L/s)
Pre-development	0.75	0.45	0.492	1.313	8.5
Post-development	0.25	0.15	0.192	0.512	21.7

4C.6 **Luan chhuah tir cap (Clause 4.5.3).** Site hi tuilian hlauhawm a ni a, chuvangin mixed-frequency dan hman a ni. Kum 100 cap chu duration zawng zawnga pre-development kum 10 peak lian ber a ni: **356 L/s** (72 h; Table 4.2). Kum 2 cap chu pre-development kum 2 peak lian ber a ni: **180 L/s** (72 h). Cap tin hi post-development duration tinah hman a ni (Clause 4.5.3.1).

4C.7 **Stage–storage–discharge.** Basin hi bang ding a ni a, chuvangin khawlna S = 2,500 × h (m³), heta h chu floor chunga stage (m) a ni. Outlet discharge chu Cd = 0.60 nen Clause 4.6.5.2 a zui:

- Stage 1, h ≥ d tan: Q1 = 0.60 × A1 × √(2g (h − d/2)). h < d tan (orifice a khat lo), head chu d/2 angin lak a ni a, result chu h/d-in puntir a ni.
- Stage 2 chu tui a laili chunga a awm veleh chhiar a ni: Q2 = 0.60 × A2 × √(2g (h − z2 − d2/2)), heta z2 chu a invert a ni. A laili hnuaiah a tui luang ngaihthah a ni a, chu chuan khawlna a tisang deuh.

Table 4C.6 — Stage–storage–discharge, outlet enchhinna (Entirna chauh — design value a ni lo)

Stage h (m)	Khawlna (m³)	Stage 1, 120 mm (L/s)	Stage 2, 470 mm (L/s)	A vaiin (L/s)
0.00	0	0.0	0.0	0.0
0.06	150	3.7	0.0	3.7
0.12	300	7.4	0.0	7.4
0.20	500	11.2	0.0	11.2

Stage h (m)	Khawlna (m³)	Stage 1, 120 mm (L/s)	Stage 2, 470 mm (L/s)	A vaiin (L/s)
0.30	750	14.7	0.0	14.7
0.40	1,000	17.5	0.0	17.5
0.50	1,250	19.9	0.0	19.9
0.60	1,500	22.1	0.0	22.1
0.70	1,750	24.0	0.0	24.0
0.80	2,000	25.9	83.0	108.9
0.90	2,250	27.5	167.8	195.3
1.00	2,500	29.1	222.3	251.4
1.10	2,750	30.7	265.8	296.5
1.20	3,000	32.1	303.2	335.3
1.30	3,250	33.5	336.4	369.9
1.40	3,500	34.8	366.7	401.5

Endikna h = 1.00 m-ah: Q1 = 0.60 × 0.01131 × √(19.62 × 0.94) = 0.0291 m³/s; Q2 = 0.60 × 0.1735 × √(19.62 × (1.00 − 0.533 − 0.235)) = 0.2223 m³/s.

4C.8 **Routing.** Ruahpui tin chu level-pool continuity hmangin route a ni (Clause 4.6.1): minute 5 step tinah, khawlna danglamna chu tui lut zat paih tui chhuak zat a ni. Chhutna hian minute 5 step tinah second 50 sub-step paruk a hmang. Table 4C.7 row tin chu ΔS ≈ (I − Ō) × 300 s angin kutin endik theih a ni, heta I chu hun tarlana tawp minute 5 step chhunga tui lut average, leh Ō chu step ṭan leh tawpa tui chhuak average a ni. Entirnan, 60:15 leh 60:20 inkarah: ΔS = 2,853.0 − 2,613.3 = 239.7 m³, leh (1.0891 − (0.2655 + 0.3069)/2) × 300 = 240.9 m³.

Table 4C.7 — Outlet enchhinna kal tlanga kum 100 darkar 72 ruahpui routing, peak vel (Entirna chauh — design value a ni lo)

Hun (h:min)	Step chhunga ruahtui tlak (mm)	Tui lut I (L/s)	Tui chhuak O (L/s)	Khawlna S (m³)	Stage h (m)
60:00	8.44	286.3	169.5	2,164.0	0.866
60:05	36.33	354.2	184.1	2,216.9	0.887
60:10	11.61	703.3	218.0	2,367.1	0.947
60:15	6.88	1,066.0	265.5	2,613.3	1.045
60:20	5.23	1,089.1	306.9	2,853.0	1.141
60:25	4.34	897.5	334.8	3,025.0	1.210
60:30	3.77	653.2	349.9	3,117.6	1.247
60:35	3.36	403.6	353.8	**3,132.9**	**1.253**
60:40	3.05	301.5	352.3	3,117.3	1.247
60:45	2.81	254.8	348.6	3,088.7	1.235
60:50	2.61	224.9	343.7	3,052.4	1.221
60:55	2.45	203.3	337.9	3,011.3	1.205

Khawlna chu 60:35-a tawp step tawpah a sang ber. A dawt step-ah tui lut average (302 L/s) chu tui chhuak (352 L/s vel) aiin a hniam a, chuvangin khawlna a tla.

Table 4C.8 — Outlet enchhinna kal tlanga kum 100 darkar 72 ruahpui routing, darkar tin (Entirna chauh — design value a ni lo)

Hun (h)	Ruahtui tlak belhkhawm (mm)	Tui lut (L/s)	Tui chhuak (L/s)	Stage (m)	Khawlna (m³)
12	35.0	14	8	0.130	325
24	70.0	15	12	0.215	536
36	105.0	16	14	0.264	660
48	140.0	16	15	0.294	736
54	181.7	47	19	0.469	1,172
57	213.5	69	23	0.623	1,559
59	248.5	120	91	0.789	1,971
60	293.3	286	170	0.866	2,164
61	378.0	187	332	1.187	2,967
62	399.3	106	237	0.968	2,421
63	414.5	80	142	0.829	2,072
66	446.9	51	52	0.771	1,927
72	489.5	33	33	0.768	1,920
84	489.5	0	18	0.405	1,012
96	489.5	0	10	0.167	418
108	489.5	0	4	0.058	146

Route tui chhuak zat chu tui lut zat (9,470 m³ vel) nen a inang: detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) hian tui zat a tihtlai a, a paih bo lo.

4C.9 **Result, outlet enchhinna.** Table 4C.9-in outlet enchhinna tana peak, stage sang ber leh drawdown hun-te a pe.

Table 4C.9 — Outlet enchhinna (orifice 120 mm leh 470 mm) result (Entirna chauh — design value a ni lo)

Duration (h)	kum 2 dah rih (L/s)	kum 2 stage sang ber (m)	kum 10 dah rih (L/s)	kum 10 stage sang ber (m)	kum 100 dah rih (L/s)	kum 100 stage sang ber (m)	kum 100 khawlna (m³)	kum 10 90% drawdown, fai (h)	kum 10 90% drawdown, 50% tihtawp (h)
1	9	0.15	15	0.30	22	0.59	1,468	27.2	54.2
2	11	0.20	18	0.42	89	0.79	1,966	28.3	57.0
3	13	0.24	20	0.50	135	0.82	2,058	29.3	59.1
6	15	0.31	23	0.64	190	0.89	2,229	31.1	63.4
12	17	0.40	49	0.77	279	1.06	2,647	36.2	69.2
24	19	0.45	87	0.79	334	1.20	2,991	42.8	75.4
48	20	0.51	144	0.83	353	1.25	3,129	42.5	72.7

Duration (h)	kum 2 dah rih (L/s)	kum 2 stage sang ber (m)	kum 10 dah rih (L/s)	kum 10 stage sang ber (m)	kum 100 dah rih (L/s)	kum 100 stage sang ber (m)	kum 100 khawlna (m³)	kum 10 90% drawdown, fai (h)	kum 10 90% drawdown, 50% tihtawp (h)
72	20	0.52	147	0.84	354	1.25	**3,133**	42.5	71.9

Drawdown hun chu kum 10 khawlna sang ber hun aṭanga chu khawlna 90% luan chhuah thleng teh a ni (Clause 4.7.1).

Ṭhen 2 — Endikna leh outlet siam ṭhat (Clause 4.5, 4.7 leh 4.8)

4C.10 **Luan chhuah tir cap.** Kum 100 peak dah rih tin chu 356 L/s emaw a hnuaiah a awm a, kum 2 peak dah rih tin chu kum 2 cap 180 L/s aiin a hniam hle. Cap pahnih hi tlin a ni. Kum 2 peak-te chu duration tin zelin pre-development peak-te nen khaikhin a ni lo: tuilian hlauhawm site tan kum 2 cap chu pre-development kum 2 peak lian ber pakhat chauh a ni (Clause 4.5.3.1).

4C.11 **Drawdown.** Clause 4.8.3 chuan drawdown endik hunah low-flow orifice chu **50% tihtawp** angin ngaih a phut. Orifice 120 mm chu a area chanve-ah, kum 10 khawlna 90% chu darkar 54 aṭanga 75 thleng chhungin a liam (Table 4C.9), Clause 4.7.1-a darkar 48 limit nena khaikhinin. **Outlet enchhinna a hlawhchham.** Orifice fai nen chuan darkar 42 velah a liam ang.

4C.12 **Outlet siam ṭhat.** Low-flow orifice chu 10 mm step zelin tihlian a ni a, duration tin tan drawdown tihtawp chu darkar 48 a tlin thleng, tichuan kum 100 cap a la tlin theih nan Stage 2 chu lenzawng ruat thar a ni. A result:

- Stage 1: floor-a **170 mm** orifice;
- Stage 2: **460 mm** orifice, invert floor chungah 0.53 m (laili 0.76 m-ah);
- Stage 3 a awm lo.

Low-flow orifice lian zawk hian ruahpui lo thleng fo-ah tui tam zawk a luan chhuah tir. Hetah chuan chu chu a phal theih a ni, tuilian hlauhawm site kum 2 cap chu pre-development kum 2 peak lian ber a nih avangin (Clause 4.5.3.1). WQv chu chunglama hmanrua hrang-ah tihfai (treat) angin ngaih a ni (Bung 8), chuvangin Stage 1 chuan WQv chu darkar 24–48 chhung a vawn a ngai lo (Clause 4.6.5.1); Stage 1-in WQv a luan chhuah tir bawk chuan, Clause 4.7.2 pawh endik ngei ngei tur a ni.

Table 4C.10 — Stage–storage–discharge, outlet siam ṭhat (Entirna chauh — design value a ni lo)

Stage h (m)	Khawlna (m³)	Stage 1, 170 mm (L/s)	Stage 2, 460 mm (L/s)	A vaiin (L/s)
0.00	0	0.0	0.0	0.0
0.085	213	8.8	0.0	8.8
0.17	425	17.6	0.0	17.6
0.30	750	28.0	0.0	28.0
0.40	1,000	33.9	0.0	33.9
0.50	1,250	38.9	0.0	38.9
0.60	1,500	43.3	0.0	43.3
0.70	1,750	47.3	0.0	47.3
0.76	1,900	49.6	0.0	49.6
0.80	2,000	51.0	88.3	139.3
0.90	2,250	54.5	165.3	219.7

Stage h (m)	Khawlna (m³)	Stage 1, 170 mm (L/s)	Stage 2, 460 mm (L/s)	A vaiin (L/s)
1.00	2,500	57.7	216.4	274.1
1.10	2,750	60.8	257.5	318.3
1.17	2,925	62.8	282.8	345.6
1.20	3,000	63.7	293.0	356.7
1.30	3,250	66.5	324.6	391.1

Table 4C.11 — Outlet siam ṭhat (orifice 170 mm leh 460 mm) result (Entirna chauh — design value a ni lo)

Duration (h)	kum 2 dah rih (L/s)	kum 2 stage sang ber (m)	kum 10 dah rih (L/s)	kum 10 stage sang ber (m)	kum 10 khawlna (m³)	kum 100 dah rih (L/s)	kum 100 stage sang ber (m)	kum 100 khawlna (m³)	kum 10 90% drawdown, 50% tihtawp (h)
1	15	0.14	28	0.29	734	42	0.57	1,426	31.3
2	20	0.19	34	0.40	990	79	0.76	1,911	32.1
3	22	0.22	37	0.46	1,147	139	0.80	1,999	32.8
6	25	0.26	41	0.56	1,386	194	0.86	2,154	34.2
12	30	0.33	46	0.68	1,692	276	1.01	2,512	39.0
24	32	0.37	49	0.75	1,870	320	1.11	2,766	45.3
48	34	0.40	82	0.77	1,913	343	1.17	**2,913**	44.8
72	34	0.41	84	0.77	1,915	343	1.16	2,911	44.7

A hmuhte:

- **Kum 100 cap:** peak dah rih lian ber 343 L/s ≤ 356 L/s. A tlin.
- **Kum 2 cap:** peak dah rih lian ber 34 L/s ≤ 180 L/s. A tlin.
- **Drawdown:** drawdown tihtawp rei ber 45.3 h ≤ 48 h (Clause 4.7.1). A tlin.
- **Khawlna thu nei ber: 2,913 m³** (kum 100, 48 h), stage sang ber **1.17 m**-ah. Low-flow orifice lian zawk hian ruahpui rei-ah a hmaa tui tam zawk a luan chhuah tir a, chuvangin outlet siam ṭhat hian outlet enchhinna aiin khawlna 220 m³ vel a tlem zawk a mamawh. Clause 4.6.7-a Table 4.2-in he design siam ṭhat hi a tarlang.
- **Ruahpui thu nei ber (Clause 4.6.2, step 12):** khawlna tan, kum 100 darkar 48 ruahpui; Stage 1 tan, kum 10 darkar 24 ruahpui (drawdown); Stage 2 tan, kum 100 darkar 48 ruahpui (cap).

Ṭhen 3 — Sensitivity, retention, spillway, outlet chipchiar leh himna

4C.13 **Ia = 0.05S sensitivity (Clause 3.8.5).** S chu S0.05 = 25.4 × 1.33 × (S0.20 / 25.4)^1.15 angin thlakin, kum 100 darkar 48 run thu nei ber chuan khawlna 2,898 m³ leh peak 341 L/s a pe, default run aiin a hniam deuh. Pre-development kum 10 peak, chuvangin kum 100 cap pawh, 344 L/s-ah a tla. Design hi default run-ah a innghat (Clause 3.8.5(c)); sensitivity result-te chu Form 3-2-ah tarlan a ni.

4C.14 **Retention leh retention credit (Clause 4.4.2 leh 4.4.6).** Entirna retention thuk zawng P_R = 40 mm nen, Q_R chu AMC II-ah sub-area tin tan chhut a ni, retention tan composite CN hman a nih loh avangin (Clause 3.9.4). Impervious, CN 98: S = 5.2 mm, Ia = 1.0 mm, Q_R = (40 − 1.0)² / (40 − 1.0 + 5.2) = 34.4 mm. Pervious, CN 70: S = 108.9 mm, Ia = 21.8 mm, Q_R = (40 − 21.8)² / (40 − 21.8 + 108.9) = 2.6 mm. RRV (khawl tur tui zat) = 10 × (34.4 × 1.571 + 2.6 × 0.429) = **552 m³**. Retention hi ruahpui ṭan laia ruak, a khat thleng ruahtui luang zawng zawng dawng, ruahpui chhunga infiltration awm lo khawlna angin model a ni (Clause 4.4.6.2).

Table 4C.12 — Routing hmanga retention credit, outlet siam ṭhat (Entirna chauh — design value a ni lo)

kum 100 ruahpui	Retention nei lova khawlna (m³)	Retention nena khawlna (m³)	Tihtlemna (m³)
24 h	2,766	2,628	138
48 h	2,913	2,906	7
72 h	2,911	2,911	0

Khawlna thu nei ber chu 2,913 aṭangin 2,906 m³-ah a tla, chuvangin retention credit chu 7 m³, RRV 1% vel a ni. Retention hi a tum ngei atan a famkimin siam tur a ni reng (Clause 4.4.1, Bung 8).

4C.15 **Emergency spillway (Clause 4.9).** Facility hi laih a ni a, embankment a nei lo, chuvangin Clause 4.9.7 hman a ni: overflow kawng chu spillway angin ngaih a ni a, Clause 4.9.1 a tlin ngei ngei tur a ni.

- Design flow: 1% AEP tui lut peak, 1,089 L/s, outlet tihtawp leh basin crest thleng khat chungin.
- Crest: outlet a hnathawh laia 1% AEP tui level sang ber chu 1.17 m a ni; rawt 0.15 m clearance nen (Clause 4.9.3) crest chu **1.35 m**-ah ruat a ni.
- Crest sei zawng: Q = C × L × H^1.5 nena broad-crested weir, C = 1.7 (SI unit-a broad-crested weir tana entirna coefficient; Clause 4.6.5.2 chuan a pianphung nena inmil coefficient a phut). L = 4.0 m nen: H = (1.089 / (1.7 × 4.0))^(2/3) = 0.295 ≈ **0.30 m**.
- Spillway a luan laia level sang ber: 1.35 + 0.30 = 1.65 m. 0.3 m freeboard (tui sang ber chunga zau dah) nen (Clause 4.9.1), bang chhip chu floor chungah **1.95 m** tal a ni.
- Spillway chuan 1% AEP overland flow path (lei chunga tui luan kawng)-ah a luang chhuak, building aṭanga hlaah (Clause 4.9.4).

4C.16 **Outlet chipchiar (Clause 4.8).**

Table 4C.13 — Outlet endikna, outlet siam ṭhat (Entirna chauh — design value a ni lo)

Thil	Mamawh	Value	A chhuah
Orifice hniam ber	≥ 50 mm (Clause 4.8.2)	170 mm	A tlin
Rack bar inkar	≤ kawngka tê ber chanve leh ≥ 25 mm (Clause 4.8.3)	≤ 85 mm	75 mm-ah ruat
Rack kawngka area	≥ 10 × area humhim (Clause 4.8.3)	10 × (0.0227 + 0.1662) m² = 1.89 m², orifice pahnih hual rack pakhat tan	≥ 1.89 m² siam
Anti-vortex, Stage 1	Head > 1.5 d a nih chuan a ngai (Clause 4.8.4)	Head 1.08 m thleng > 0.26 m	A ngai
Anti-vortex, Stage 2	Head > 1.5 d a nih chuan a ngai (Clause 4.8.4)	Laili chunga head 0.41 m thleng < 0.69 m	A ngai lo
Isolation	1 ha aia tam rawngbawl facility (Clause 4.8.6)	2.0 ha a rawngbawl	Stop-log slot emaw penstock, a pangngaiin hawng
Outlet barrel	≥ 300 mm (Clause 4.8.5)	343 L/s tan Bung 9 hnuaiah lenzawng ruat	Design tur

4C.17 **Himna (Clause 4.15).** Kum 10 thuk zawng (0.77 m) hian mipui luh theih khawlna tana limit 0.45 m a khum (Clause 4.15.1(a)), chuvangin facility hi mipui tan hawn a ni lo. 0.6 m aia sang bang ding a nei a, spillway a luan laiin 1.2 m aia thuk a ni, chuvangin 1.2 m tal sang, lawn theih loh fence, lock theih gate nen, a ngai (Clause 4.15.3). Chhinchhiahna (sign) leh thuk zawng tehna (depth marker) dah a ni (Clause 4.15.5).

4C.18 **Design tlangpui (Entirna chauh — design value a ni lo).**

Table 4C.14 — Design siam ṭhat tlangpui (Entirna chauh — design value a ni lo)

Thil	Value
Khawlna	Plan area 2,500 m²; 1% AEP level sang ber 1.17 m-ah 2,913 m³
Stage 1	Floor-a 170 mm orifice, trash rack leh anti-vortex plate nen
Stage 2	460 mm orifice, invert 0.53 m
Spillway	Crest 1.35 m, sei zawng 4.0 m, level sang ber 1.65 m
Bang chhip	Floor chungah ≥ 1.95 m
kum 100 peak luan chhuah tir	343 L/s (cap 356 L/s)
kum 2 peak luan chhuah tir	34 L/s (cap 180 L/s)
kum 10 drawdown, 50% tihtawp	45.3 h (limit 48 h)
Retention	RRV 552 m³ belh siam; credit 7 m³
La endik tur	Lunglei khawpui tlang pang colony aṭanga tlang lui (lui)-a outfall tana outfall khar endikna (Belhchian 5C); luanna hnuailam zirchianna (Bung 5); leihnuai tui leh flotation (Clause 4.12); WQv (Bung 8)

Form 4-1 — Site Ruahtui Luang Thunun Report

Bung 4-a Clause 4.3 aṭanga 4.17 thleng a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Site tin tan form pakhat. Site chu outfall pakhat aia tam-ah a luan chuan, outfall tin tan Section E aṭanga J thleng ziak famkim rawh (Clause 4.5.1.3). Clause 4.14.2 hmang Tier B site-te chuan Section F leh G aiah Form 4-2 an belh; fixed-coefficient route hmang site-te chuan Section F leh G aiah Form 4-3 an belh (Clause 4.17).

A. Site leh route

Table 4F.1 — Form 4-1: site leh route

Field	Ziah luh tur
A1. Project hming leh dilna thehluhtu (applicant)	
A2. Hmun (khaw emaw ward, survey number, district)	
A3. Approving Authority (phalna petu Authority) leh tier (Tier A / Tier B)	
A4. Site area, lei tihbuai (land disturbance) leh tui luh theih lohna hmun (impervious) thar emaw thlak (ha, ha, m²) (Clause 4.1.2)	
A5. Outfall zat (Clause 4.5.1.3)	
A6. Lenzawng ruatna route: kalphung famkim (Clause 4.6) / Tier B table (Clause 4.14.2) / fixed-coefficient route (Clause 4.14.3)	
A7. Hmun khawp lo redevelopment route (Clause 4.5.6) hman em? Hman chuan, Constraint Statement, dinhmun awm mek model leh tlakchhamna leh fee chhutna belh rawh	

B. Chhutna thu (Clause 4.17, item 1)

Table 4F.2 — Form 4-1: chhutna thu

Field	Ziah luh tur
B1. Design Ruahtui Tlak Sheet reference (Form 2-1)	
B2. Hydrology Chhutna Tlangpui reference (Form 3-1)	
B3. Sub-area tin HSG leh a finfiahtu test-te (Clause 4.6.2, step 1)	
B4. Pre-development dinhmun leh CN (Clause 4.5.1.2)	
B5. Sub-area tin post-development CN, leh Tc pre leh post	
B6. Routing kalphung leh software, version nen; time step (Clause 4.6.1, 4.6.2)	

C. Hmalakna indawt dan (Clause 4.3.1; Clause 4.17, item 2)

Table 4F.3 — Form 4-1: hmalakna indawt dan

Step	Design-in a tih	Engvangin nge he step hian a tih aia tam a tih theih loh
1. Humhalh		
2. Khawl		
3. Dah rih		
4. Luan tir		

D. Retention (Clause 4.4; Clause 4.17, item 3 leh 4)

Table 4F.4 — Form 4-1: retention

Field	Ziah luh tur
D1. Retention thuk zawng P_R (mm) leh zone (Belhchian 2E)	
D2. Sub-area zela ruahtui luang thuk zawng Q_R (mm) leh RRV (m³) (Clause 4.4.2)	
D3. Retention hmanrua leh tui zat siam (m³)	
D4. Infiltration test: zat, hmun leh thuk zawng, rate teh (mm/h) (Clause 4.4.3(a))	
D5. Design infiltration rate (mm/h), rate teh chanve aia tam lo (Clause 4.4.3(b))	
D6. Hmanrua tin bul hnuaia hun bik-a leihnuai tui sang ber thuk zawng (m), 1.0 m tal (Clause 4.4.3(c))	
D7. Retention chu hman nawn (reuse) hmanga a nih chuan, hman nawn mamawh chhutna (Clause 4.4.3)	
D8. Retention drawdown hun (h), 72 h aia rei lo (Clause 4.4.5)	
D9. RRV tlakchhamna (m³), a awm chuan, WQv angin ngaih (Clause 4.4.4.2)	
D10. Retention nei lo leh nei khawlna thu nei ber, leh retention credit (m³) (Clause 4.4.6)	
D11. Humhalhna credit area leh covenant reference (Clause 4.4.7)	

E. Luan chhuah tir zat tehna (Clause 4.5; Clause 4.17, item 5)

Table 4F.5 — Form 4-1: luan chhuah tir zat tehna

Field	Ziah luh tur
E1. Catchment class: pangngai (Clause 4.5.2) emaw tuilian hlauhawm (Clause 4.5.3), Belhchian 4A map lak chhuah nen	
E2. AEP zela luan chhuah tir cap (L/s), leh cap tin ruattu duration	
E3. Clause 4.5.5 hman em (orifice 50 mm zawm anga ngaih, emaw duration tawi kum 2 chhuahna)? Kum 2 pelhna reng reng tarlang rawh	

F. Result (Clause 4.6; Clause 4.17, item 6)

Duration tin tan row pakhat ziak famkim rawh, Table 4.2 format-in. Khawlna, outlet stage tin leh spillway tana case thu nei ber chhinchhiah rawh (Clause 4.6.2, step 12).

Table 4F.6 — Form 4-1: duration zela result (L/s; m³)

Duration (h)	kum 2 pre	kum 2 post, dah rih	kum 10 pre	kum 10 post, dah rih	kum 100 post, thunun loh	kum 100 post, dah rih	kum 100 khawlna hman
1							
2							
3							
6							
12							
24							
48							
72							

G. Facility, drawdown leh outlet (Clause 4.7, 4.8, 4.10; Clause 4.17, item 7 aṭanga 9 thleng)

Table 4F.7 — Form 4-1: facility, drawdown leh outlet

Field	Ziah luh tur
G1. Facility chi (Clause 4.10) leh khawlna siam (m³)	
G2. Stage–storage leh stage–discharge table leh plot-te; case thu nei ber tana inflow leh outflow hydrograph-te (belh rawh)	
G3. Kum 10 drawdown: khawl tui zat sang ber 90% luan chhuah hun (h), low-flow orifice 50% tihtawp chungin (Clause 4.7.1, 4.8.3)	
G4. WQv luan chhuah hun (h), darkar 24 aṭanga 48 thleng (Clause 4.7.2)	
G5. Tidal outfall: tidal tailwater nena drawdown, leh pump hmanga drawdown reng reng (Clause 4.7.4)	
G6. Outlet stage tin: chi, lenzawng (mm), invert level (m)	
G7. Trash rack: bar inkar chiang (mm) leh kawngka area (m²) (Clause 4.8.3)	
G8. Anti-vortex device (Clause 4.8.4); outlet barrel diameter leh tui chiar thununna (Clause 4.8.5); isolation (Clause 4.8.6)	
G9. Proprietary device: head–discharge curve finfiah (certified) leh kawngka chiang hniam ber (Clause 4.6.5.3)	

H. Spillway, freeboard leh embankment (Clause 4.9; Clause 4.17, item 10)

Table 4F.8 — Form 4-1: spillway leh freeboard

Field	Ziah luh tur
H1. Hlauhawmna classification, a chhan nen (Clause 4.9.2)	
H2. 1% AEP tui lut peak (L/s); hlauhawmna sang facility tan 0.2% AEP tui lut peak (L/s)	
H3. Outlet a hnathawh laia 1% AEP tui level sang ber (m); spillway crest level (m) (Clause 4.9.3)	
H4. Spillway emaw overflow kawng: chi, lenzawng, outlet tihtawp laia level sang ber (m)	
H5. Embankment crest emaw bang chhip thlenga freeboard (m), 0.3 m tal (Clause 4.9.1)	
H6. Spillway awmna leh a tui luan kawng (Clause 4.9.4)	

Field	Ziah luh tur
H7. Embankment sanzawng (m); 2 m aia sang a nih chuan geotechnical report (Clause 4.9.6)	

I. RWH chhiar dan, leihnuai tui leh flotation (Clause 4.11, 4.12; Clause 4.17, item 11 leh 12)

Table 4F.9 — Form 4-1: RWH, leihnuai tui leh flotation

Field	Ziah luh tur
I1. RWH khawlna siam (m³), ruahpui tin ṭan laia khat angin ngaih (Clause 4.11.2)	
I2. RWH leh detention tank inzawm: zone level leh detention orifice level (Clause 4.11.3); tank cross-section-te belh rawh	
I3. Design leihnuai tui level leh a innghahna (Clause 4.12.1)	
I4. Khawlna lined emaw lined lo; design leihnuai tui level hnuaia tui zat chhiar loh (Clause 4.12.2)	
I5. Flotation factor of safety, 1.2 aia tlem lo (Clause 4.12.3)	

J. Luanna hnuailam, tailwater, himna leh enkawlna (Clause 4.17, item 13 leh 14)

Table 4F.10 — Form 4-1: luanna hnuailam, tailwater, himna leh enkawlna

Field	Ziah luh tur
J1. Luanna Hnuailam leh Tailwater Report (Form 5-1) emaw Luanna Hnuailam Thusawi Tawi (Form 5-2) reference	
J2. Routing-a tailwater hman, leh tailwater-in a thunun hmunah flap gate (Clause 4.6.6)	
J3. Mipui luh theihna, 10% leh 1% AEP ruahpui-a thuk zawng, tlang pang, fence, grate, chhinchhiahna (sign) leh thuk zawng tehna (Clause 4.15)	
J4. Maintenance declaration draft reference (Bung 10)	

K. Registered professional puanchhuahna (Clause 10.6)

Kei hian he report hi Mizoram Ruahtui Luanna Design Kaihhruaina Bu (Draft v1.0) Bung 4 hnuaiah buatsaih a ni a, result tarlante hi model thehluhte-in an siam chhuak leh thei a, Bung 4 kalsanna tin hi a chhan nen tarlan a ni tih ka puang e. Professional Design Certificate (Form 10-3) belh a ni.

Table 4F.11 — Form 4-1: registered professional puanchhuahna

Field	Ziah luh tur
Hming	
Thiamna leh registration number	
Empanelment number, Clause 10.6.1-in a phut chuan	
Hnathawhna pawl (organisation)	
Hmingziak	
Ni	

Form 4-2 — Tier B Site Sheet

Bung 4-a Clause 4.4.6.3, 4.14.1 leh 4.14.2 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. He sheet hian Clause 4.14.2 hmang Tier B site-te tan Site Ruahtui Luang Thunun Report (Form 4-1) item 6 leh 7 a thlak. Belhchian 4B-ah Table 4.3 tlangzarh a nih hnuah chauh hman theih a ni; chu hma chu, Tier B site-te chuan Clause 4.6 emaw, ha 1 emaw a aia tê site tan, fixed-coefficient route an hmang (Clause 4.14.1 leh 4.14.3).

A. Tlin theihna (Clause 4.14.1)

Table 4F.12 — Form 4-2: tlin theihna

Field	Ziah luh tur
A1. Local body (Tier B)	
A2. Site area A (ha): tuilian hlauhawm catchment pawnah 2 ha emaw a aia tê; a chhungah 0.5 ha emaw a aia tê	
A3. Catchment class: pangngai emaw tuilian hlauhawm (Belhchian 4A)	

B. Table 4.3 value-te (Clause 4.14.2, step 1)

Table 4F.13 — Form 4-2: Table 4.3 aṭanga value chhiar

Field	Ziah luh tur
B1. Ruahtui zone (Belhchian 2A)	
B2. Hydrologic soil group	
B3. Post-development imperviousness (%)	
B4. PSD kum 2 (L/s/ha)	
B5. PSD kum 100 (L/s/ha), catchment class tan	
B6. SSR (m³/ha), catchment class tan	

C. Khawlna leh luan chhuah tir (Clause 4.14.2, step 2 leh 3)

Table 4F.14 — Form 4-2: khawlna leh luan chhuah tir

Line	Zat	Chhutna	Value
C1	RRV siam (m³)	Clause 4.4	
C2	C_R	Belhchian 4B; tlangzarh a nih hma chu 0	
C3	V_credit (m³)	C2 × C1 (Clause 4.4.6.3)	
C4	Khawlna ngai V (m³)	B6 × A − C3	
C5	Khawlna siam (m³)	Drawing aṭanga	
C6	Q_PSD,2 (L/s)	B4 × A	

Line	Zat	Chhutna	Value
C7	Q_PSD,100 (L/s)	B5 × A	

D. Outlet leh thil dang siam (Clause 4.14.2, step 4 leh 5)

Table 4F.15 — Form 4-2: outlet leh thil dang siam

Field	Ziah luh tur
D1. Low-flow orifice: Belhchian 4B outlet table aṭanga diameter (mm), head (m), 50 mm tal	
D2. Chunglam thununna: chi, lenzawng leh level	
D3. Spillway emaw overflow (Clause 4.9)	
D4. RWH chhiar dan (Clause 4.11)	
D5. Himna thupek (Clause 4.15)	

E. Puanchhuahna

Kei hian a chunga value-te hi site zone, soil group, imperviousness leh catchment class tan Belhchian 4B aṭanga lak an ni a, drawing-a khawlna leh outlet lantirte hi an inmil tih ka puang e.

Table 4F.16 — Form 4-2: puanchhuahna

Field	Ziah luh tur
Hming	
Thiamna leh registration number	
Hmingziak	
Ni	

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

Form 4-3 — Fixed-coefficient Route Sheet (Clause 4.14.3 aṭanga 4.14.7 thleng)

Bung 4-a Clause 4.14.3 aṭanga 4.14.7 thleng a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. He sheet hian fixed-coefficient route hmang site-te tan Site Ruahtui Luang Thunun Report (Form 4-1) item 6 leh 7 a thlak. Site aṭanga ruahtui luang chhuahna hmun tin tan ziak famkim rawh (Clause 4.14.4). Milem 4.3-in kalphung a lantir.

A. Tlin theihna (Clause 4.14.3)

Table 4F.17 — Form 4-3: tlin theihna

Endikna	Aw / Aih
A1. Site area 1 ha emaw a aia tê	
A2. Design-in dil (tank) emaw tui awmna (waterbody) khawlna a chhiar lo (Clause 4.14.3(a))	
A3. Site chanvo reng reng tui awmna setback (tui kam aṭanga hmun kalhlen tur) chhungah a awm lo (Clause 4.14.3(b))	
A4. Site chu luanna hnuailam design-a a khawlna chhiar dil cascade (tank cascade)-ah a luang lo (Clause 4.14.3(c))	

B. Luan chhuah tir cap (Clause 4.14.4)

Table 4F.18 — Form 4-3: luan chhuah tir cap

Line	Zat	Hnar emaw chhutna	Value
B1	Site area A (ha)	Survey	
B2	Hydrologic soil group tin area (ha)	Clause 3.7	
B3	C_10 leh C_2, area-weighted	Table 4.3A	
B4	i_10 leh i_2 (mm/h), duration minute 15, climate factor nen	Form 2-1; Clause 2.8	
B5	Q_cap,10 (L/s)	2.78 × C_10 × i_10 × A	
B6	Q_cap,2 (L/s)	2.78 × C_2 × i_2 × A	
B7	Cap a tê zawk hmunah, stage inmila orifice 50 mm discharge (L/s) (Clause 4.5.5.1)	Orifice equation, Clause 4.6.5.2	

C. Volumetric coefficient (Clause 4.14.5)

Table 4F.19 — Form 4-3: volumetric coefficient C_v

Line	Zat	Value
C1	Table 3.2-a composite C (range tin chanve chung lam)	
C2	1% AEP tana Table 3.3-a Cf	
C3	Darkar 12 hnuai duration tana C_v (C1 × C2)	
C4	Darkar 12 emaw a aia rei duration tana C_v, pervious surface tin C chu 0.50 aia tlem lo nen	

D. Khawlna (Clause 4.14.5)

Duration tin tan: tui lut = 10 × C_v × P(d) × A (m³); luan chhuah tir = 1.8 × Q_cap × d (m³); danglamna = tui lut − luan chhuah tir. V_100 leh V_2 chu danglamna lian ber an ni; V chu an pahnih zinga lian zawk a ni.

Table 4F.20 — Form 4-3: duration zela khawlna

d (h)	P_100(d) (mm)	kum 100 tui lut (m³)	1.8 × Q_cap,10 × d (m³)	kum 100 danglamna (m³)	P_2(d) (mm)	kum 2 tui lut (m³)	1.8 × Q_cap,2 × d (m³)	kum 2 danglamna (m³)
1								
2								
3								
6								
12								
24								
48								
72								

Table 4F.21 — Form 4-3: khawlna ngai leh siam

Line	Zat	Value
D1	V_100 (m³) leh duration thu nei ber	
D2	V_2 (m³) leh duration thu nei ber	
D3	V = D1 leh D2 zinga lian zawk (m³)	
D4	Khawlna siam (m³)	

E. Outlet, retention leh endikna dang (Clause 4.14.3, 4.14.6, 4.14.7)

Table 4F.22 — Form 4-3: outlet, retention leh endikna dang

Field	Ziah luh tur
E1. Low-flow orifice: diameter (mm) leh invert; V_2 khawlna a khat laia discharge (L/s), Q_cap,2 aia tam lo	
E2. Chunglam orifice emaw weir: lenzawng leh level; V chhipa luan chhuah tir zawng zawng (L/s), Q_cap,10 aia tam lo	
E3. V bakah Clause 4.4-a retention tui zat siam (m³); retention credit lak loh	
E4. Drawdown (Clause 4.7), trash rack (Clause 4.8), spillway (Clause 4.9): Form 4-1 Section G leh H reference	
E5. Luanna hnuailam leh tailwater endikna (Bung 5) leh tui ṭhatna (Bung 8): reference	

F. Puanchhuahna

Kei hian site hian Clause 4.14.3-a tlin theihna dan a tlin a, a chunga cap, khawlna leh outlet-te hi Clause 4.14.4 aṭanga 4.14.7 thleng hmangin chhut a ni tih ka puang e.

Table 4F.23 — Form 4-3: puanchhuahna

Field	Ziah luh tur
Hming	
Thiamna leh registration number	
Hmingziak	
Ni	

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

BUNG 5 BELHCHIAN

Luanna Hnuailam leh Tailwater Zirchianna

Heng belhchiante hian Bung 5 an ṭanpui. Belhchian 5C hi Clause 5.10-a outfall (drain tui luan chhuahna) khar endikna (outfall-closed check) chhut dan entirna a ni a, Belhchian 4C-a entirna facility tan a ni. Belhchian 5A leh 5B hian tidal, surge, survey leh luipui data, he draft-in a la neih loh, a mamawh a; belhchian tinin Bung 5-in a ruat sa a tarlang a, a ruangam tur a pe a, a tlangzarh hma chuan Bung 5-a interim dan hman tur a sawi. Form 5-1 leh 5-2 hi Clause 5.14-in a phut thehluh tur form an ni. Form-te hi draft form an ni a, dan anga dinhmun (statutory status) an nei lo.

Belhchian 5A — Tidal datum (MSL, MHWS, HAT, CD leh Survey of India datum nena khaikhin), surge allowance leh coastal segment (tuifinriat kam ṭhen) zela 1% still-water level

Bung 5-a Clause 5.7, 5.9, 5.10, 5.11 leh 5.12 a ṭanpui.

5A.1 Table 5A.1-in he belhchian value-te hi Table 5.1-a design tailwater (outfall hnuailama tui sang zawng) level-ah engtin nge an luh tih a lantir. Sea-level allowance chu Clause 5.7.4-in a ruat a, he belhchian hi a innghat lo.

Table 5A.1 — Design tailwater-a (Table 5.1) Belhchian 5A value hman dan

Design case	Tailwater	Belhchian 5A value hman	Bung value
Tui luanna system tenau (minor) design	MHWS + SLA	MHWS	SLA ≥ +0.3 m (Clause 5.7.4)
Tui luanna system lian (major) leh khawlna design	HAT + surge + SLA	HAT; 10% AEP surge (Clause 5.7.3(a))	SLA ≥ +0.3 m
Joint case (Clause 2.12(b))	1% AEP still-water level + SLA	1% AEP still-water level (Clause 5.7.3(b))	SLA ≥ +0.3 m
Datum inthlakna	Chart datum aṭanga project datum-ah	Chart datum aṭanga Survey of India datum thleng offset (Clause 5.7.2(b))	—

Mizoram tan buatsaih a ni lo. Mizoram hian tuifinriat kam a nei lo a, chuvangin State-a outfall pakhat mahin tidal tailwater a nei lo va, he belhchian hian Mizoram thu a keng lo (Clause 5.1.4). A table-te hi ruak takin vawn a ni, belhchian leh table number-te he Kaihhruaina Bu edition dangte nen an inmil nan. Form 5-1-a row F1 aṭanga F7 thleng chu "a huam lo" tiin ziah a ni a, tailwater chu row F8 aṭanga F10 thleng hnuaiah chhut chhuah a ni; lui-a outfall tan, row F10-ah Clause 5.8.5(a) emaw (b)-a study, tuilian chhinchhiahna (flood marks), bed survey leh lui inkawpna dawt thleng lui endikna chhinchhiah a ni a, Tuirial emaw Serlui B reservoir-a outfall tan, Clause 5.8.5(e)-a kalpuitu (operator) level-te leh an datum, emaw interim level chhinchhiah a ni.

Table 5A.2 — Coastal segment zela tidal datum, surge leh still-water level (layout)

Coastal segment	Reference port leh tide-table edition	MSL (m CD)	MHWS (m CD)	HAT (m CD)	CD aṭanga Survey of India datum (m)	10% AEP surge (m)	1% AEP still-water level (m CD)	Wave set-up (m), tuifinriat zau lam hawi outfall	Thu hnar

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Belhchian 5B — Major drain, luipui outfall lui chhung (riverine outfall reach) leh sand bar-in a khar theih luipui kuam; map

Bung 5-a Clause 5.2, 5.3, 5.8 leh 5.13 a ṭanpui.

5B.1 Table 5B.1-ah Bung 5-in a sawi sa tui awmna (water body)-te a tarlang. A kim lo: belhchian hian lui chhung tin zau zawng, State-a luipui dang, canal leh luipui kuam-te, leh map a belh ang.

Table 5B.1 — Bung 5-a tui awmna sawi lante

Tui awmna	Bial	Tarlan dan	Clause
Tlang chhip khawpui luite: Lunglei, Serchhip, Champhai, Kolasib, Siaha, Lawngtlai, Mamit, Khawzawl, Saitual, Hnahthial leh a dangte	State pum	Major drain; gauge nei lo, tuilian level tlangzarh a awm lo [TBC]; energy dissipation (tui chakna tihnemna) nena free outfall; bulking (leidip avanga tui pun) leh tihtawp (blockage) leh survey-a tuilian chhinchhiahna nena 1% AEP study; lui inkawpna dawt thleng lui endikna; survey-a bed sang zawng sang ber aia 0.5 m tal chunga outfall; khar (invert chu design level hnuaia a awm chuan) ruahpui leh a tui tlahniam hun (recession), darkar 24 aia tlem lo; tuikhur aṭanga 15 m chhungah emaw lung laihna (quarry) hmai-ah outfall a awm tur a ni lo	5.2, 5.8.1, 5.8.5
Chite lui (a lui pengte, leh Muthi leh Tuipawl lui nen) Tuirial thleng; Ser lui (Ramri, Tuikal, Vai leh Zawngkawt lui nen) Tlawng thleng	Aizawl	Major drain leh khawpui lui; gauge nei lo, tuilian level tlangzarh a awm lo [TBC]; MZ-B ruahtui tlak nena item (a) dan; Chite leh Tuikual lui chu CPCB Priority II leh Lawibual lui chu Priority III (Clause 8.9); master plan-ah check dam pariat rawt a ni, outfall level reng reng a tisang tur a ni lo	5.2, 5.8.1, 5.8.5
Sairang, Bairabi leh Keitum CWC site-a Tlawng (Dhaleswari)	Aizawl, Kolasib, Lunglei district	Luipui outfall lui chhung; Sairang (hydrograph a chhunzawm mek) leh Keitum-ah CWC level site, level sang ber chhut a awm lo [TBC]; warning emaw danger level a awm lo; model-a 1% AEP level leh survey-a tuilian chhinchhiahna (June 2018 leh a hnu lam); phai outfall-te flap gate nei, darkar 72 ruahpui pum khar, darkar 72 aia tlem lo; hmar lamah Barak phai lam a luang a, chutah ṭhenawm edition-in a thunun	5.8.1, 5.8.5
Champhai leh Zokhawthar-a Tiau; Champhai phai	Champhai district; Myanmar ramri	Luipui outfall lui chhung leh phai ram; CWC level site a awm lo; model level leh tuilian chhinchhiahna (June 2025 leh a hnu lam); khar darkar 72 aia tlem lo; ramri ral lam level a awm lo	5.8.1, 5.8.5
Chawngte-a Kau (Tuichawng); an CWC site-a Tuichang leh Tuichawng; Bailley Bridge-a Tuipui	Lawngtlai leh Lunglei district; Champhai district	Luipui outfall lui chhung; CWC level site, level sang ber chhut a awm lo [TBC]; model level leh tuilian chhinchhiahna; phai ram-ah khar darkar 72 aia tlem lo	5.8.1, 5.8.5

Tui awmna	Bial	Tarlan dan	Clause
Tlabung-a Khawthlangtuipui (Karnaphuli)	Lunglei district (MZ-D1)	Luipui outfall lui chhung; luipui tuilian khawpui (June 2017, June 2018, July 2019, August 2023, chanchin tlangzarh angin); CWC level site tarlan a awm lo; model leh survey-a tuilian chhinchhiahna aṭanga tuilian level-a luipui atan design; flap gate; khar darkar 72 aia tlem lo, tuilian chhinchhiahnain a rei zawk a lantir chuan a rei zawk; Bangladesh-ah a luang lut a, ramri ral lam level a awm lo	5.8.1, 5.8.5
NEEPCO Tuirial (Sonai) reservoir leh dam hnuaia Tuirial	Kolasib district	Reservoir outfall leh tui chhuah tirna lui chhung (release reach); FRL 90.5 m, MDDL 68.0 m, tailwater pangngai 30.7 m (CERC); NEEPCO-in MWL a pek hma chu tailwater 91.0 m (FRL + 0.5 m), datum [TBC]; CWC Turial gauge HFL (gauge-a tuilian sang ber) 149.0 m (June ni 17, 1995), reservoir level-te nena inzawm tir loh tur [TBC]; tui chhuah tir (release): chhinchhiah lian ber, a awm loh chuan spillway capacity, a awm loh chuan tihhniam loh 1% AEP inflow [TBC]; dam-break peak 3,035.34 m³/s (chanchin tlangzarh angin) chhinchhiah, design release a ni lo; NEEPCO remtihna	5.8.1, 5.8.3, 5.8.5
Serlui B reservoir leh dam hnuaia Serlui	Kolasib district	Reservoir outfall leh tui chhuah tirna lui chhung; FRL leh MWL hmuh a ni lo [TBC]; kalpuitu level ziaka pek, emaw survey-a tui kam ri emaw spillway crest + 0.5 m; tui chhuah tir chu Tuirial ang; State power department remtihna	5.8.1, 5.8.3, 5.8.5
CWC Sihthangpui site-a Chhimtuipui (Kaladan)	Lawngtlai district; Myanmar lam	Luipui outfall lui chhung; level sang ber chhut a awm lo [TBC]; ramri ral lam level a awm lo; luanna hnuailam hla takah model boundary, sensitivity run nen	5.8.1, 5.8.5
Tuivai leh State an chhuahsanna hmuna hmar lam luipuite	Hmar lam ramri	Luipui outfall lui chhung; a hnuailam lui chhung-te chu ṭhenawm Barak phai edition-in a thunun; a level-te hian model luanna hnuailam boundary chauh an khung	5.8.1, 5.8.5
Palak Dil (Pala wetland) leh Tam Dil	Siaha district (Mara Autonomous District Council area); Saitual bul	Dil outfall; level hmuh a ni lo [TBC]; tui liam chhuahna sang zawng (spill level) leh head; enkawltu (custodian) remtihna (a area-ah District Council remtihna pawh); bal, bawlhhlawh leh leidip dawnna; ek tui (sewage) luh tir loh; dil reng reng detention pond (ruahtui dah rihna dil siam) atan hman loh; Palak Dil hi Ramsar site (a RIS angin August ni 31, 2021-ah thlan; July ni 26, 2022-ah puangchhuak, chanchin tlangzarh angin)	5.8.5
Aizawl Municipal Corporation, Lunglei Municipal Council, Village Council, PWD, PHED leh national-highway agency-te drain, 1.0 m emaw a aia zau; Autonomous District Council area-a khaw drain leh luite	Mizoram	Major drain; neitu remtihna (municipal area chhungah Municipalities Act s.295-a Chairman phalna ziak leh s.296-a municipality remtihna; Corporation area-a State kawngah PWD leh Corporation pahnih remtihna), design tui sang zawng leh flap gate	5.2, 5.8.5
Tuirial leh Serlui B dam	Tuirial, Serlui	Luipui level-ah tui chhuah tir leh gate kalpui dan telh tur (tui chhuah tir record leh kalpui dan (operating rule) [TBC]); tui chhuah tir tak chhiar, hriattirna (notice) chhiar lo	5.8.3, 5.8.5
Sand bar-in a khar theih luipui kuam	Mizoram-ah a awm lo	A huam lo (Clause 5.1.4)	5.13.1

Buatsaih tur. He belhchian hian (a) basin plan tin major drain-te, (b) backwater model tur a nihna luipui outfall lui chhung-te, an chunglam leh hnuailam tawpna leh an design tuilian level hnar nen, leh (c) hun bik-a sand bar-in a khar theih luipui kuam leh creek luhna-te, fûr hma (pre-monsoon) bar crest level thar ber leh IWRD kuam enkawlna programme (mouth-maintenance programme) a awm chuan, a tarlang ang a, map-ah a lantir ang. Heng hi a mamawh: IWRD luipui leh canal record, design leh chhinchhiah tuilian level, reservoir kalpui dan (operating rule), kuam dinhmun, dredging leh bar-cutting record leh fûr hma bar survey (IWRD), Aizawl Municipal Corporation leh local body dangte drain inventory, basin ruahtui luanna master plan (Bung 11), leh Survey of India leh NRSC base map. A tlangzarh hma chuan: luipui zawng zawng, IWRD canal, Aizawl chhak lam kal tlang Chite lui leh a lui pengte leh Aizawl thlang lam kal tlang Ser lui leh a lui tê-te, Lunglei leh tlang chhip khawpui dangte luite, Sairang, Bairabi, Vairengte, Tlabung, Chawngte phai emaw Champhai phai-a flap gate kal tlanga luang chhuak drain zawng zawng, Aizawl Municipal Corporation, Lunglei Municipal Council, Village Council, District Council, PWD, PHED emaw national-highway agency-in a sak emaw a neih drain, a chhung zau zawng 1.0 m emaw a aia zau, leh catchment (ruahtui luan khawmna hmun) 8 ha emaw a aia tam nei lui emaw channel pangngai dang zawng zawng leh tidal creek zawng zawng chu major drain a ni (Clause 5.2); Table 5B.1-a tui awmna-te chu luipui outfall lui chhung an ni (Clause 5.8.1); leh coastal State-te luipui kuam (Mizoram-ah a awm lo) chu IWRD-in a dang a finfiah (certify) loh chuan fûr ṭan lai-ah khar niin ngaih a ni (Clause 5.13.2).

Table 5B.2 — Belhchian 5B layer-te attribute (layout)

Field	A chhunga thu	Unit emaw format
feature_id	Identifier danglam (unique)	text
name	Drain, luipui, canal, creek emaw kuam hming	text
category	Major drain; luipui outfall lui chhung; sand bar-in a khar theih kuam	text
clause	A tarlanna Bung 5 Clause	text
reach_limits	Lui chhung chunglam leh hnuailam tawpna	text
design_flood_level_source	IWRD design emaw chhinchhiah tuilian level sang ber, emaw hydraulic model (Clause 5.8.2)	text
reservoir_release	Chunglam reservoir emaw dil (tank) leh a kalpui dan, a awm chuan (Clause 5.8.3)	text
bar_crest_level	Kuam tan, fûr hma bar crest level thar ber	m (Survey of India datum)
mouth_programme	IWRD kuam enkawlna programme leh certification (Clause 5.13.2)	text
source	Thu hnar agency leh ni	text
geometry	Line (drain leh lui chhung) emaw point (kuam)	line / point

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Belhchian 5C — Chhut dan entirna: Lunglei khawpui-a tlang pang khua (hillside colony), tlang lui (lui)-a luang, outfall khar endikna

Bung 5-a Clause 5.9, 5.10, 5.11 leh 5.12 leh Bung 4-a Clause 4.6.6 a ṭanpui.

Entirna chauh — design value a ni lo. He entirna hian Clause 5.10-a outfall khar endikna chu Belhchian 4C-a detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) facility siam ṭhat-ah a hmang. Site, a level-te leh a drain (tui luanna) dawngtu hi kalphung lantir nan siam chawp a ni. Tidal level hman a ni lo: tide hi Table 5C.1-a entirna thusawi, drain dawngtu chu site outlet (luan chhuahna) aia a sang emaw a hniam tih chungchang chauhvah a lut.

Input-te

5C.1 Site hi Belhchian 4C-a tuilian hlauhawm (flood-sensitive) site 2.0 ha, Lunglei khawpui-a tlang pang khua (Clause 4.5.3.2-a tuilian hlauhawm catchment (i)) a ni. A outlet chamber ngei leh flap gate kal tlangin public storm drain-ah a luang a, chu drain chu lined chute zawhin tlang lui (lui)-ah a luang chhuk a, chu lui tui sang zawng chu ruahpuiah lui a khat huna drain outlet chung thlengin a chhuang a, ruahpui leh a tui tlahniam hun chhung zawng a sang reng a, chuvangin Clause 5.10.1 hi facility-ah a hman. Kalphung lantir nan, he entirna hian Clause 5.10.3-a darkar 6 khar hun (lock window) pahnih a hmang, he Kaihhruaina Bu coastal edition-te angin. Mizoram-ah, lui-a outfall a invert chu a design level hnuaia a awm chuan design ruahpui leh lui tui tlahniam hun chhung, darkar 24 aia tlem lovin khar a ni a, darkar 48 leh 72 ruahpui run a nih chuan ruahpui pum chhung khar a ni; a luipui design level hnuaia phai ram-a outfall chu darkar 72 ruahpui pum chhung, darkar 72 aia tlem lovin khar a ni; Tlabung-a outfall chu darkar 72 aia tlem lovin khar a ni a, Khawthlangtuipui chu rei zawk a ding reng tih tuilian chhinchhiahnain a lantir chuan a rei zawk; Tuirial emaw Serlui B dam hnuaia tui chhuah tirna lui chhung-a outfall chu darkar 72 aia tlem lovin khar a ni; leh reservoir pahnih zinga pakhat design level hnuaia outfall chu ruahpui pum chhung khar a ni, Clause 5.8.5 hnuaiah. Hetah hman khar hun aia rei zawk a nih case tinah, facility chuan khar rei zawk chhunga tui zat chu, ruahpui tui zat pum thlengin, a khawl emaw a pump emaw ngei ngei tur a ni (Clause 5.9.4); chu chuan he entirna lantir aia khawlna tam zawk emaw pump a mamawh. Routing, Clause 5.10.4-a tui zat inmilna (volume balance) leh enfiahna chu a inang. Public drain-in lui-a a outfall ngei pawhin energy dissipator (tui chakna tihnemna), lui inkawpna dawt thleng lui endikna leh Clause 5.8.5(a)-a bed che zawng chung lama invert, leh Clause 6.3.6-a debris rack (bal dangna) leh bulking factor a mamawh bawk ang; leh Lunglei tlang pang-ah, lei pangngai 10° aia chhoh nasa zawk emaw Surma-group shale-ah tlang pang eng ang pawhin, facility ngei chu lined tank a ni ang a, infiltrating basin a ni lo vang, a tui liam (overflow) chu lined drain-ah a kal ang a, tlang pang-ah engtikah mah a kal lo vang (Clause 4.11 (tlang dan)).

Table 5C.1 — Input-te (Entirna chauh — design value a ni lo)

Thil	Value	Innghahna
Facility	Belhchian 4C-a facility siam ṭhat: plan area 2,500 m², bang ding; floor-ah orifice (tui chhuahna khur tê) 170 mm; orifice 460 mm, invert 0.53 m	Belhchian 4C, Table 4C.14
Ruahpui	1% AEP, darkar 48, ni hnuhnung berah peak, AMC III; darkar 72 pawh run a ni	Clause 5.10.2
Inflow	Belhchian 4C-a post-development 1% AEP hydrograph (hun hrang hranga tui luang zat) (darkar 48: 8,420 m³; darkar 72: 9,468 m³)	Belhchian 4C
Inzawmna, J1, J2 leh J3-a drain dawngtu level	Site outlet invert hnuaiah (drain neitu model aṭanga)	Entirna input
Khar hun tin chhunga drain dawngtu	Site outlet invert chung thlengin a ding kir a, chuvangin site-in tui a luan chhuah thei lo	Entirna input; Clause 5.10.3(b)
Site outlet-a flap gate	Outlet chamber-a orifice invert-te aia 0.15 m hniamin dah, khar hun pawn lamah a hawn head leh head loss-in orifice control a nghawng loh nan	Entirna input; certified curve aṭanga nemnghet tur (Clause 5.11.2)
Khar hun	Darkar 6 zel pahnih, ṭanna inkar darkar 12.4 (semi-diurnal tide)	Clause 5.10.3(a)
Pump	Awm lo	—

5C.2 **Table 5.2-a case-te.** Drain dawngtu chu J1, J2 leh J3-ah site outlet hnuaiah a awm reng avangin (Table 5C.1), chung case-te chuan Belhchian 4C-a free-outfall result an pe: J2-ah 1% AEP tui sang zawng sang ber chu **1.17 m** (2,913 m³) a ni a, J3 (10% AEP, darkar 48)-ah 0.77 m a ni. R1 leh R2 hi a huam lo, site hi luipui-ah a luan loh avangin. J4, outfall khar endikna, chu a hnuaiah chhut a ni.

Khar hun (Clause 5.10.3)

5C.3 Darkar 48 ruahpui darkar 24 hnuhnung ber chhunga darkar 1 block sang ber chu 35:35–36:35 h a ni a, 98.2 mm a ni (Table 4C.2-a darkar 1 zat). Run pahnih siam a ni:

- **Run A:** khar hun hmasa chu block laiah dah a ni: 33:05–39:05 h; a pahnihna chu darkar 12.4 hnuah a ṭan: 45:29–51:29 h.
- **Run B:** khar hun hmasa chu block-ah a ṭan: 35:35–41:35 h; a pahnihna: 47:59–53:59 h.

Darkar 72 ruahpui tan, hun zawng zawng hi darkar 24 hnu lam a ni.

5C.4 Khar hun tin chhungah gravity luan chhuah chu zero a ni. Khar hun pawn lamah outlet chuan Table 4C.10-a orifice-te kal tlangin a luan chhuak. Routing hi Belhchian 4C-a level-pool routing ang chiah a ni.

A chhuah

Table 5C.2 — Outfall khar endikna result (Entirna chauh — design value a ni lo)

Ruahpui	Run	Khar hun (h:min)	Stage sang ber (m)	Khawlna sang ber (m³)	Sang ber hun (h:min)	Khar hun hnua luan chhuah lian ber (L/s)
1% AEP, darkar 48	A	33:05–39:05; 45:29–51:29	2.01	5,019	39:05	566
1% AEP, darkar 48	B	35:35–41:35; 47:59–53:59	**2.10**	**5,238**	41:35	584
1% AEP, darkar 72	A	57:05–63:05; 69:29–75:29	2.00	5,012	63:05	565
1% AEP, darkar 72	B	59:35–65:35; 71:59–77:59	2.09	5,233	65:35	584

Darkar 48 ruahpui Run B chuan a thunun. Khar hun hmasa chuan ruahpui peak a lo thlen lai takin outlet a khar a, chuvangin peak pum chu khawl a ni. Khar hun pahnihna chu facility tui 0.7 m vel, Stage 2 orifice hnuai thlenga a hniam tawh hunah a thleng a, a belh tam lo.

5C.5 **Tui zat inmilna (Clause 5.10.4).** Table 5C.3-in Run B tan inmilna a pe. Hun ṭhen tina outflow chu continuity hmangin hmuh a ni: outflow = ṭanna khawlna + inflow − tawpna khawlna.

Table 5C.3 — Tui zat inmilna, 1% AEP darkar 48 ruahpui, Run B (Entirna chauh — design value a ni lo)

Hun ṭhen (h:min)	Inflow (m³)	Gravity outflow (m³)	Pump (m³)	Ṭanna khawlna (m³)	Tawpna khawlna (m³)
0:00–35:35, khar hun 1 hma	3,817	2,213	0	0	1,604
35:35–41:35, khar hun 1	3,634	0	0	1,604	5,238
41:35–47:59, khar hun inkar	941	4,423	0	5,238	1,756
47:59–53:59, khar hun 2	28	0	0	1,756	1,784
53:59 hnu	0	1,784	0	1,784	0
A vaiin	8,420	8,420	0	—	—

Khar hun 1 endikna: V_inflow = 3,634 m³ ≤ V_storage available + V_pumped + V_gravity = (5,238 − 1,604) + 0 + 0 = 3,634 m³. Chuvangin facility hian khawlna **5,238 m³** a mamawh a, routing-in a nemnghet.

Table 5C.4 — Stage hydrograph, 1% AEP darkar 48 ruahpui, Run B (Entirna chauh — design value a ni lo)

Hun (h)	Inflow (L/s)	Outlet	Outflow (L/s)	Stage (m)	Khawlna (m³)
24	20	Hawng	18	0.18	445
28	39	Hawng	24	0.25	621
32	59	Hawng	32	0.36	906
34	85	Hawng	37	0.47	1,166
36	286	Khar	0	0.78	1,944
38	106	Khar	0	1.73	4,321
40	66	Khar	0	1.96	4,904
42	51	Hawng	529	1.79	4,472
44	42	Hawng	204	0.87	2,181
46	37	Hawng	49	0.74	1,854
48	33	Hawng	47	0.70	1,756
50	0	Khar	0	0.71	1,784
54	0	Khar	0	0.71	1,784
56	0	Hawng	43	0.58	1,459
60	0	Hawng	32	0.37	921
66	0	Hawng	16	0.16	397
72	0	Hawng	7	0.06	162

Enfiahna

5C.6 **Clause 5.10.4(a).** Belhchian 4C-a facility chu J2-ah 1.17 m a thleng a, a spillway crest chu 1.35 m-ah a awm (Belhchian 4C). Outfall khar endikna-ah stage chu 2.10 m a thleng a, chuvangin spillway a hna thawk ang. **Belhchian 4C-a facility hian endikna a tlin lo.**

5C.7 **Siam ṭhatna (remedy).** Pump (Clause 5.12) hian hetah a ṭanpui lo: khar hun chhungin drain dawngtu ngei a khar a, chutah pump luh chuan a level a tisang ang a, chu chu Clause 5.12.3-in a phal lo. Siam ṭhatna chu khawlna tam zawk a ni. Plan area 2,500 m² leh Belhchian 4C-a outlet-te vawng rengin:

- facility chuan 5,238 m³, stage **2.10 m** thleng, a khawl ngei ngei tur a ni;
- spillway crest chu chu stage chungah, Clause 4.9.3-in a rawt 0.15 m inhlat nen dah a ni: **2.25 m**;
- Belhchian 4C-a 4.0 m spillway (head 0.30 m) nen, spillway a luan laia level sang ber chu 2.55 m a ni a, freeboard (tui sang ber chunga zau dah) 0.3 m nen bang chhip chu floor aṭangin **2.85 m** tal a ni.

Chuvangin outfall khar endikna hian khawlna a thunun: 5,238 m³, luan chhuah tir zat (release rate) endikna aṭanga 2,913 m³ nen khaikhin chuan 80% vel a tam zawk. Plan area lian zawk chuan facility a tithuk lo ang; chutichuan outlet, cap-te leh drawdown chu endik leh ngei ngei tur a ni ang, stage–discharge inzawmna a danglam avangin.

5C.8 **Khar hnua luan chhuah tir.** Khar hun hmasa a tawp hunah, khawl tui chu head 2 m vel hnuaiah, 584 L/s thlengin luan chhuah tir a ni. Hei hi kum 100 cap 356 L/s aia sang a ni. Clause 5.10.4 hian hei hi a phal a, luan chhuah tir hi drain hawn thar leh tawh-ah a thlen avangin, leh luanna hnuailam zirchianna J4 run-ah (Clause 5.4 leh 5.9) telh leh Form 5-1, Section H-ah report a phut.

5C.9 **Ruahpui hnua drawdown (Clause 5.10.5).** J1 tidal curve chu site outlet hnuaiah a awm reng a (Table 5C.1), chuvangin Belhchian 4C-a drawdown a hman: kum 10 khawlna 90% tan darkar 45.3, low-flow orifice 50% tihtawp nen, Clause 4.7-a darkar 48 chin chhungah. Run B-ah, J4 khawlna sang ber 90% chu sang ber hnu darkar 22.6-ah luan chhuah a ni.

5C.10 **Mamawh dangte.**

- Site outlet-a flap gate chu kum tin March ni 31 hmain leh ruahpui tui luang laka a khar hnu tinin endik leh kalpui a ni (Clause 5.11.5).
- Facility thuk zawk chu design leihnuai tui sang zawng-a leihnuai tui (groundwater) nen flotation endik a ni; Tlawng, Tuirial leh Khawthlangtuipui phai leh lui kam zawl (river terrace)-ah (Sairang, Bairabi, Vairengte leh Tlabung-ah), Champhai phai, dil leh reservoir kam, leh piezometer chhiar nei lo tlang panga tuikhur (spring) hnuaia tui chiar hmun (seepage zone)-ah chuan chu level chu lei sang zawng awm mek a ni (Clause 4.12.1 leh 4.12.3).
- Belhchian 4C-a fence leh sign-te hi facility thuk zawkah a hman (Clause 4.15).

Table 5C.5 — A tlangpui (Entirna chauh — design value a ni lo)

Thil	Value
Thunun case	J4, 1% AEP darkar 48 ruahpui, Run B (darkar 1 block sang ber-a ṭan khar hun hmasa)
Khawlna mamawh	5,238 m³ (Belhchian 4C luan chhuah tir zat design: 2,913 m³)
Stage sang ber	2.10 m, plan area 2,500 m² nen
Spillway crest	2.25 m
Bang chhip	Floor aṭangin ≥ 2.85 m
Khar hun hnua luan chhuah lian ber	584 L/s, luanna hnuailam J4 run-ah telh tur
Drawdown	Belhchian 4C result a hman: darkar 45.3, low-flow orifice 50% tihtawp nen

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Form 5-1 — Luanna Hnuailam leh Tailwater Report

Bung 5-a Clause 5.3 aṭanga 5.14 thleng a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Project tin tan report pakhat. Site 0.5 ha aia tê, Clause 5.3.4 tlin chuan, Authority (phalna petu Authority)-in a lo pawm chuan, a aiah Form 5-2 an thehlut thei. Plan, model file leh hydrograph sawi lante belh rawh.

A. Project

Table 5F.1 — Form 5-1: project

Field	Ziah luh tur
A1. Project hming, dilna thehluhtu (applicant) leh hmun	
A2. Project chi: Bung 4 hnuaia site; Bung 6 hnuaia drainage project; regional detention emaw dil (tank) siam ṭhatna (Clause 5.1.2)	
A3. Site emaw project zau zawng (ha) leh outfall-te	
A4. Site Ruahtui Luang Thunun Report reference (Form 4-1), a kaihhnawih chuan	

B. Zirchianna huam chin (Clause 5.3; Clause 5.14, item 1)

Table 5F.2 — Form 5-1: zirchianna hmun

Hmun	Awmna	Chi (Clause 5.3.3 (a) aṭanga (e) thleng)	Ruahtui luang lut catchment (ha)	Project zau zawng, a %

Table 5F.3 — Form 5-1: tawpna hmun

Field	Ziah luh tur
B1. Tawpna hmun leh a chhan: 10% hmun, tank emaw dil, emaw major drain emaw tuifinriat (Clause 5.3.1 (a) aṭanga (c) thleng)	
B2. Tawpna hmun chu tank emaw dil a nih chuan: tui sang zawng sang ber (m) leh surplus-weir luan chhuah (m^3/s) danglamna; level a san chuan weir hnuaia chhunzawm (Clause 5.3.2)	
B3. Zirchianna huam chin plan, site, hmun tin a ruahtui luang lut zau zawng leh percentage nen, leh tawpna hmun lantirin (belh rawh)	

C. Model (Clause 5.4.4; Clause 5.14, item 2)

Table 5F.4 — Form 5-1: model

Field	Ziah luh tur
C1. Software leh version; hydrologic leh hydraulic kalphung (Clause 5.4.4)	
C2. Network schematic, drain leh crossing-te survey hnar nen (belh rawh)	
C3. Site pawn hmun ram hman dan (land use) leh CN (ram hman dan awm mek)	
C4. Chunglam detention telh, a sak, a enkawl leh thuziaka a chhinchhiah a nihna finfiahna nen	
C5. Calibration emaw validation finfiahna, a awm chuan	
C6. Scenario run: awm mek, project nen, leh Authority-in a phut chuan hmalam (Clause 5.4.1)	
C7. Ruahpui run: AEP leh duration, AMC leh areal reduction (Clause 5.4.3)	

D. Zirchianna hmun tina result (Clause 5.4.2; Clause 5.14, item 3)

Zirchianna hmun, AEP leh duration tin tan row pakhat ziah kim rawh. E = awm mek; P = project nen.

Table 5F.5 — Form 5-1: zirchianna hmun zela result

Hmun	AEP	Duration (h)	Peak flow E / P (m³/s)	Peak thlen hun E / P (h)	Tui sang zawng sang ber E / P (m)	Peak velocity E / P (m/s)	Tui chim rei zawng E / P (h)

E. Lo pawmna (Clause 5.5; Clause 5.14, item 4)

Table 5F.6 — Form 5-1: lo pawm theihna tehna

Tehna (criterion)	Hmun tinah a tling em?	A tlin lohnaah, siam ṭhatna hman (Clause 5.5.3)
E1. Building, kawngka hniam ber leh carriageway-ah 1% AEP tui sang zawng pun ≤ 10 mm (Clause 5.5.1(a))		
E2. Building thar tuilianin a chim lo; building emaw kawng thar Bung 6 chin tlin lo a awm lo (Clause 5.5.1(b))		
E3. Element tin tui luanna system tenau AEP-ah emaw 1% AEP-ah peak flow chu awm mek aia sang lo (Clause 5.5.1(c))		
E4. Lined channel-a velocity chu lining chin chhungah, 3.0 m/s sang ber (Clause 5.5.1(d))		
E5. Unlined channel-a velocity, 50% leh 10% AEP, 10% aia tam pun lo (Clause 5.5.1(e))		
E6. Arterial emaw emergency route-a kawng kal theih loh rei zawng danglamna (Clause 5.5.2)		
E7. Hun chungchang exception ngen em (Clause 5.5.4)? Condition tlin sawi rawh		

F. Tailwater chhut chhuahna (Clause 5.6 aṭanga 5.8 thleng; Clause 5.14, item 5)

Table 5F.7 — Form 5-1: tailwater chhut chhuahna

Field	Ziah luh tur
F1. Tide-table edition leh port, emaw port authority thu hnar (Clause 5.7.2(a))	
F2. MHWS, HAT leh MSL (chart datum chunga m)	
F3. Chart datum aṭanga Survey of India benchmark leh project datum inzawmna: offset (m) leh thu hnar (Clause 5.7.2(b))	
F4. Estuary, creek emaw canal outfall: level hman leh open-coast level kalsanna finfiahna reng reng (Clause 5.7.2(c))	
F5. 10% AEP surge leh 1% AEP still-water level: value, thu hnar, kalphung leh record rei zawng (Clause 5.7.3)	
F6. Wave set-up, tuifinriat zau lam hawi outfall tan (Clause 5.7.3(d))	
F7. SLA (m), +0.3 m tal; design life; design life kum 50 aia rei tan SLA let hnih-a sensitivity run (Clause 5.7.4)	
F8. Non-tidal tailwater: tui dawngtu system level leh thu hnar (Clause 5.6.2, 5.6.3)	
F9. Luipui level leh thu hnar; reservoir emaw dil (tank) tui chhuah tir telh (Clause 5.8.2, 5.8.3)	
F10. Lui, phai luipui, Tlabung, reservoir leh tui chhuah tirna lui chhung, dil, ramri kal tlang luipui, leh pawl dangte drain: lui tan (Clause 5.8.5(a) leh (b)), sub-area tana Clause 2.3.6-a ruahtui tlak (Aizawl tan MZ-B) hmanga 1% AEP study, AMC, Clause 6.3.6-a bulking leh tihtawp, luah hnehna (encroachment), leidip, leimin bal (slide debris) leh bawlhhlawh paih hnua survey-a channel, survey-a tuilian chhinchhiahna leh an thu hnar, energy dissipator leh lui thlenga lined kawng, lui inkawpna dawt thleng lui endikna (bulking nena capacity, velocity, kam nghehna) leh a result, outfall leh lui chhung leimin hlauhawm map class, bed survey leh bed che zawng, survey-a bed sang zawng sang ber aia 0.5 m tal chunga invert, foundation scour thuk zawng, tuikhur aṭanga 15 m chhungah, a catchment humhalh-ah emaw lung laihna hmai-ah outfall a awm lohna nemnghetna, model-a check dam emaw dawnna (trap) telh reng reng, leh invert chu design level hnuaia a awm chuan khar (ruahpui leh a tui tlahniam hun, darkar 24 aia tlem lo); phai ram tan (Clause 5.8.5(c)), CWC, NEEPCO emaw State gauge a awmnaah calibrate site study nena model aṭanga 1% AEP luipui level, gauge hnai ber (Sairang, Keitum, Turial 149.0 m, Bailley Bridge Tuipui, Tuichang, Tuichawng, Sihthangpui) tan CWC aṭanga level hmuh reng reng outfall-a hlan, survey-a tuilian chhinchhiahna leh an thu hnar, level tin a datum leh gauge sawi leh Survey of India benchmark nena a inzawmna nen; 10% AEP luipui level (warning emaw danger level a awm lo: frequency analysis lo pawm a nih hma chu design luipui level); flap gate, drain register aṭanga a neitu, sill leh khar level; gate hnunga drain chu a catchment pum, tlang catchment-te telin, leh khawlna awm mek nen route, pump awm a nihna nemnghet (pump nghet chauh, installed capacity aṭanga pump lian ber paih aia tam lo), design luipui level-ah pump hman theih; darkar 72 ruahpui pum khar vawi khat, darkar 72 aia tlem lo, emaw model emaw stage record aṭanga a rei zawk, leh a thu hnar; gate hawng renga tang endik; Tlabung tan (Clause 5.8.5(d)), Khawthlangtuipui model, June 2017, July 2019, August 2023 emaw a hnu lama tuilian chhinchhiahna leh chenna mite chhinchhiah, luanna hnuailam boundary leh a sensitivity run, leh khar (darkar 72 aia tlem lo, tuilian chhinchhiahnain a lantir chuan a rei zawk); Tuirial emaw Serlui B reservoir tan (Clause 5.8.5(e)), kalpuitu remtihna, a MWL emaw FRL leh design-flood surcharge (tui khat luat a nek chhuahna) ziaka a datum nen, emaw interim level (Tuirial 91.0 m, FRL 90.5 m + 0.5 m; Serlui B survey-a tui kam ri emaw spillway crest + 0.5 m), Turial gauge level chhinchhiah, reservoir level nen inzawm tir lovin, tailwater hnuaia outfall chu darkar 72 ruahpui pum chhung khar anga ngaih, reservoir FRL-a ṭan, leh gate kalpui, drawdown, tui chhuah tir hriattirna emaw reservoir attenuation reng reng chhiar lohna; tui chhuah tirna lui chhung tan, design ruahpui leh darkar 72 ruahpui, tui chhuah tir chhinchhiah lian ber, emaw spillway capacity, emaw kalpuitu-in pakhat a pek hma chu tihhniam loh 1% AEP inflow nen, ruahpui hma, a laiah leh a hnuah dah, leh Tuirial dam hnuaia dam-break peak 3,035.34 m³/s report leh outfall chu a tui chim zau zawngah a awm em tih; dil tan, enkawltu remtihna (a area-ah District Council remtihna pawh), survey-a tui liam chhuahna sang zawng leh head, leh a hmaa bal, bawlhhlawh leh leidip dawnna; State chhuahsan luipui tan (Clause 5.8.5(f)), model boundary leh a sensitivity run, leh hmar lam luipuite tan ṭhenawm edition level chu model luanna hnuailam boundary atan chauh hman; neitu remtihna (Municipalities Act s.295 hnuaia Chairman phalna ziak leh s.296 hnuaia municipality remtihna; Corporation area-a State kawngah PWD leh Corporation pahnih; national-highway agency; Village Council; a area-ah District Council), luan chhuah phal zat, design tui sang zawng emaw channel level chhut, leh flap gate; leh ri endik (SD&SM reg. 28 riverine reserve; Mizo District (Forest) Act, 1955 hnuaia riverine reserve leh April 2021 khapna reng reng EF&CC nena nemnghet; master plan-a 15 m buffer; River Conservation Zone reng reng, Rivers dan hman mek a nih leh zone notify (Gazette-a tarlan) a nih chauhin; AMCBR reg. 33-a 15 m) (Clause 5.8.5)	

G. Joint case (Clause 5.9; Clause 5.14, item 6)

Table 5F.8 — Form 5-1: joint-case result

Case	Ruahtui tlak	Tailwater hman (m, project datum)	A kaihhnawih em?	Thunun result (khawlna, level, pipe size emaw pump capacity)
J1				
J2				
J3				
J4				
R1				
R2				

H. Outfall khar endikna (Clause 5.10; Clause 5.14, item 7)

Table 5F.9 — Form 5-1: outfall khar endikna

Field	Ziah luh tur
H1. Endikna a kaihhnawih chhan (Clause 5.10.1)	
H2. Ruahpui: AEP, darkar 48 leh darkar 72, AMC III (Clause 5.10.2)	
H3. Khar rei zawng leh a innghahna: darkar 6 khar hun pahnih default, emaw site study (Clause 5.10.6); sand bar khar avanga tihrei (Clause 5.13.5)	
H4. Run pahnih khar hun (ṭan leh tawp hun) (Clause 5.10.3(d))	
H5. Facility tina stage sang ber, a 1% AEP tui sang zawng sang ber nen khaikhin (Clause 5.10.4(a))	
H6. Tui luanna system tenau leh lian-a stage sang ber, Bung 6 chin nen khaikhin (Clause 5.10.4(b))	
H7. In inzawmna (property connection): surcharge level, emaw non-return valve bun (Clause 5.10.4(c))	
H8. Stage hydrograph (belh rawh)	
H9. J1 tidal curve hnuaia ruahpui hnua drawdown, leh a ngaiah pump (Clause 5.10.5)	

Table 5F.10 — Form 5-1: khar hun tin tan tui zat inmilna (Clause 5.10.4)

Hun ṭhen	Inflow (m³)	Gravity outflow (m³)	Pump (m³)	Ṭanna khawlna (m³)	Tawpna khawlna (m³)
Khar hun 1 hma					
Khar hun 1					
Khar hun inkar					
Khar hun 2					
Khar hun 2 hnu					

I. Gate leh valve (Clause 5.11; Clause 5.14, item 8)

Table 5F.11 — Form 5-1: flap gate, tide gate leh non-return valve tarlanna

Awmna	Chi	Size (mm)	Invert (m, project datum)	Certified head–discharge data (reference)	Stop-log emaw penstock (outfall > 600 mm)

J. Pump hmang outfall (Clause 5.12; Clause 5.14, item 9)

Table 5F.12 — Form 5-1: pump hmang outfall

Field	Ziah luh tur
J1. Pump a mamawh chhan (Clause 5.12.1)	
J2. J2 tailwater static head-a duty capacity (m³/s); standby capacity (Clause 5.12.2)	
J3. Tui dawngtu level-a a nghawng dan (Clause 5.12.3)	
J4. Power supply: supply inzawm lo pahnih, emaw darkar 72 fuel nena standby generation; amah ngeia inthlak (automatic changeover) (Clause 5.12.4)	
J5. Electrical panel, control, generator leh fuel level, 1% AEP tuilian level + 0.5 m leh HAT + surge + SLA + 0.5 m zinga a sang zawk nen khaikhin (Clause 5.12.5)	
J6. Luan chhuah tir dan (Clause 5.12.6); control, alarm leh logging (Clause 5.12.7); screen (Clause 5.12.8)	

K. Sand bar (Clause 5.13; Clause 5.14, item 10)

Table 5F.13 — Form 5-1: sand bar ngaihdan (assumption)

Field	Ziah luh tur
K1. Luipui kuam emaw creek luhna chungchang	
K2. Kuam khar niin ngaih, emaw IWRD certification belh nena hawng (Clause 5.13.2)	
K3. Fûr hma survey thar ber aṭanga bar crest level (m) leh kuam khar tailwater (Clause 5.13.3)	
K4. Khar rei zawng tihrei, a ngaiah (Clause 5.13.5)	

L. Endikna leh enkawlna (Clause 5.14, item 11)

Table 5F.14 — Form 5-1: endikna leh enkawlna

Field	Ziah luh tur
L1. March ni 31 hma leh khar hnu tina gate leh valve endikna (Clause 5.11.5)	
L2. March ni 31 hmaa pump test run (Clause 5.12.9)	
L3. Enkawlna plan tana mamawh dangte (Bung 10)	

M. Registered professional puanchhuahna (Clause 10.6)

Kei hian he report hi Mizoram Ruahtui Luanna Design Kaihhruaina Bu (Draft v1.0) Bung 5 hnuaiah buatsaih a ni a, result report-te hi model thehluhte hian an siam chhuak leh thei a, Bung 5 kalsanna tin hi a chhan nen tarlan a ni tih ka puang e. Professional Design Certificate (Form 10-3) belh a ni.

Table 5F.15 — Form 5-1: registered professional puanchhuahna

Field	Ziah luh tur
Hming	
Thiamna leh registration number	
Empanelment number, Clause 10.6.1-in a phut chuan	
Hnathawhna pawl (organisation)	
Hmingziak	
Ni	

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

Form 5-2 — Luanna Hnuailam Thusawi Tawi (site tê tan)

Bung 5-a Clause 5.3.4 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Site 0.5 ha aia tê tan. Section B-a chhanna zawng zawng hi "Aw" a nih chauhin Authority-in he thusawi hi zirchianna kim aiah a lo pawm thei. A nih loh chuan Form 5-1 thehlut rawh.

A. Site

Table 5F.16 — Form 5-2: site

Field	Ziah luh tur
A1. Project hming, dilna thehluhtu leh hmun	
A2. Site zau zawng (ha), 0.5 ha aia tê	
A3. Public drain dawngtu: hming emaw reference, chi leh size	
A4. Site Ruahtui Luang Thunun Report reference (Form 4-1)	

B. Condition-te (Clause 5.3.4)

Table 5F.17 — Form 5-2: condition-te

Condition	Aw / Aih	Finfiahna
B1. Public drain dawngtu hian a tui luanna system tenau design flow (Bung 6) tan capacity thuziaka chhinchhiah a nei		
B2. Site outfall luanna hnuailam 500 m chhungah tuilian awm ṭhinna hmun chhinchhiah a awm lo. Record endik: local body, Aizawl Municipal Corporation, MSDMA, IWRD (Clause 5.3.3(d))		
B3. Site hi tidal emaw backwater nghawng outfall-ah a luang lo		

C. Luanna kawng plan

Table 5F.18 — Form 5-2: thil belh

Thil belh	Belh em?
C1. Site outfall aṭanga luanna hnuailam 500 m thleng tui luanna kawng plan, drain dawngtu leh tuilian awm ṭhinna hmun chhinchhiah reng reng nen	
C2. Drain capacity record copy emaw reference	

D. Puanchhuahna

Kei hian site hian a chunga lantir angin Clause 5.3.4 condition-te a tlin a, record tarlante hi endik a ni tih ka puang e.

Table 5F.19 — Form 5-2: puanchhuahna

Field	Ziah luh tur
Hming	
Thiamna leh registration number	
Hmingziak	
Ni	

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

BUNG 6 BELHCHIAN

Tui Luanna System Tenau leh Lian

Heng belhchiante hian Bung 6 an ṭanpui. Belhchian 6A (standard inlet (luan lutna) leh an theihna curve) leh Belhchian 6B (sediment yield) hian test leh survey data, tuna la awm lo, an mamawh a; belhchian tinin a chhunga awm tur leh a tlangzarh hma chhunga interim dan hman tur a tarlang. Belhchian 6C-in standard drawing, Bung 6 leh Bung 9-in an ruat tawh lenzawng chauh keng, a pe; lenzawng dang zawng zawng chu "design-ah finfiah tur" ("to be confirmed in design") tia chhinchhiah a ni. Form 6-1 hi draft form a ni: Clause 6.15-in a phut a tarlang a, engmah a belh lo.

Belhchian 6A — Mizoram tana standard inlet chi, theihna curve nen (grade chungah leh sag-ah)

Bung 6-a Clause 6.6.1 aṭanga 6.6.7 thleng leh Bung 9-a Clause 9.11 a ṭanpui.

Buatsaih tur. He belhchian hian Mizoram kawngpui tana standard inlet chi tlem tê list (kerb-opening, grate leh combination inlet, drain (tui luanna) khuh-a kawng level-a bang kawngka inlet tiamin), leh chi tin tan grade chunga leh sag (kawng hniam lai)-a theihna curve-te a keng ang. Kawng neitu agency-te nena inremna standard inlet geometry set nghet, leh chung geometry-te rating test (laboratory emaw full-scale), emaw geometry tin tan test nena endik HEC-22 chhutna a mamawh (data leh a hnar awm theihte: Public Works Department (PWD), national-highway agency-te leh Aizawl Municipal Corporation standard detail-te, NIT Mizoram leh Mizoram University, chutah chuan State khawpuite tana ruahtui tlak frequency (IDF) zirchianna hmuh a ni lo a, an hydraulic test theihna pawh zirchianna hunah finfiah a ni lo [TBC], emaw hydraulic laboratory dangte, manufacturer test rating-te). A tlangzarh hma chuan, inlet rawt ngei tihfai lai theihna (clean capacity) chu FHWA HEC-22 (4th edition, 2024) kalphungte hmangin emaw chu geometry chiah tana manufacturer test rating aṭangin chhut rawh (Clause 6.6.2), Table 6.5-a clogging factor (bal avanga tihtawp factor)-te hmangin tihtlem rawh (Clause 6.6.3), leh Table 6A.1-a interim thupekte zawm rawh.

Table 6A.1 — Belhchian 6A tlangzarh hma chhunga inlet tana interim thupekte (Bung 6 leh 9 aṭanga)

Thil	Mamawh	Clause
Public kawngpui-a inlet chi	Kerb-opening emaw combination inlet, Approving Authority (phalna petu Authority)-in hmun pakhat tan grate chauh inlet a lo pawm loh chuan	6.6.1(a)
Inlet level	Kawngka chu kawng level-ah; theih chinah gutter depression	6.6.1(b)
Tihfai lai theihna	FHWA HEC-22 (4th ed., 2024) emaw geometry chiah tana manufacturer test rating; CPHEEO §5.6.2 equation-te chu cross-check atan chauh	6.6.2
Clogging, grade chungah	Grate 50%; kerb opening 10%	6.6.3, Table 6.5
Clogging, sag-ah	Grate 50%; kerb opening 20%	6.6.3, Table 6.5
Inkar	Gutter run tin chhip aṭanga ṭan chhutna inzui hmangin; kerb nei kawngah 30 m aia hla lo	6.6.4

Thil	Mamawh	Clause
Kerb opening lenzawng	Sanzawng chiang 100 mm tal; a sei zawng 1.0 m tal	9.11.4
Grate pianphung	Motor kal lam nena inzawn kawngka 25 mm aia zau lo	9.11.3(a)
Load class	Carriageway (motor kalna kawng) leh median-ah D400; kerb aṭanga 0.5 m chhungah C250; kekawng (footpath) leh cycle track-ah B125 (emaw IS class tluk)	9.11.2
Connection pipe	Diameter 300 mm tal; inlet design flow-ah 0.9 m/s tal petu gradient	6.6.6
Silt sump	Outlet (luan chhuahna) pipe invert (tui luanna hniam ber) hnuaiah 300 mm tal thuk, lei chung aṭanga tihfai theih	6.6.7, 9.11.6

Belhchian ruangam tur chu Table 6A.2 aṭanga 6A.4 thleng-ah pek a ni.

Table 6A.2 — Standard inlet chi register (layout)

Type code	A hrilhfiahna	Grate lenzawng emaw kerb opening (mm)	Gutter depression (mm)	Load class	Standard drawing
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Table 6A.3 — Grade chunga theihna (layout; inlet chi tin tan table pakhat)

Cross slope Sx (m/m)	Longitudinal slope SL (m/m)	Gutter tui luang Q (L/s)	Spread T (m)	Tihfai lai tui man (L/s)	Clogging hnua design tui man (L/s)	Bypass flow (L/s)
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

Table 6A.4 — Sag-a theihna (layout; inlet chi tin tan table pakhat)

Inlet-a tui tlin thuk zawng (mm)	Tihfai lai theihna (L/s)	Clogging factor (Table 6.5)	Design theihna (L/s)	Flow regime (weir, orifice emaw transition)
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Belhchian 6B — Silt-trap lenzawng ruatna leh sediment allowance calibration tana sediment yield

Bung 6-a Clause 6.7.4, 6.7.8, 6.13.3 leh 6.13.10 a ṭanpui.

Buatsaih tur. He belhchian hian Mizoram khawpui drain-te sediment yield (bal (sediment) lo awm zat), ram hman dan (land use) leh drain chi zelin, Clause 6.13.3-a silt trap (leidip dawnna) lenzawng ruat nan, leh Clause 6.7.8-a sediment allowance chu leidip (silt) thuk zawng teh tak nena calibration a keng ang. Leidip laih chhuah (desilting) record-te (drain sei zawng leh catchment (ruahtui luan khawmna hmun) area zela paih chhuah tui zat emaw rihna, ni nen), fûr hun hma leh hnua leidip thuk zawng survey-te, leh catchment ram hman dan leh lei data a mamawh (data leh a hnar awm theihte: Aizawl Municipal Corporation leh urban local body dangte leidip laih chhuah record-te, channel tan IWRD record-te, NRSC aṭanga land cover, Mizoram soil survey leh NBSS&LUP aṭanga lei, IMD aṭanga ruahtui tlak). A tlangzarh hma chuan, silt trap tin chu tihfai hun ruat inkara sediment lo awm tur, designer-in a chhut, drain ngei emaw local body ang chhunga drain inang dangte leidip laih chhuah record-a innghat, aṭangin lenzawng ruat rawh, leh tihfai inkar hun ngaih chu sawi rawh; inkar hun chu Clause 6.13.10-a kumtin fûr hma leidip laih chhuah aia a rei loh tur a ni. Inlet silt sump-te chu 300 mm tal thuk an ni reng (Clause 6.6.7), leh Clause 6.7.8-a sediment allowance chu thlak danglam lovin hman a ni.

Kalphung tum chu tui zat inbuk (volume balance) awlsam a ni a, a term tin chu design-ah sawi tur a ni:

> $V_{trap} = Y \cdot A \cdot t_c$

heta V_{trap} chu trap outlet invert hnuaia sediment khawlna tui zat (m^3), Y chu catchment ram hman dan leh drain chi tana sediment yield (kum khatah m^3/ha, Table 6B.2 tlangzarh a nih hnuah chuta mi), A chu trap-a luang catchment area (ha), leh t_c chu tihfai inkar hun ruat (kum) a ni. Belhchian hian safety margin belh a ni em tih a sawi ang.

Table 6B.1 — Bung 6-in a ruat tawh sediment allowance-te (provisional, calibrate tur)

Element	Invert-a sediment allowance	Clause
Drain khuh lo leh drain khuh	75 mm leh chhung lam thuk zawng chiang 10% zinga lian zawk	6.7.8(a)
Diameter 600 mm emaw a aia lian pipe	Chhung lam diameter 5%	6.7.8(b)
600 mm hnuai pipe	Allowance a awm lo; Clause 6.7.3(a)-a velocity tlem ber hman a ni	6.7.8(c)
Velocity tlem ber thleng thei lo drain leh pipe	Allowance let hnih; machine-a leidip laih chhuahna kawng siam	6.7.4(b), (c)
Inlet silt sump	Outlet pipe invert hnuaiah 300 mm tal	6.6.7

Table 6B.2 — Ram hman dan leh drain chi zela sediment yield (layout)

Ram hman dan emaw catchment chi	Drain chi	Sediment yield Y (kum khatah m^3/ha)	Bulk density (t/m^3)	Local body leh record hman	Record kum zat
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

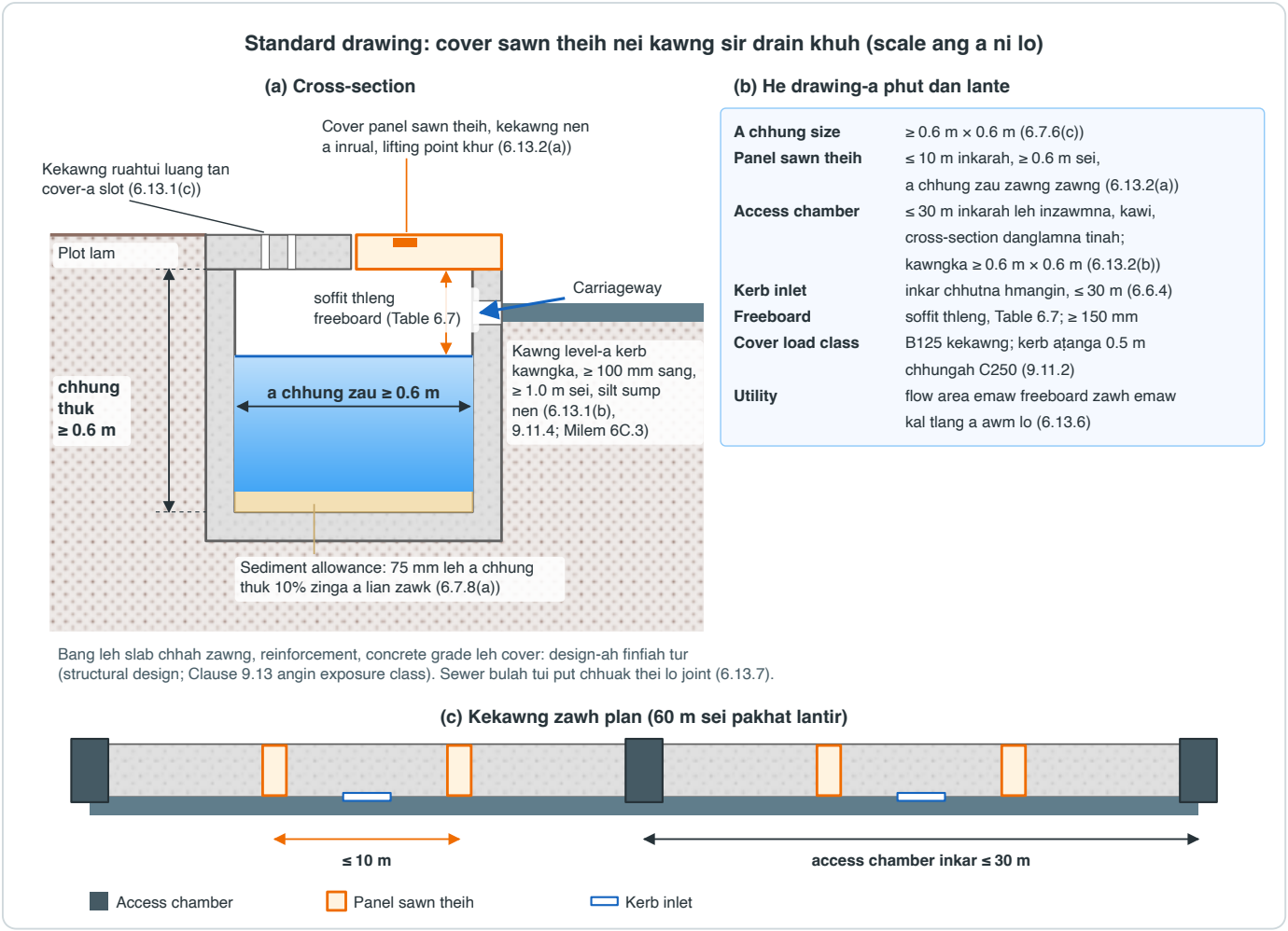
Table 6B.3 — Sediment allowance calibration (layout)

Drain emaw pipe ID	Chhung lam thuk zawng chiang emaw diameter (mm)	Clause 6.7.8 hnuaia allowance (mm)	Fûr hma leidip laih chhuah hmaa leidip thuk zawng teh (mm)	Fûr hun tawpa leidip thuk zawng teh (mm)	Teh leh allowance ratio
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

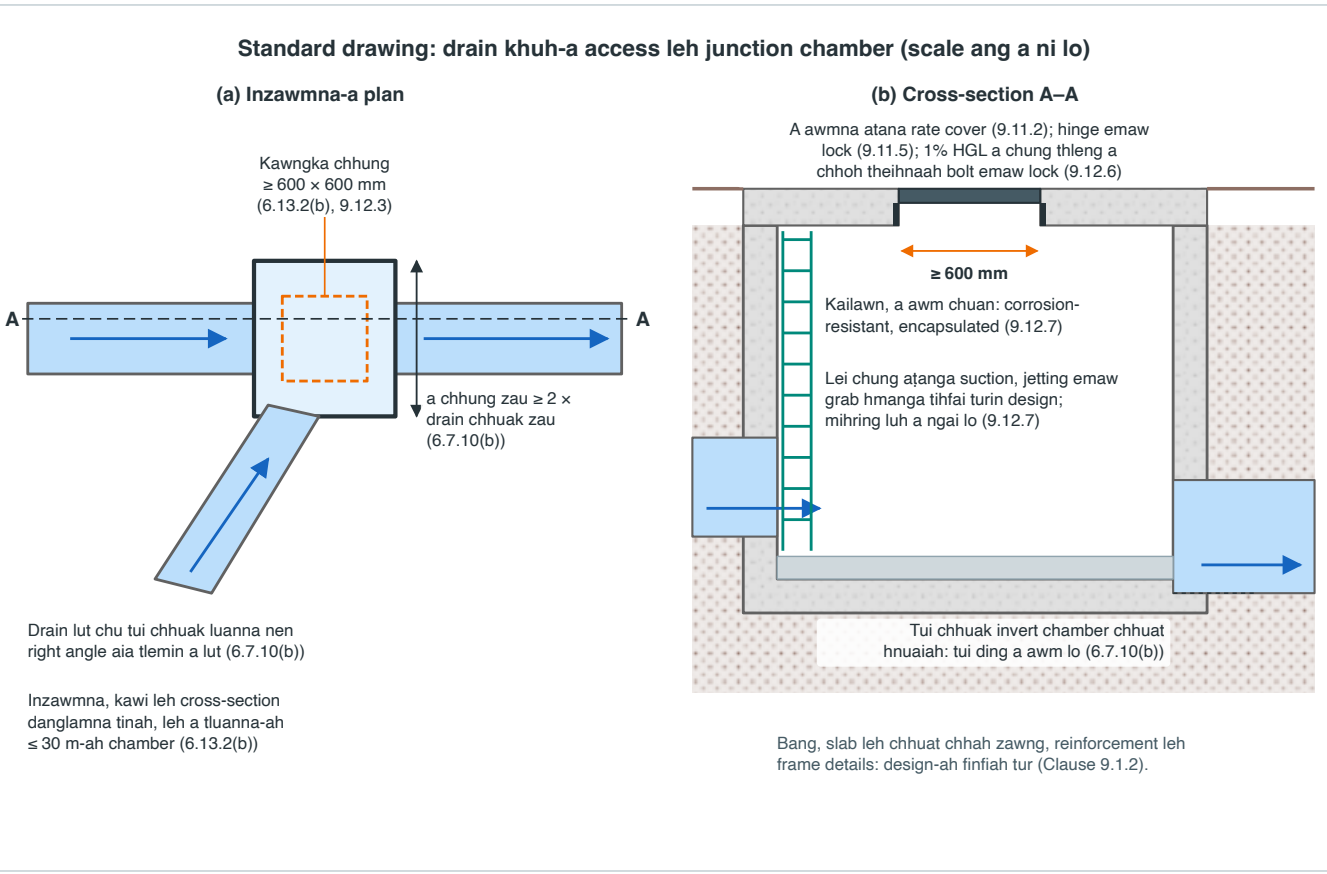
Belhchian 6C — Standard drawing: cover sawn theih nei kawng sir drain khuh, access chamber, silt sump nei inlet

Bung 6-a Clause 6.6, 6.7.6 aṭanga 6.7.10 thleng leh 6.13, leh Bung 9-a Clause 9.11 leh 9.12 a ṭanpui.

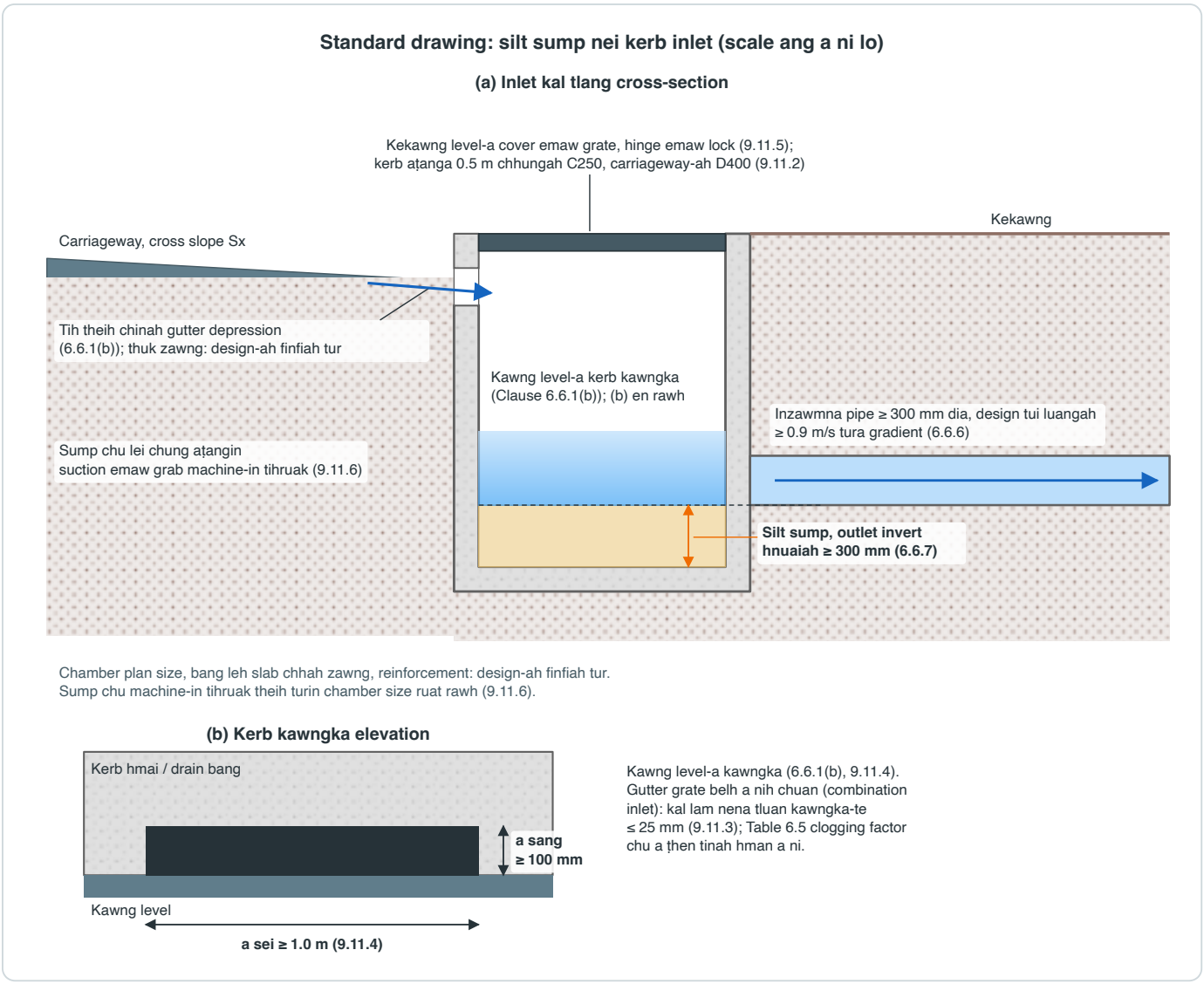
A hnuaia drawing-te hi schematic standard drawing an ni. Bung 6 leh Bung 9-in an ruat lenzawng chauh an lantir. Bang leh slab chhah zawng, reinforcement, concrete grade leh cover, chamber plan lenzawng leh frame detail-te chu design-ah finfiah tur a ni: structural design (Clause 9.1.2) leh Clause 9.13-a exposure class aṭangin an lo chhuak. Table 6C.1-in lenzawng lantirte leh an Clause hnar-te a tarlang.



Milem 6C.1 — Standard drawing: cover sawn theih nei kawng sir drain khuh, kawng level-a kerb inlet, kekawng slot, soffit thlenga freeboard (tui sang ber chunga zau dah) leh sediment allowance, kekawng zawha cover panel leh access chamber plan nen. He Kaihhruaina Bu tana milem siam thar, CPHEEO, Manual on Storm Water Drainage Systems (2019), Chapter 5, leh IRC:SP:50-2013 aṭanga siam danglam.



Milem 6C.2 — Standard drawing: drain khuh chunga access leh junction chamber, kawngka chiang, junction zau zawng, drain lut luhna kil, chamber floor hnuaia invert chhuak, leh cover thupekte nen. He Kaihhruaina Bu tana milem siam thar, CPHEEO, Manual on Storm Water Drainage Systems (2019), §5.3.4 leh Chapter 11 aṭanga siam danglam.



Milem 6C.3 — Standard drawing: kawng level-a kerb inlet, silt sump, connection pipe leh cover nen, leh kerb opening elevation. He Kaihhruaina Bu tana milem siam thar, CPHEEO, Manual on Storm Water Drainage Systems (2019), Figure 5.9, leh FHWA, HEC-22 Urban Drainage Design Manual (4th ed., 2024) aṭanga siam danglam.

Table 6C.1 — Standard drawing-a lenzawng-te leh an Clause hnar

Drawing	Thil	Lenzawng emaw dan	Clause
6C.1	Public drain khuh chhung lam lenzawng chiang	0.6 m zau leh 0.6 m thuk tal	6.7.6(c)
6C.1	Cover soffit thlenga freeboard	Table 6.7; kawng sir drain reng reng tan 150 mm aia tlem lo	6.7.9, 6.13.1(a)
6C.1	Sediment allowance	75 mm leh thuk zawng chiang 10% zinga lian zawk	6.7.8(a)
6C.1	Cover panel sawn theih	10 m centre aia hla lo; panel tin 0.6 m tal sei leh zau zawng chiang pum kal tlang; lifting point thlak lut; kekawng nena inrual	6.13.2(a)
6C.1	Kekawng ruahtui luang	Cover-a slot emaw grate kawngka kal tlangin	6.13.1(c)
6C.1	Kerb inlet	Kawng level-a drain bang kawngka, tin silt sump nen; inkar chhutna hmangin, 30 m aia hla lo	6.13.1(b), 6.6.4
6C.1, 6C.2	Access chamber	Junction, kawi leh cross-section inthlakna tinah, leh run dik-ah 30 m centre aia hla lo	6.13.2(b)

Drawing	Thil	Lenzawng emaw dan	Clause
6C.2	Luhna kawngka chiang	0.6 m × 0.6 m (600 mm) tal	6.13.2(b), 9.12.3
6C.2	Junction chamber	Chhung lam zau zawng chu drain chhuak zau zawng let hnih tal; drain lut chu kil dik aia tlemin; invert chhuak chu chamber floor hnuaiah	6.7.10(b)
6C.2	Cover	Hmun tana load class; hinge emaw lock nei; 1% AEP HGL cover chunga a sang theihnaah bolt emaw lock nei	9.11.2, 9.11.5, 9.12.6
6C.2	Tihfai	Lei chung aṭanga machine-in; kailawn (ladder), dah a nih chuan, thir ei lo (corrosion-resistant) leh khuh (encapsulated)	9.12.7
6C.3	Kerb opening	Kawng level-ah; sanzawng chiang 100 mm tal; a sei zawng 1.0 m tal	6.6.1(b), 9.11.4
6C.3	Silt sump	Outlet pipe invert hnuaiah 300 mm tal; suction emaw grab machine-in tihruak	6.6.7, 9.11.6
6C.3	Connection pipe	Diameter 300 mm tal; design flow-ah 0.9 m/s tal	6.6.6
6C.3	Combination inlet-a grate	Motor kal lam nena inzawn kawngka 25 mm aia zau lo; ṭhen tinah Table 6.5 clogging	9.11.3, 6.6.3
Zawng zawng	Bang leh slab chhah zawng, reinforcement, concrete grade leh cover, chamber plan lenzawng, gutter depression thuk zawng	Design-ah finfiah tur	9.1.2, 9.13

Form 6-1 — Tui Luan Tirna Design Report checklist

Bung 6-a Clause 6.15 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Dan anga hman tur a ni lo.

He checklist hi Tui Luan Tirna Design Report hmaah belh rawh. Item tin tan, Aw, Aih emaw A huam lo ziak rawh, leh a lanna drawing emaw phêk ziak rawh.

Section A — Project

Table 6F.1 — Form 6-1, Section A: project

Field	Ziah luh tur
Project hming leh hmun	_____
Local body, leh Tier A emaw Tier B (Bung 1)	_____
Dilna thehluhtu (applicant)	_____
Designer (hming leh registration)	_____
Catchment area pumpui a rawngbawl (ha)	_____
10% AEP (kum khatah a lo thlen theih dan) tui luanna system tenau (minor system) tana high-density area dinhmun (Clause 6.4.4)	_____
Clause 6.11.6-a coastal band (tuifinriat kam ram) chhungah (Aw / Aih)	_____
Ni leh revision	_____

Section B — Clause 6.15-in a phut thu awmte

Table 6F.2 — Form 6-1, Section B: Clause 6.15-in a phut thu awmte

No.	Thil	Clause	Pek (Aw / Aih / NA)	Drawing emaw phêk
1	Catchment plan: sub-catchment, tui luanna system tenau, inlet awmna leh 1% AEP tui luanna system lian (major system) overland flow path (lei chunga tui luan kawng)-te	6.3.2		
2	Element tin tana ram hman dan leh kawng class AEP hman, leh high-density area dinhmun	Table 6.1, 6.4.4		
3	Design flow, Bung 2-a ruahtui tlak sheet leh Bung 3-a kalphung nen	6.3.4		
4	Minor, check leh 1% event tana gutter spread (kawng chunga tui zau zawng), thuk zawng leh D·V endikna	Table 6.2, 6.3		
5	Inlet schedule: tihfai lai theihna, clogging factor, design theihna leh bypass flow (inlet kal pelh tui)	6.6		
6	Pipe leh drain design table: n, velocity, sediment allowance leh freeboard	6.7		
7	Minor leh check event tana HGL profile, tailwater (outfall hnuailama tui sang zawng) hman nen	6.8		
8	Sag tui tlin level, tawp vek endikna tiamin	6.10		
9	Building tin tana floor-level schedule	6.11		

No.	Thil	Clause	Pek (Aw / Aih / NA)	Drawing emaw phêk
10	Culvert (kawng hnuaia tui kalna) leh kal tlangna chhutna (Form 9-1 nen)	6.12, Bung 9		
11	Utility kal tlangna schedule leh drain khuh tana luhna kawngka layout	6.13		

Section C — Design innghahna

Table 6F.3 — Form 6-1, Section C: design innghahna

Field	Ziah luh tur	Clause
Tui luanna system tenau design AEP hman	_____	Table 6.1
Kawng class(-te) leh kawng drainage leh kal tlangna tana design / check AEP	_____	Table 6.1, 6.4.2
Ruahtui tlak hnar leh climate factor hman	_____	6.3.4, Bung 2
Kalphung: Rational Method (catchment ≤ 16 ha, element pakhat) emaw routing nena hydrograph (hun hrang hranga tui luang zat) kalphung	_____	6.3.4(a), (b)
Time of concentration (catchment hla ber aṭanga tui lo thlen hun) hniam ber hman (minute 10 aia tlem lo)	_____	6.3.4(c)
HGL tana outfall (drain tui luan chhuahna)-a tailwater (tidal outfall-ah MHWS + 0.3 m, emaw dawngtu level)	_____	6.8.2
Catchment pianphung inkara tui sawn reng reng (6.3.5 hnuaia lo pawm a nih loh chuan a awm lo)	_____	6.3.5

Section D — Dan zawm endikna

Table 6F.4 — Form 6-1, Section D: dan zawm endikna

No.	Endikna	Limit	Clause	A zawm (Aw / Aih / NA)
D1	Inlet, sag, pipe, drain, culvert leh khawlna element tin hian 1% AEP overland path an nei	Plan-ah lantir	6.3.2	
D2	Tui luanna system lian tui luang = 1% AEP peak, tui luanna system tenau theihna tawp paihin	Hmun tinah chhut	6.3.3	
D3	Minor event-a spread	Table 6.2	6.5.2	
D4	Check leh 1% event-a thuk zawng	Crown (kawng laili sang ber)-ah ≤ 150 mm; a thuk berah ≤ 350 mm	Table 6.2	
D5	Hmun zela tui luan hlauhawmna (D·V)	Table 6.3	6.5.3	
D6	Inlet clogging factor hman	Table 6.5	6.6.3	
D7	Kerb nei kawng-a inlet inkar	≤ 30 m	6.6.4(a)	
D8	Sag inlet design theihna ≥ minor design flow lo thleng; a ngaih lai chuan flanking inlet	—	6.6.5	
D9	Inlet connection pipe leh silt sump	≥ 300 mm dia, ≥ 0.9 m/s; sump ≥ 300 mm	6.6.6, 6.6.7	
D10	Manning's n chu design value hniam ber aia tlem lo	Table 6.6	6.7.2	

No.	Endikna	Limit	Clause	A zawm (Aw / Aih / NA)
D11	Minor design flow-a velocity tlem ber	Drain 0.6 m/s; pipe 0.9 m/s	6.7.3(a)	
D12	Velocity sang ber leh Froude number	Drain lined leh pipe 3.0 m/s; Fr ≤ 0.8	6.7.3(b), (d)	
D13	Velocity tlem ber tlin theih loh hmunah: velocity tarlan, sediment allowance let hnih, leidip laih chhuahna kawng siam	—	6.7.4	
D14	Pipe chu pipe khat theihna atan lenzawng ruat, 0.95-thuk peak ni lovin	—	6.7.5	
D15	Lenzawng tlem ber	Pipe 300 mm (public main 450 mm); drain khuh lo bed 0.3 m; public drain khuh 0.6 m × 0.6 m	6.7.6	
D16	Pipe chunga lei khuh (cover); crown aṭanga 1 m chhunga leihnuai tui a awm chuan flotation endikna	≥ 0.6 m; carriageway hnuaiah ≥ 0.9 m	6.7.7	
D17	Theihna-a sediment allowance	6.7.8 value	6.7.8	
D18	Freeboard, kawi-a superelevation tiamin	Table 6.7	6.7.9	
D19	Kawi radius leh junction sump	6.7.10	6.7.10	
D20	Run dik-a manhole inkar	Table 6.8	6.7.11	
D21	Minor event-ah HGL chu inlet chhip leh manhole cover hnuaiah	≥ 0.3 m	6.8.3	
D22	Lei chung thlenga surcharge (tui khat luat a nek chhuahna) thei manhole: bolt emaw lock nei cover	—	6.8.4	
D23	Soffit inrual emaw soffit chhuak hniam zawk; invert chhuak chu invert lut hniam ber chungah ni lo	—	6.8.6	
D24	HGL-ah gate leh valve loss tel; a ngaih lai chuan private connection-ah non-return valve (tui kir leh dangtu valve)	—	6.8.7, 6.8.8	
D25	Kawngpui pawna overland flow path: zau zawng, neihna (tenure), dal tur awm lo, chhuk zel	≥ 1% chhip zau zawng + lam tin 0.5 m, ≥ 3.0 m	6.9.2	
D26	Map-a flow path kal tlang compound wall (in hung bang): kawngka chuan 50% tihtawp (blockage) chungin 1% tui luang a luan tir	—	6.9.3	
D27	Chhip zau zawng ≥ 2 m drain khuh lo zawha luhna kawng (access strip)	≥ 3.5 m, ≤ 500 m-ah kawng nen inzawm	6.9.4	
D28	A ngaih laia drainage reserve: zau zawng, plot hran, structure awm lo, chhinchhiahna (marker), service, 2 m stability endikna	Table 6.9	6.9.6–6.9.8	
D29	1% event-a sag tui tlin, overflow kawng, leh tawp vek endikna	A thuk berah ≤ 350 mm	6.10.2, 6.10.3	
D30	Trapped sag leh kawng underpass (kawng hnuai kal tlang)	6.10.4, 6.10.5	6.10.4, 6.10.5	
D31	Floor level	≥ 1% AEP level + 0.5 m; level chhut a awm loh chuan 6.11.3 default-te	6.11.1–6.11.3	

No.	Endikna	Limit	Clause	A zawm (Aw / Aih / NA)
D32	Basement leh building service-te	6.11.4, 6.11.5	6.11.4, 6.11.5	
D33	Coastal band: floor ≥ 1% still-water level + 2 × SLA (+ a huam chuan wave set-up) + 0.5 m; basement room emaw plant awm lo	—	6.11.6	
D34	Culvert: design AEP, a chung tui luan kai (overtopping), 50% / 20% tihtawp endikna, lenzawng tlem ber	≥ 900 mm	6.12	
D35	Drain khuh: panel sawn theih leh access chamber	≤ 10 m; ≤ 30 m	6.13.1, 6.13.2	
D36	Silt trap, bypass nei screen leh 50% tihtawp endikna	—	6.13.3, 6.13.4	
D37	Drain chungah building sak loh; flow area emaw freeboard-ah utility awm lo; kal tlangna awm mek chu 50% tihtawp nen paih	—	6.13.5, 6.13.6	
D38	Ek tui (sewage) connection awm lo; sewer bulah tui put chhuak thei lo joint (sealed joint); 1.0 m aia thuk drain khuh lo-ah kam humhimna	—	6.13.7, 6.13.8	
D39	Outfall: tailwater, 1% still-water level hnuaia flap gate emaw non-return valve, outlet humhimna	—	6.14	

Section E — Variance

Table 6F.5 — Form 6-1, Section E: variance

Clause	Thupek zawm loh	A chhan leh thlan dang rawt	Phalna petu leh ni
_____	_____	_____	_____

Section F — Signature

Report hi registered professional-in a buatsaih leh a hmingziak tur a ni a, Professional Design Certificate (Form 10-3) belh tur a ni (Bung 10-a Clause 10.6.1 leh 10.6.3). Drainage reserve kam aṭanga 2 m chhunga structure a din chuan, stability design chu structural engineer thiam-in a hmingziak bawk tur a ni (Clause 6.9.8(f)).

Table 6F.6 — Form 6-1, Section F: signature

Mawhphurhna	Hming	Registration emaw empanelment no.	Hmingziak	Ni
Designer	_____	_____	_____	_____
Structural engineer (Clause 6.9.8(f), a huam chuan)	_____	_____	_____	_____

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

BUNG 7 BELHCHIAN

Tui Awmnate, Dil (Dil Lian leh Dil Tê) leh Setback

Heng belhchiante hian Bung 7 an ṭanpui. Inventory field specification, zau zawng nghet setback (tui kam aṭanga hmun kalhlen tur) table, kalpui dan (operating rule) template, leidip laih chhuah leh siam ṭhat lehna specification, Mizo tui awmna thumal awmzia leh Clause 7.15-in a phut form pathum a pe. Belhchian pakhat chu tunah a zawh theih loh chuan chu chu a sawi a, chu chhunga hman tur dan a pe. Form-te hi draft form an ni; template leh entirna thuziak hi competent authority ngaihtuah tur a ni a, hman a ni lo.

Belhchian 7A — State pum tui awmna GIS layer leh inventory field

Bung 7-a Clause 7.3.1, 7.3.3 leh 7.3.5 a ṭanpui.

Buatsaih tur. He belhchian hian Clause 7.3.1-in a phut State pum tui awmna (waterbody) GIS layer, Authority tin-in IWRD leh Land Revenue & Settlement Department nena a buatsaih, a keng ang. Hei hian Land Revenue & Settlement Department ram record leh map, ram record vawngtu leh Aizawl Municipal Corporation area chhunga ram hman dan la kaltu (CAG, 2025), a pek land pass leh settlement record-te nen (pakhat mah he Kaihhruaina Bu tan chhiar a ni lo [TBC]); Mizoram (Village Councils) Act, 2025 hnuaia Village Council-te-in in hmun leh ram dang an pek (allotment)-te; Lai, Mara leh Chakma Autonomous District Council area-ah, District Council-te ram record, chutah ram an chelh leh an settle a (Lai Autonomous District Council (Land Holding and Settlement) Act, 2002 hi snippet aṭanga chauh hriat a ni a, heng record-te pakhat mah chhiar a ni lo [TBC]); Mizoram Municipalities Act, 2007 section 80 leh 289 hnuaia Aizawl Municipal Corporation ta public dil (tank), lui, reservoir, well leh drain (tui luanna)-te; Master Plan for Aizawl: Vision 2030 ram hman dan map-te, a luipui, lui, tuikhur, dil tê, dil, wetland leh tui catchment area "W" use zone nen, a lui-te, Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017-in "Stream" hrilhfiahna atan a lak, leh a drain leh catchment (ruahtui luan khawmna hmun) map (Map 8.3, he Kaihhruaina Bu tan lak chhuah a ni lo [TBC]); Corporation Landslide Hazard Maps (leimin hlauhawmna map) leh Aizawl leh khawpui thlan bik tana MIRSAC leimin hlauhawmna zonation atlas; Mizoram Water Resources (Management and Regulation) Act, 2024-in kum nga chhunga a phut water-resources map siamna (s.17), a zawh hunah; Tuirial reservoir level leh ram chungchanga NEEPCO record; tuikhur (spring) inventory reng, Aizawl tan pakhat mah hmuh a ni lo [TBC]; leh khawpui tin drain register (Bung 6); FTL leh MWL nena NEEPCO leh Village Council dil register; datum inanga survey level; ISRO National Wetland Inventory and Assessment (NRSC); Survey of India topographic map; leh court thupek hnuaia tui awmna list tlangzarh reng a mamawh. A tlangzarh hma chuan, Applicant (dilna thehluhtu) tin chuan Clause 7.3.3-a thu hnar zawng zawng aṭangin tui awmna a zawn chhuak a, a zau zawk chuan a thunun a, Tui Awmna Sheet (Form 7-1)-ah a ziak lut.

A hnuaia field specification hi a kim tawh. Bung-in a phut field tin (Clause 7.3.1(a) aṭanga (g) thleng) hian hming, chi (type) leh hnar ruat a neih nan, leh project pakhat Form 7-1 aṭanga field inang chu dah khah theih a nih nan ziah a ni.

7A.1 Layer-te

- **WB_POLY** — tui awmna tin tan polygon pakhat: Revenue record ramri (Clause 7.3.1(c)).

- **WB_FTL** — survey-a FTL contour (tank, dil, dil tê) emaw kam chhip (top of bank; channel), polygon emaw line angin.
- **WB_MWL** — dil tin MWL contour, polygon angin.
- **WB_FLOOD** — 1% AEP tuilian zau zawng, map a nih chuan (Clause 7.3.1(f)), floodway (tuilian luan kawng) tehfel a nih chuan a nen (Clause 7.6.1).
- **WB_STRUCT** — surplus weir, sluice, regulator, inlet (luan lutna) leh drain outfall (drain tui luan chhuahna) tan point.
- **WB_LINK** — tui petu channel, surplus course leh cascade-a dil inkara inzawmna tan line (Clause 7.3.1(e)).
- **WB_ENCR** — luah hnehna (encroachment) hriat sa polygon, tin-in a chhinchhiah ni nen (Clause 7.3.1(g)).
- **WB_SETBACK** — Zone 1 leh Zone 2 polygon (Clause 7.4), a chunga layer-te aṭanga siam.

Layer zawng zawng chuan tui awmna identifier (WB_ID) an keng tur a ni, inzawm theih nan. Level zawng zawng chu datum pakhatah sawi tur a ni (Clause 7.3.5), layer metadata-ah hming dah.

Table 7A.1 — Tui awmna inventory attribute field (WB_POLY)

Field	Chi (type)	Unit / domain	A ngai	A chhunga thu	Clause
WB_ID	Text	District code + indawt number	Aw	Identifier danglam, hman nawn ngai lo	7.3.1
WB_NAME	Text	—	Aw	Revenue leh NEEPCO record-a hming, khawtlang hming nen	7.3.1(a)
WB_NAME_LUS	Text	Mizo script (Roman hawrawp)	Aw	Mizo ṭawnga hming	7.3.1(a)
WB_TYPE	Code	Table 7A.2	Aw	Tui awmna chi	7.2, 7.3.1(a)
SURVEY_NOS	Text	Khua, survey leh subdivision number	Aw	Tui awmna Revenue survey number	7.3.1(a)
VILLAGE	Text	—	Aw	Revenue khua, sub-division leh district	7.3.1(a)
CUSTODIAN	Code	Table 7A.2	Aw	Enkawltu pawl (custodian)	7.3.1(b)
AREA_REC	Number	ha	Aw	Revenue record ramri chhunga area	7.3.1(c)
AREA_FTL	Number	ha	Dil	FTL-a tui zau zawng, survey	7.2, 7.3.1(d)
FTL	Number	m (datum)	Dil	Full tank level (dil tui khat level)	7.3.1(d)
MWL	Number	m (datum)	Dil	Maximum water level (Clause 7.2 hrilhfiahna)	7.3.1(d)
MWL_BASIS	Code	NEEPCO record / 1% AEP chhut	Dil	MWL thununtu value	7.2
TBL	Number	m (datum)	Dil	Bund chhip level, a hniam berna	7.3.1(d)
WEIR_CREST	Number	m (datum)	Dil	Surplus weir crest level	7.3.1(d)
WEIR_LEN	Number	m	Dil	Surplus weir crest sei zawng	7.3.1(d)
WEIR_TYPE	Text	—	Dil	Surplus weir chi (entirnan crest nghet, shutter emaw falling board nei)	7.3.1(d)
SLUICE_N	Integer	—	Dil	Sluice zat; a kimchang WB_STRUCT-ah	7.3.1(d)
SUPPLY_CH	Text	WB_ID(s)	Dil	Dil tui petu channel(-te)	7.3.1(d)
SURPLUS_CS	Text	WB_ID(s)	Dil	Dil aṭanga chhuak surplus course(-te)	7.3.1(d)

Field	Chi (type)	Unit / domain	A ngai	A chhunga thu	Clause
UPSTR_WB	Text	WB_ID(s)	Cascade	Cascade-a luanna chunglam (upstream) dil(-te)	7.3.1(e)
DNSTR_WB	Text	WB_ID	Cascade	Luanna hnuailam (downstream) dil, luipui, drain emaw tuifinriat outfall	7.3.1(e)
CATCH_AREA	Number	ha	Channel	Lui chhung hnuai tawpa drainage area (Clause 7.4.1(b) leh Table 7.1-a ha 8 trigger tan)	7.4.1
DATUM	Text	—	Aw	Level zawng zawng datum; NEEPCO datum hlui aṭanga thlak danglamna	7.3.5
LEVEL_DATE	Date	—	Dil	Level survey ni	7.7.1(a)
SSC_DATE	Date	—	Dil	Stage–storage survey hnuhnung ber ni	7.7.1(b)
FLOOD_SRC	Code	Map pawm / site zirchianna / awm lo	Aw	1% AEP zau zawng hnar	7.3.4
FLOODWAY	Code	Tehfel / 1% zau zawng pumpui / MWL hnuai	Aw	Floodway bul	7.6.1
ENCR_KNOWN	Code	Aw / Aih	Aw	Luah hnehna hriat sa; a kimchang WB_ENCR-ah	7.3.1(g)
CREDITED	Code	Aw / Aih	Dil	Clause 7.7 hnuaia khawlna chhiar, scheme reference nen	7.7.1
WETLAND	Code	Notify / list-a awm / dang	Wetland	Clause 7.12.1 hnuaia dinhmun	7.12.1
SOURCES	Text	—	Aw	Hnar hman, Clause 7.3.3(a) aṭanga (e) thleng list aṭanga	7.3.3
UPDATED	Date	—	Aw	Siam ṭhat hnuhnung ber ni, leh tuin nge	7.3.1

Table 7A.2 — Code list

Code list	Value-te	Clause
WB_TYPE	Luipui emaw lui (lui; luipui); drain emaw laihkawr (tui luankawr, tuihawr); dil (dil lian emaw dil tê, pianphung emaw laih; dil tê); reservoir (a drawdown zone nen); check-dam tui dilna; tuikhur emaw tuikhur aṭanga tui chhuahna (tuikhur; hna, tuihna) leh a catchment humhim; wetland, marsh emaw tui chiahna lei; tui petu channel; surplus course	7.2
CUSTODIAN	Aizawl Municipal Corporation (Municipalities Act, 2007, ss.80 leh 289); Lunglei Municipal Council; PWD emaw national-highway agency (kawng drain leh culvert); IWRD (luipui, tui lak siam hna tenau (minor irrigation), tuilian hna); PHED (tui supply hnar emaw intake); NEEPCO (Tuirial reservoir leh tui chhuah tirna lui chhung); State power department (Serlui B reservoir leh tui chhuah tirna lui chhung [TBC]); Fisheries Department (Tam Dil); EF&CC (ramngaw ram, riverine reserve, wetland); Land Revenue & Settlement Department (ram record, land pass); Village Council, a Village emaw Local Water Resources Committee nen; District Council (Lai, Mara emaw Chakma) a Village Council nen [TBC]; mimal neitu emaw land-pass neitu; developer (a hlan hma chu); State Wetlands Authority (hmuh a ni lo); dang (hming)	7.3.1(b)
Structure (WB_STRUCT)	Surplus weir; sluice; regulator; inlet; drain outfall; gross pollutant trap; kalh tlanna (crossing)	7.3.1(d), 7.10
Luah hnehna (WB_ENCR)	In; lei vur; kawng; bang; bawlhhlawh paih; thlai chin; dang — tin-in a chhinchhiah ni, area (m²) leh hnar nen	7.3.1(g), 7.13

Table 7A.3 — Structure-te attribute field (WB_STRUCT)

Field	Chi (type)	Unit	A chhunga thu	Clause
STR_ID	Text	—	Identifier danglam	7.3.1(d)
WB_ID	Text	—	A rawngbawl tui awmna	7.3.1(d)
STR_TYPE	Code	Table 7A.2	Structure chi	7.3.1(d)
CREST_SILL	Number	m (datum)	Weir crest emaw sluice sill level	7.7.1(a)
LENGTH_SIZE	Text	m	Weir crest sei zawng, emaw sluice kawngkhar lenzawng	7.7.1(a)
GATED	Code	Aw / Aih	Thunun theih outlet (luan chhuahna; flood cushion tan a ngai, Clause 7.8.2(a))	7.8.2
CONDITION	Code	Hman theih / chhe	Fûr hma endikna hnuhnung ber rah chhuah, ni nen	7.7.1(d), 7.14.4

Belhchian 7B — Zau zawng nghet setback table (alternative S-3, Belhchian 1C nen)

Bung 7-a Clause 7.3.4, 7.4.3, 7.4.6 leh 7.4.7, leh Policy Supplement-a alternative S-3 (Belhchian 1C) a ṭanpui.

7B.1 Table hman theih hun

Zau zawng nghet setback chu heng zawng zawng a dik chauhin hman theih a ni:

- (a) Authority-in tui awmna tan 1% AEP tuilian zau zawng map a pawm loh (Clause 7.3.4);
- (b) Clause 7.3.4-in Applicant chu hydraulic zirchianna hmanga 1% AEP zau zawng hriat chhuak a phut loh: site chu flood-sensitive catchment-ah a awm lo, tui awmna bula ha 1 emaw a aia tam site a ni lo, leh Authority-in zirchianna a phut lo; leh
- (c) tui awmna chu setback hman tur a nih (Clause 7.4.1): tui awmna record emaw hmuh chhuah reng, leh site-ah ha 8 emaw a aia tam luang khawm channel pianphung reng.

Authority-in Clause 1.7 hnuaiah alternative S-3 a pawm chuan, a hnuaia table hi S-3 table a ni. Clause 1.7.3(e) chuan S-3 table chu State Stormwater Technical Committee-in a chhuah tur a ti. A chhuah hma chu, value-te chu Clause 7.4.6-a mi, hetah thlak danglam lova nawn a ni.

Table 7B.1 — Tui awmna class zela zau zawng nghet setback (alternative S-3)

Tui awmna class	Site-a drainage area	Setback pumpui (Zone 1 + Zone 2)	Chu zinga Zone 1	Tehna bul
Channel, tê	ha 8 aṭanga ha 65	25 m	15 m	Kam chhip (Clause 7.4.3)
Channel, lai	ha 65 aṭanga km² 20	40 m	15 m	Kam chhip
Channel, lian, leh luipui	km² 20 aia tam	50 m	20 m	Kam chhip
Tank, dil emaw dil tê	Eng pawh	MWL contour + 25 m	MWL contour thleng, FTL aṭanga m 15 aia tlem lo	FTL contour (Zone 1); MWL contour (pumpui)
Marsh, estuary emaw backwater	Eng pawh	Authority-in a notify ang, m 50 aia tlem lo	15 m	Clause 7.13.1-a tui awmna ramri

Value-te hi Clause 7.4.6 (Table 7.1) aṭanga a ni. Zone 2 chu setback pumpui aṭanga Zone 1 paih a ni.

7B.2 Hman dan

- (a) **Tehna.** Plan-ah horizontal-in teh, Clause 7.13.1-a ramri aṭanga pawn lamah: Revenue record ramri leh survey-a FTL (emaw kam chhip) zinga a lian zawk. FTL leh kam chhip pahnih hman a nih chuan, zone zau zawk petu chu hmang (Clause 7.4.3).
- (b) **Drainage area.** Channel tan, site bula lui chhung hnuai tawpa drainage area hmang. Site chhungah lui chhung chuan class ramri a kal tlang chuan, site chhunga lui chhung pumpui tan setback zau zawk hmang.
- (c) **Kam lehlam.** Setback chu channel kam tin-ah leh tank, dil, dil tê emaw marsh vel vekah hman a ni.
- (d) **He Kaihhruaina Bu-in a ruat tlem ber.** Zone 1 chu m 15 aia tlem ngai lo (Clause 7.4.7). Dan anga emaw phalna setback zau zawk chuan a khap hman danah a thunun (Clause 7.4.5).
- (e) **A khauh zawk.** Hydraulic zirchianna duh thu-a siam a nih chuan, setback chu Table 7B.1 leh Clause 7.4.3 leh 7.4.4 zinga a zau zawk a ni.
- (f) **Record.** Setback bul (zau zawng nghet) chu Tui Awmna Sheet (Form 7-1)-ah leh phalnaah sawi tur a ni (Clause 7.4, Inpuanna).
- (g) **Endikna.** Authority-in 1% AEP tuilian map a pawm hnu kum 2 chhungin table chu endik tur a ni (Clause 7.16.1).

7B.3 Channel zau zawng hnar

Channel zau zawng-te hi he Kaihhruaina Bu-in 2006 Kansas City APWA default stream buffer en chungin a ruat a ni, a sang lamah tihkim a, m 15 tlem ber-ah floor (Clause 7.4.6, hrilhfiahna). Hnar value-te, bung-a tarlan angin, heng hi an ni:

Table 7B.2 — Clause 7.4.6-a hnar buffer tarlan (KC APWA 5600, 2006, §5605.3)

Drainage area (hnar, acre)	SI inang zawng hnai	Hnar buffer
40 ac aia tlem	ha 16 aia tlem	40 ft (12 m)
40–160 ac	16–65 ha	60 ft (18 m)
160–5,000 ac	65 ha – 20 km²	100 ft (30 m)
5,000 ac aia tam	km² 20 aia tam	120 ft (37 m)

Table 7B.1-a ha 65 leh km² 20 class ramri-te hi 160 ac leh 5,000 ac SI inang zawng an ni. Ha 8 ramri hniam zawk hi APWA 2025.01-a 20-acre trigger a ni (Clause 7.4.1(b)).

Belhchian 7C — Dil kalpui dan (operating rule) template, flood cushion nen

Bung 7-a Clause 7.7.1(c), 7.7.3, 7.8 leh 7.14.4 a ṭanpui.

Competent authority ngaihtuah tura entirna thuziak. Hman a ni lo. NEEPCO thununna hnuaia dil-te tan, kalpui dan chu NEEPCO dan a ni (Clause 7.8.4); he template hian Clause 7.8-in a phut thil a tarlang a, chutiang chuan enkawltu (custodian) dan chu a nena khaikhin theih a ni. Square bracket chhunga thu hi dil tin tan dah khah tur a ni.

7C.1 Hriat chhuahna

1. Dil: [hming, Belhchian 7A-a WB_ID, khua, sub-division, district].
2. Enkawltu (custodian): [NEEPCO division / ULB / Village Council / dang].
3. Cascade-a a awmna: luanna chunglam dil(-te) [ ]; luanna hnuailam dil, luipui emaw drain [ ].
4. Datum: [ ]. Survey level-te (Clause 7.7.1(a)), survey ni [ ]: FTL [ ] m; MWL [ ] m; TBL (a hniam berna) [ ] m; surplus weir crest [ ] m, sei zawng [ ] m; sluice sill [ ] m.

5. Stage–storage curve (Clause 7.7.1(b)): survey ni [ ]; Schedule 1 angin belh.
6. Thunun theih outlet (Clause 7.8.2(a)): [gate nei sluice / regulator / awm lo]; FTL-a capacity [ ] m³/s.

7C.2 Tum leh a pawimawh dan

7. Dil hian [ha [ ] command area tui lak / in tur tui supply / recharge / tuilian khawlna] a rawngbawl. Enkawltu-in a dang a chhinchhiah loh chuan tui lak (irrigation) leh tui supply chu a hmasa ber reng a ni (Clause 7.8.2(d)).

7C.3 Kum chhunga level leh ni-te (Clause 7.8.1(a))

8. Dil chu Table 7C.1-a level-te angin kalpui tur a ni.

Table 7C.1 — Hun zela dan level (dil tin tan dah khah tur)

Hun	Level tum (m)	Chin sang ber (m)	Chin hniam ber (m)	Tum
[1 Jan – ni]	[ ]	FTL	[ ]	Tui lak / supply tan vawn
[ni – cushion hun ṭanna]	[ ]	FTL	[ ]	Vawn
[Flood-cushion hun, a awm chuan]	Cushion level [ ]	Cushion level [ ]	[ ]	Flood cushion (Clause 7.8.2)
[Cushion hun tawpna – 31 Dec]	[ ]	FTL	[ ]	Tihkhat leh

9. Flood cushion hman a nih loh chuan, design tana ṭan level chu FTL a ni a (Clause 7.7.3), cushion hun row chu paih a ni.

7C.4 Flood cushion (Clause 7.8.2)

10. Cushion level: [ ] m, FTL hnuaia [ ] m, Schedule 1 aṭanga cushion tui zat [ ] m³ petu.
11. Ni-te: cushion chu [ ] aṭanga [ ] thleng hman a ni.
12. Drawdown: dil chu FTL aṭanga cushion level thleng [outlet] kaltlangin darkar [ ] chhungin tihhniam theih a ni, paragraph 18-a tui chhuah tir zat sang ber aia tam lo tui chhuah tir nen.
13. Rintlakna: record [kum] chhunga continuous simulation (Clause 3.13) chuan design ruahpui ṭan laiin fûr hun [ ]%-ah cushion a awm tih a lantir, chu chu a tlem berah 90% a ni tur a ni. Simulation report chu Schedule 2 a ni.
14. Tui chhuah zat: enkawltu chuan Schedule 3-a sawi tui lak emaw supply tui chhuah zat bo chu a lo pawm [leh chutah compensation chhinchhiah].
15. Dil-in thunun theih outlet a neih loh chuan, he ṭhen hi hman a ni lo a, flood cushion ngaih a ni lo (Clause 7.8.3).

7C.5 Tui chhuah tir (Clause 7.8.1(b) aṭanga (d) thleng)

16. Level tin-a sluice leh regulator setting: Table 7C.2.
17. Kalpuitu: sluice leh regulator-te chu [nihna]-in a kalpui. [ ] m³/s aia tam tui chhuah tir chu [nihna]-in chauh, emaw, harsatna laiin, [nihna]-in a thupek thei.
18. Tui chhuah tir zat sang ber: [ ] m³/s. He zat hi luanna hnuailam catchment tui luang nena belh khawm pawhin, luanna hnuailama in-te tuilianin a chim lo (Schedule 4-in luanna hnuailam endikna a pe).
19. Tumah hian enkawltu harsatna lai kalphung (Clause 7.14.5) hnuaia ni lo chuan bund emaw surplus weir an tan, an tihniam emaw an tichhia loh tur a ni.

Table 7C.2 — Level zela outlet setting (dil tin tan dah khah tur)

Dil level (m)	Sluice 1	Sluice 2	Regulator	Tui chhuak beisei (m³/s)	Hriat tur
Cushion level hnuai	[ ]	[ ]	[ ]	[ ]	
Cushion level aṭanga FTL thleng	[ ]	[ ]	[ ]	[ ]	
FTL (weir a luan liam ṭanna)	[ ]	[ ]	[ ]	[ ]	
FTL chung aṭanga MWL thleng	[ ]	[ ]	[ ]	[ ]	TBL thleng freeboard (tui sang ber chunga zau dah) endik (Clause 7.7.4(b))

7C.6 Forecast, hriattirna leh inbiakpawhna (Clause 7.8.1(e) leh (f))

20. Trigger leh hmalakna-te chu Table 7C.3-ah a awm.
21. He dan hnuaia tui chhuah tir hmain, kalpuitu chuan luanna hnuailam ULB-te leh district administration, leh mipui chu Schedule 5-a kawng sawi hmangin, forecast-in a phal chuan tui chhuah tir hma darkar [ ] tal a hriattir tur a ni.

Table 7C.3 — Trigger leh hmalakna (dil tin tan dah khah tur)

Trigger	Hnar	Hmalakna	Tuin nge
Catchment tan IMD district ruahpui hriattirna	IMD	Gauge darkar [ ] zelin chhiar; outlet a fai em endik; dil chu a dan level-ah emaw a hnuaiah a awm tih finfiah	[ ]
IMD emaw MSDMA red alert	IMD, MSDMA	Dan level thlen nan tui chhuah tir ṭan, tui chhuah tir zat sang ber chhungin; luanna hnuailam pawl-te hriattir (paragraph 21)	[ ]
Khawpui forecast system hriattirna, a awm chuan	[ ]	[ ]	[ ]
Dil level-in FTL a thlen	Gauge	Darkar tin tui chhuak chhinchhiah; bund leh weir endik	[ ]
Dil level-in [MWL − [ ] m] a thlen	Gauge	Harsatna lai kalphung; emergency action plan reng breach area hnena hriattirna (Clause 7.14.3(c))	[ ]

7C.7 Record leh endikna (Clause 7.8.1(g))

22. Fûr hun (April ni 1 aṭanga October ni 31 thleng) chhungin kalpuitu chuan nitin heng hi a chhinchhiah tur a ni: dil level, tui chhuah tir tin (hun, zat leh a rei zawng), leh gate setting tin. Fûr hun pawn lamah, record chu [kartin] vawn tur a ni.
23. Record-te chu O&M plan (Bung 10) nen vawn tur a ni a, Authority-in a phut chuan pek tur a ni.
24. Dil chu fûr hma (March ni 31 thlengin) leh ruahpui nasa tin hnuah endik tur a ni (Clause 7.14.4).
25. He dan hi dil-in [ ] m aia sang levelah tui a luan liam chanchin hnuah, weir, sluice emaw bund thlak danglamna hnuah (Clause 7.7.6), leh engpawh nise Kaihhruaina Bu endikna nen endik tur a ni.

Schedule-te: 1 stage–storage curve; 2 continuous simulation report; 3 tui chhuah zat leh compensation; 4 tui chhuah tir sang ber luanna hnuailam endikna; 5 inbiakpawhna list.

Belhchian 7D — Leidip laih chhuah leh siam ṭhat lehna specification

Bung 7-a Clause 7.7.1(b), 7.9 leh 7.14.4 a ṭanpui.

He specification hi Clause 7.9 hnuaia tank, dil tê emaw tui awmna dang leidip laih chhuah, siam ṭhat leh emaw tihthuk tin-ah hman a ni. Value-te chu Bung 7-a mi an ni. Bung-in value a ruat loh chuan, "design-ah finfiah tur" tih chhinchhiah a ni a, hna design-ah sawi tur a ni.

7D.1 Hna hma survey (Clause 7.9.1)

- (a) **Topographic leh bathymetric survey** tui zau zawng, kam (MWL contour thleng), bund, surplus weir leh sluice-te, Clause 7.3.5-a datum-a level. Survey grid leh point density: design-ah finfiah tur.
- (b) **Bed hmasa level** chu grid-ah test pit emaw auger hmanga zawn chhuah (grid inkar design-ah finfiah tur), leh record hlui a awm chuan chuta ṭangin. Pit log tin chuan leidip thuk zawng, bed hmasa level, leh a hnuaia clay emaw leidip layer reng a lantir tur a ni.
- (c) Dil-in urban ruahtui luang emaw ek tui a dawn chuan **leidip test**: (b)-a pit aṭanga sample, paih dan ruahman hmaa heavy metal leh tihbawlhhlawhtu dangte test. Parameter leh limit-te chu Mizoram Pollution Control Board (MPCB)-in a thupek ang a ni tur a ni.
- (d) **Structure-te:** bund dinhmun (tui chiar, a tlak, a kek, ramsa kua, thing), surplus weir leh sluice, Clause 7.14.4-a ang.
- (e) **Stage–storage curve awm sa** chu (a)-a survey aṭangin.

7D.2 Laih chin (Clause 7.9.2 leh 7.9.3)

- (a) Leidip laih chhuah hian 7D.1(b)-a bed hmasa level thleng bal khawm a laih chhuak a, a thuk zawk a laih lo.
- (b) Bed hmasa hnuai thleng tihthuk chu Clause 7.9.3(a) aṭanga (c) thleng tin lantirtu hydrogeological report nen chauh.
- (c) Sluice sill hniam ber hnuaia khawlna siam chu tuilian khawlna a ni lo, stage–storage curve siam ṭhatah chutiang anga tarlan loh tur a ni.
- (d) Laihna chu bund ke aṭanga design-a finfiah tur hlatzawngah awm tur a ni, bund nghehna a tihniam loh nan.

7D.3 Kam leh himna (Clause 7.9.4)

Mipuiin kam an thlen theihna hmunah:

- (a) **FTL chung 0.5 m** aṭanga **FTL hnuai 1.2 m** thleng sir pang **1V:4H** aia pang lo; emaw
- (b) **FTL hnuai 0.3 m leh 0.5 m** inkarah, a tlem berah **3 m** zau, himna bench zawl; leh
- (c) bed-ah khur thuk mahni chauh emaw cut tlakchhuk reng dah loh. Borrow pit-te chu bed thlengin tihzawl leh tur a ni.

7D.4 Khawlna tihtlem loh (Clause 7.9.5)

- (a) Tui zau zawng emaw kam chhunga thliarkar (island), kal kawng, tui zau zawng lama bund tihzauh, ring road, parking, in leh dil kam platform-te chu khawlna bo an ni.
- (b) Khawlna bo chu level inangah compensatory storage-in, band tin zelin, Form 7-3 hmangin thlak tur a ni.

7D.5 Leidip enkawl leh paih (Clause 7.9.6)

- (a) Leidip laih chhuah chu setback chhungah, bund chungah (bund tihchak phalna pek chauh lo chu), emaw tuilian kawng rengah dah loh tur a ni.
- (b) Leidip bawlhhlawh chu Mizoram Pollution Control Board (MPCB)-in a thupek angin paih tur a ni.
- (c) Phurh kawng leh hun lai khawlkhawmna-te chuan Clause 8.12-a sak lai erosion and sediment control dan, Zone 1 pawna khawlkhawmna pawh tiamin, an zawm tur a ni.

7D.6 Inlet-te (Clause 7.9.7)

Urban ruahtui luang thlentu inlet tin chuan Bung 8 hnuaia design (Belhchian 8D) sediment forebay, constructed wetland inlet zone emaw gross pollutant trap a nei tur a ni.

7D.7 Hun (Clause 7.9.8)

Leidip laih chhuah chu **March ni 31** thlengin zawh tur a ni a, tui awmna chu tihhim tur a ni. Fûr hun chhungin laihna hawng dah loh tur a ni a, sluice emaw weir phelh dah loh tur a ni.

7D.8 Zawhna record

- (a) As-built survey leh stage–storage curve siam ṭhat. Curve hi Clause 7.7.1(b)-in "leidip laih chhuah hnuhnung ber hnuah" ("after the last desilting") a phut kha a ni.
- (b) Tui zat (volume) laih chhuah, a paihna hmun, leh leidip test rah chhuah.
- (c) Bund, weir, sluice leh inlet hna thlalak.
- (d) Inventory record siam ṭhat (Belhchian 7A: SSC_DATE, LEVEL_DATE, CONDITION).

Table 7D.1 — Leidip laih chhuah leh siam ṭhat lehna hna tan hold point

Hold point	Endikna	Clause
1. Laih hmain	Hna hma survey, pit log, leidip test, leh tihthuk a nih chuan hydrogeological report	7.9.1, 7.9.3
2. Bed hmasa thlen	Level-te pit log nen khaikhin; phalna pek loh chuan bed hmasa hnuai laih a awm lo	7.9.2
3. Kam siam	7D.3 anga sir pang emaw himna bench	7.9.4
4. Inlet hna	Forebay, wetland inlet zone emaw GPT sak	7.9.7
5. Zawhna (March ni 31 thlengin)	As-built survey, stage–storage curve, leidip paihna record	7.9.8, 7.7.1(b)

Belhchian 7E — Mizo tui awmna thumal awmzia leh bial hrang hranga an danglamna

Bung 7-a Clause 7.2 leh Clause 7.3 a ṭanpui.

A hnuaia thumalte hi Mizoram-a tui awmna, tuikhur, channel, tuilian leh ram tana Mizo thumal an ni. Mizo ṭawng hi Roman hawrawpin ziah a ni a, thumal tam tak chu lui, dil leh hmun hmingah a lang (Chite lui, Ser lui, Palak Dil, Tam Dil, Zemabawktuikhur lui, Tuikhurhlu lui). **Belhchian 7A inventory-ah, field WB_NAME_LUS hian tui awmna hming Mizo ṭawngin a keng a, Table 7A.1-a "Mizo script" tih hian Mizo ṭawng a standard Roman ziah dan a kawk** (LUS hi Mizo ṭawng tana ISO 639-2 leh 639-3 code, *lus*, field hming dangte angin hawrawp lianin ziah a ni). Tui awmna tin tana Revenue, municipal, Village Council, District Council emaw NEEPCO record-a hming hman, leh khuain a hman hming chu, Kaihhruaina Bu thumal bulah inventory-ah ziah a ṭha. Awmzia hi dictionary pahnih, Internet Archive-a an scan thuziak copy chhiar, pakhata hmuh a nih chauhin a hnuaiah pek a ni: J. Herbert Lorrain leh Fred W. Savidge, *A Grammar and Dictionary of the Lushai Language (Dulien Dialect)* (1898), "L&S 1898" tia tarlan; leh Lalropara Pachuau, *English–Mizo Dictionary* (Saitual, 1997), a phêk number lak a nih loh avangin headword chauhin tarlan. **Fimkhurna pathum a awm.** L&S 1898 tana phêk number pek hi scan thuziak running head aṭanga ngaihtuah chhuah a ni a (phêk 213 leh 215 head inkara entry chu "pp. 213–215" tiin pek a ni), he belhchian hi innghah hmain phêk milem-ah endik tur a ni; Lorrain-a hnua a *Dictionary of the Lushai Language* (1940) leh J. F. Laldailova dictionary chhiar a ni lo; leh ziah dan hi dictionary-te ziah dan ngei a ni a, tunlai Mizo-in compound tam zawk chu a zawm (tuikhur, tuihawr). Awmzia hi dictionary-te English hrilhfiahna a ni a, tunlai hman dan chu a zim zawk emaw a zau zawk thei. Autonomous District Council area-a hman Lai, Mara leh Chakma ṭawng thumal-te hi he Kaihhruaina Bu tan zir chian a ni lo [TBC]. List hi State Stormwater Technical Committee-in, Mizo editor nen leh tunlai Revenue, municipal leh Village Council hman dan nen tihzauh tur a ni.

Mizoram-a dil lian emaw dil tê tana Kaihhruaina Bu thumal chu **dil** a ni a, a hman hmasak berah "**dil (lake emaw pond; dil tê, dil tê emaw tank tê)**" tiin ziah a ni. Dictionary pahnih hian lake leh pond atan an pe a, chuvangin tui ding pianphung leh laih a huam a, State dil hriat lar berte pawhin an keng (Palak Dil, Tam Dil). Mizo-ah plural chu *-te*-in chhinchhiah a ni a, chu chu *dil té*-a *té*, "small", nen a inpawlh thei; chuvangin English plural **dils** hi he Kaihhruaina Bu ziah dan a ni a, chhut hmain Mizo editor-in finfiah tur a ni. **tuikhur hi tank thumal a ni lo**: well, waterhole emaw spring a ni a, dan-ah "tui pekna lak theihna hmun reng reng" ("any place wherein water supply is obtained") a ni (Mizoram (Village Councils) Act, 2025, s.2(29)); a hman hmasak berah "**tuikhur (spring emaw water point)**" tiin ziah a ni a, he Kaihhruaina Bu-ah tuihna leh a chunga tui chhuahna siam tan chauh hman a ni. Engineer-in a siam detention basin chu dil emaw tuikhur tih ngai a ni lo: detention pond (ruahtui dah rihna dil siam) a ni. Dil pianphung chuan a hming ngei a vawng, Palak Dil ang, leh tuikhur chu ruahtui laka humhim a ni a, khawlna atan hman ngai a ni lo.

Table 7E.1 — Tui awmna leh tuikhur

Thumal	Awmzia (hnar)	Kaihhruaina Bu thumal (Clause 7.2)
dil	"(s.) a lake" (L&S 1898, pp. 81–83); "Lake, (s.) dil" (L&S 1898, English–Lushai part, phêk lak a ni lo); "lake: dil"; "pond: dil, tui tling reng" (Pachuau 1997)	Dil (lake emaw pond), Clause 7.2 hnua hrilhfiahna en rawh; hmingah, Palak Dil leh Tam Dil ang
dil té	"(s.) a pond, a tank" (L&S 1898, pp. 83–85); "Pond, (s.) dil-té" (L&S 1898, English–Lushai part, pp. 307–309)	Dil tê emaw tank tê; he bung tan dil a ni
tuikhur (tui-khur)	"(s.) a well, a waterhole" (L&S 1898, pp. 213–215); "Well, (s.) tui khur, tui-chhun-chhuah" (L&S 1898, English–Lushai part); "fountain: tuikhur"; "fount: tui khur" (Pachuau 1997); "any place wherein water supply is obtained" (Mizoram (Village Councils) Act, 2025, s.2(29)); "street hydrant" chu Ward Committee and Local Council Rules, 2010 Mizo thuziakah *vantlang tuikhur* tiin lehlin a ni	Tuikhur (spring emaw water point), Clause 7.2 hnua hrilhfiahna en rawh; detention pond emaw khawlna a ni ngai lo
hna; tuihna	"Hna, (s.) the source (of a stream), a spring" (L&S 1898, pp. 99–103); "spring (n) tuihna" (Pachuau 1997)	Lui hnar; tuihna, tui an lakna a nih chuan tuikhur angin ngaih

Table 7E.2 — Lui, drain leh tuilian

Thumal	Awmzia (hnar)	Kaihhruaina Bu thumal (Clause 7.2)
lui	"(s.) a stream, a river" (L&S 1898, pp. 137–139); "stream: lui te" (Pachuau 1997)	Lui (stream), Clause 7.2 hnua hrilhfiahna en rawh; hmingah, Chite lui leh Ser lui ang
lui-pui	"(s.) a river" (L&S 1898, pp. 137–139)	Luipui (river)
tui luankawr	"drain: tui luankawr"; "ditch: tui luankawr (laihchawp)" (Pachuau 1997)	Drain emaw laihkawr, siam emaw tui-in a laih
tui-hawr	"(s.) a gutter, a ditch" (L&S 1898, pp. 213–215); "Ditch, (s.) tui-hawr"; "Gutter, (s.) tui-hawr, kawm" (L&S 1898, English–Lushai part)	Drain emaw laihkawr, kawng sir ang; tunlai ziah danin *tuihawr*
kawm	"(s.) a gutter cut in the ground under the eaves" (L&S 1898, pp. 115–119)	In chhuang hnuaia tui tlakna laihkawr; local chauh
tui lian	"flood: tui lian; luangliam" (Pachuau 1997)	Tuilian (tunlai hman dan)
tui lét	"(s.) a flood, (v.) to be a flood" (L&S 1898, pp. 215–217); "Flood, (s.) tui lét" (L&S 1898, English–Lushai part)	Tuilian (hman dan hlui)

Table 7E.3 — Ram leh hna

Thumal	Awmzia (hnar)	He Kaihhruaina Bu-a hman dan
lei min	"Landslip, (s.) lei min" (L&S 1898, English–Lushai part, pp. 289–291)	Leimin (landslide emaw landslip)
kor	"Ravine, (s.) kor, kor-dung" (L&S 1898, English–Lushai part, pp. 313–315)	Kor (ravine); ha 8 emaw a aia tam a luan khawm chuan Clause 7.4.1(b) hnuaia channel pianphung
tui-khuah	"(s.) a dam, (v.) to dam up water" (L&S 1898, pp. 213–215; scan headword a ṭhen chhiar theih a ni lo)	Dam emaw check dam; ziah dan finfiah tur (Table 7E.4)

Table 7E.4 — Thumal leh ziah dan finfiah loh

Heng thumal, ziah dan emaw awmzia-te hi he Kaihhruaina Bu tana zirchian laiin finfiah a ni lo. Finfiah a nih hma chu record emaw drawing-ah thumal hrilhfiah angin hman loh tur a ni.

Thumal emaw ziah dan	Awmzia emaw hman dan sawi	Dinhmun
tui-khuah	Dam	Scan headword a ṭhen chhiar theih a ni lo; ziah dan chu phêk milem-ah leh Mizo editor nen finfiah tur
dils	He Kaihhruaina Bu English plural *dil* tan	He Kaihhruaina Bu ziah dan (Mizo *-te* chu *té*, "small", nen a inpawlh thei); Mizo editor-in finfiah tur
Tunlai ziah dan zawm (tuikhur, tuihawr)	Dictionary-te chuan compound tam zawk chu hrang emaw hyphen nen an chhut	Tunlai ziah dan chu chhut hmain Mizo editor-in finfiah tur
L&S 1898 phêk number	Table 7E.1 aṭanga 7E.3 thlenga tarlan angin	Scan thuziak running head aṭanga ngaihtuah chhuah; phêk milem-ah endik tur
Pachuau 1997 phêk number	Headword-in tarlan	Lak a ni lo
Lai, Mara leh Chakma thumal	Autonomous District Council area-a tui awmna leh tuikhur tana thumal	He Kaihhruaina Bu tan zir chian a ni lo [TBC]

Kaihhruaina Bu hian Table 7E.1 aṭanga 7E.3 thlenga column hnuhnung ber thumalte leh Clause 7.2 hnua Mizoram thumal hrilhfiahte a hmang.

Form 7-1 — Tui Awmna Sheet

Bung 7-a Clause 7.3.2, 7.4 leh 7.15(1) a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Tui awmna tin tan sheet pakhat. Clause 7.3.2-a plan chu 1:1,000 emaw a aia lian zawkah belh rawh.

Table 7F.1 — Form 7-1, Section A: Project leh tui awmna

No.	Field	Ziah luh tur	Clause
A1	Project hming leh Authority file number	_____	—
A2	Tui awmna hming (English leh Mizo) leh inventory ID (Belhchian 7A), a awm chuan	_____	7.3.1
A3	Tui awmna chi (Clause 7.2)	_____	7.2
A4	A awmna: site chhungah / site ramri aṭanga m 100 chhungah / luanna hnuailamah Bung 5 huam chin chhungah	_____	7.3.2
A5	Survey number leh khua	_____	7.3.1(a)
A6	Enkawltu (custodian)	_____	7.3.1(b)
A7	Hnar endik (chhinchhiah rawh): Land Revenue & Settlement record leh land pass, Village Council allotment, District Council ram record, Municipal Corporation (ss.80 leh 289) record, Master Plan for Aizawl map, Landslide Hazard Maps, NEEPCO record, tuikhur inventory, drain register □; NEEPCO / Village Council register □; Authority inventory emaw court list □; map hlui leh imagery, NWIA pawh tiamin □; site survey □	_____	7.3.3
A8	Hnar a inang loh chuan: eng zau zawng nge thunun (a lian zawk)	_____	7.3.3
A9	Level zawng zawng datum, leh NEEPCO datum aṭanga thlak danglamna	_____	7.3.5

Table 7F.2 — Form 7-1, Section B: Level leh a thil awmte

No.	Field	Ziah luh tur	Clause
B1	FTL (tank, dil, dil tê) emaw kam chhip (channel), m	_____	7.2
B2	MWL (dil), m, leh a bul (NEEPCO record emaw 1% AEP chhut)	_____	7.2
B3	TBL, a hniam berna (dil), m	_____	7.3.1(d)
B4	1% AEP tuilian sang zawng, m, leh a hnar (map pawm / hydraulic zirchianna / a awm lo)	_____	7.3.4
B5	Site-a drainage area (channel), ha	_____	7.4.1(b)
B6	Tui petu channel, surplus course, sluice leh surplus weir plan-a tarlan (aw / aih)	_____	7.3.2
B7	Luah hnehna hriat sa, a chhinchhiah ni nen	_____	7.3.1(g)

Table 7F.3 — Form 7-1, Section C: Setback

No.	Field	Ziah luh tur	Clause
C1	Setback bul: map-a zau zawng / hydraulic zirchianna / zau zawng nghet (Belhchian 7B)	_____	7.15(1)
C2	Clause 7.3.4 (a) / (b) / (c) hnuaiah hydraulic zirchianna a ngai em?	_____	7.3.4

No.	Field	Ziah luh tur	Clause
C3	Floodway pawn lam ramri, FTL emaw kam chhip aṭanga m, leh a tehfel dan	_____	7.6.1
C4	Zone 1 zau zawng, m (15 m, floodway ramri, MWL contour zinga a lian ber)	_____	7.4.3
C5	Zone 2 zau zawng, m (1% AEP zau zawng + 10 m thleng, emaw 10 m)	_____	7.4.4
C6	Dan anga emaw phalna setback zau zawk, a awm chuan, leh a hnar	_____	7.4.5
C7	Setback hman: Kaihhruaina Bu standard / dan, plan emaw phalna ri zau zawk: Aizawl Municipal Corporation-in site tan a zau zawng a ruat chuan SD&SM reg. 28-a riverine reserve (regulation-in a hrilhfiah lo); septic tank emaw soak pit leh tui hnar inkara 15 m (AMCBR reg. 33); master plan-a drainage channel lian kam 15 m green buffer (rawtna) emaw a "SL" zone; April 2021-a chhuah nia report executive notification hnuaia luipui laiah aṭanga restricted zone, site-ah a hman chuan (thuziak chhiar a ni lo [TBC]; dan anga buffer a ni ngai lo); River Conservation Zone, Rivers dan hman mek a nih a, zone notify a nih chauhin (pahnih hi finfiah a ni lo); SD&SM regs. 4, 14 emaw 26-a tlang pang ri; notify a nih wetland, reserve forest emaw ramngaw ram ramri; court emaw Tribunal ri; NEEPCO, power department emaw IWRD ri; District Council ri; emaw dang (sawi rawh)	_____	7.4, Inpuanna
C8	Zone 1 leh Zone 2-a hman dan rawt, leh Zone 1-a hna reng tan enkawltu NOC	_____	7.5, 7.15(5)
C9	Flood fringe-a lei vur rawt (aw / aih); aw a nih chuan Form 7-3 belh	_____	7.6.3
C10	Zone 1 chhinchhiahna dahna hmun tarlan (m 30 aia hla lo inkarah)	_____	7.13.4

Table 7F.4 — Form 7-1, Section D: Buatsaihtu

Field	Ziah luh tur
Hming, registration leh empanelment number (Clause 10.6)	_____
Signature leh ni	_____
Level tan licensed surveyor (hming, licence number)	_____

Form 7-2 — Dil Khawlna Credit Sheet

Bung 7-a Clause 7.7, 7.8, 7.11, 7.14 leh 7.15(4) a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Khawlna chhiar dil tin tan sheet pakhat. Section B-a thil pakhat emaw a tlin loh khawlna chu chhiar loh tur a ni (Clause 7.7.1).

Table 7F.5 — Form 7-2, Section A: Dil leh scheme

No.	Field	Ziah luh tur	Clause
A1	Dil hming leh inventory ID (Belhchian 7A); enkawltu	_____	7.3.1
A2	Khawlna chhiarna scheme: basin plan / regional facility / fee-in-lieu (S-5)	_____	7.7.1, 7.11
A3	Cascade model: a chung ber dil _____ aṭanga outfall _____ thleng	_____	7.7.2
A4	Datum	_____	7.3.5

Table 7F.6 — Form 7-2, Section B: Khawlna chhiar theihna dinhmun

No.	Dinhmun	Ni / reference	A tling em (aw / aih)	Clause
B1	FTL, MWL, TBL, weir crest leh sei zawng, sluice sill kum 5 kal ta chhunga survey	_____	_____	7.7.1(a)
B2	Kum 5 chhunga emaw leidip laih chhuah hnuhnung ber hnua, a hnu zawk zawk, bathymetric leh topographic survey aṭanga stage–storage curve	_____	_____	7.7.1(b)
B3	Enkawltu nena inrem kalpui dan ziak (Belhchian 7C)	_____	_____	7.7.1(c), 7.8
B4	Weir, sluice leh bund O&M plan hnuaiah; fûr hma endikna hnuhnung berin hman theih a ti	_____	_____	7.7.1(d), 7.14.4
B5	Enkawltu inremna (concurrence) ziak	_____	_____	7.7.1(e)

Table 7F.7 — Form 7-2, Section C: Level leh credit theih tui zat

No.	Thil	Value	Clause
C1	Ṭan level: FTL, emaw Clause 7.8.2 tlin dan hnuaia cushion level, m	_____	7.7.3
C2	Cushion hman a nih chuan: thunun theih outlet (chi) leh drawdown hun, h	_____	7.8.2(a)
C3	Cushion hman a nih chuan: continuous simulation aṭanga rintlakna, fûr hun % (≥ 90%)	_____	7.8.2(c)
C4	Level sang ber chhut, climate factor nena 1% AEP tui lut cascade kaltlanga route, m	_____	7.7.4
C5	MWL, m; C4 ≤ MWL em?	_____	7.7.4(a)
C6	C4 aṭanga TBL thleng freeboard, m; NEEPCO freeboard standard, m; a tling em?	_____	7.7.4(b)
C7	C1 leh C4 inkara khawlna, stage–storage curve aṭangin, m³	_____	7.7.5
C8	Facility emaw scheme dang tana hman tawh tui zat, m³	_____	7.7.5
C9	Credit theih tui zat = C7 − C8, m³	_____	7.7.5
C10	Clause 10.17 hnuaia register entry (fee-in-lieu khawlna)	_____	7.11.2(d)

Table 7F.8 — Form 7-2, Section D: Bund himna

No.	Thil	Ziah luh tur	Clause
D1	Dam Safety Act, 2021 hnuaia specified dam em? Sang zawng, crest sei zawng, capacity, tuilian tui luang sang ber	_____	7.14.1
D2	Hlauhawmna class: sang / hniam	_____	7.14.2
D3	Hlauhawmna sang: weir-in freeboard nen MWL-ah 1% AEP a luan tir; 0.2% AEP endikna chung lam luan liam lovin	_____	7.14.3(a)
D4	Hlauhawmna sang: breach analysis leh emergency action plan (reference)	_____	7.14.3(b), (c)
D5	Hlauhawmna sang: Clause 10.6 hnuaia endiktu hrang endikna (hming)	_____	7.14.3(d)

Table 7F.9 — Form 7-2, Section E: Signature

Mawhphurhna	Hming leh designation	Signature leh ni
Designer (Clause 10.6)	_____	_____
Endiktu hrang, Clause 7.14.3(d) a hman chuan	_____	_____
Enkawltu inremna (Clause 7.7.1(e))	_____	_____

Form 7-3 — Compensatory Storage Chhutna (sanzawng band zelin)

Bung 7-a Clause 7.6.3 aṭanga 7.6.5 thleng, 7.9.5 leh 7.15(3) a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

Kalphung

1. **Chin hniam** ruat rawh: tui awmna tui level pangngai, emaw a sang zawk a nih chuan 50% AEP (kum 2) level (Clause 7.6.4(b)).
2. **Chin sang** ruat rawh: 1% AEP tuilian sang zawng (climate factor nen).
3. Inkar chu **m 0.3 aia thuk lo band**-ah ṭhen rawh. A chung ber band chu a pan lo zawk thei.
4. Band ramri-a level z tin tan, plan-ah teh rawh:
    - A_fill(z): lei awm sa chu z hnuaia a awmna lei vur hmun area; leh
    - A_cut(z): lei siam zawh chu z hnuaia a awm a, lei awm sa chu z chunga a awmna laihna area (tuilian area thar).
5. Band tin tan, average end-area kalphungin: V = (A(z_bottom) + A(z_top)) / 2 × band thuk zawng. Hei hi lei vur (tui zat bo) leh laihna (tui zat hmuh) tan ti rawh.
6. **Band tin endik rawh:** tui zat hmuh ≥ tui zat bo. Band pakhata a tam chuan band dang tlakchham a thuhruk thei lo (Clause 7.6.4(b)).
7. Clause 7.6.4(c) aṭanga (f) thlenga dinhmun dangte chu Section C-ah endik rawh.

Kalphung hi Bung 7-a Milem 7.2-in a lantir.

Table 7F.10 — Form 7-3, Section A: Level-te

No.	Field	Ziah luh tur	Clause
A1	Tui awmna, lui chhung, leh inventory ID	_____	7.6.4(c)
A2	Tui level pangngai, m; 50% AEP level, m; chin hniam (a sang zawk), m	_____	7.6.4(b)
A3	Climate factor nena 1% AEP tuilian sang zawng, m (chin sang)	_____	7.6.4(b)
A4	Band thuk zawng, m (≤ 0.3) leh band zat	_____	7.6.4(b)
A5	Datum	_____	7.3.5

Table 7F.11 — Form 7-3, Section B: Band tin zela inmilna

Band	Aṭanga (m)	Thleng (m)	A_fill hnuai (m²)	A_fill chung (m²)	Tui zat bo (m³)	A_cut hnuai (m²)	A_cut chung (m²)	Tui zat hmuh (m³)	Hmuh ≥ bo em?
1	_____	_____	_____	_____	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____	_____	_____	_____	_____
A vaiin					_____			_____	

A ngaih ang zelin row belh rawh.

Table 7F.12 — Form 7-3, Section C: Dinhmun dangte

No.	Dinhmun	A tling em (aw / aih) leh finfiahna	Clause
C1	Lei vur chu floodway ni lovin flood fringe-ah a awm, hman dan phalah	_____	7.6.2, 7.6.3
C2	Laihna chu tui awmna inang lui chhung inangah a awm, hydraulic taka inzawm, lei vur aia luanna hnuailam lamah a hla lo	_____	7.6.4(c)
C3	Tuilian a kian zelin laihna chu amah ngeiin (gravity) a ruak; pumping a awm lo; tui level pangngai hnuaiah tui dil reng a awm lo	_____	7.6.4(d)
C4	Laihna chu lei vur hmain, emaw a rual vekin siam	_____	7.6.4(e)
C5	Vur khah ngai loh nan covenant emaw hlanna (reference)	_____	7.6.4(f)
C6	Bung 4 hnuaia detention emaw retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) anga chhiar loh	_____	7.6.5
C7	Designer signature (Clause 10.6) leh ni	_____	10.6

Chhut dan entirna

Entirna chauh — design value a ni lo. Channel flood fringe-a site pakhatin Zone 2 hman dan phal (Clause 7.5.2) tan lei vur pad a mamawh. Input-te chu ngaihtuah lawk a ni.

- Tui level pangngai 10.00 m; 50% AEP level 9.80 m. Chin hniam = 10.00 m (a sang zawk).
- 1% AEP tuilian sang zawng 11.20 m. Inkar 1.20 m, chuvangin 0.30 m band pali.
- Lei vur hmun hi 1,600 m² a ni. Lei awm sa chu hmun pumpuiah 10.00 m aṭanga 11.20 m thlengin a inang zelin a sang a, chuvangin level tin hnuaia hmun area chu: 10.00 m-ah 0 m²; 10.30 m-ah 400 m²; 10.60 m-ah 800 m²; 10.90 m-ah 1,200 m²; 11.20 m-ah 1,600 m².
- Laihna chu channel bula grade-a cut a ni a, a chhuat 10.00 m-ah. Level tin hnuaia tuilian area thar (tihchhin hmasa) chu: 10.00 m-ah 300 m²; 10.30 m-ah 900 m²; 10.60 m-ah 1,100 m²; 10.90 m-ah 1,500 m²; 11.20 m-ah 1,500 m².

Step 1 — tui zat bo, band tin zelin (V = area chawhrual × 0.3 m):

- Band 1: (0 + 400) / 2 × 0.3 = 60 m³
- Band 2: (400 + 800) / 2 × 0.3 = 180 m³
- Band 3: (800 + 1,200) / 2 × 0.3 = 300 m³
- Band 4: (1,200 + 1,600) / 2 × 0.3 = 420 m³
- A vaiin: 960 m³

Step 2 — tui zat hmuh, tihchhin hmasa:

Table 7F.13 — Chhut dan entirna: tihchhin hmasa (entirna chauh)

Band	Aṭanga (m)	Thleng (m)	Tui zat bo (m³)	A_cut hnuai (m²)	A_cut chung (m²)	Tui zat hmuh (m³)	Hmuh ≥ bo em?
1	10.00	10.30	60	300	900	180	Aw
2	10.30	10.60	180	900	1,100	300	Aw
3	10.60	10.90	300	1,100	1,500	390	Aw
4	10.90	11.20	420	1,500	1,500	450	Aw
A vaiin			960			1,320	

Band tin a tling. Hriat chian tur chu, entirnan cut chu a thuk zawk leh a zim zawka siam a nih chuan, a vaia inmilna chauh chuan a tlin lohna a thup thei: designer-in chu aiah 10.00 m-ah 1,400 m², 10.30 m-ah 1,400 m², 10.60 m-ah 1,000 m², 10.90 m-ah 600 m² leh 11.20 m-ah 200 m² tuilian area thar nei cut rawt ta se.

Table 7F.14 — Chhut dan entirna: cut thuk zawk, zim zawk (entirna chauh)

Band	Aṭanga (m)	Thleng (m)	Tui zat bo (m³)	A_cut hnuai (m²)	A_cut chung (m²)	Tui zat hmuh (m³)	Hmuh ≥ bo em?
1	10.00	10.30	60	1,400	1,400	420	Aw
2	10.30	10.60	180	1,400	1,000	360	Aw
3	10.60	10.90	300	1,000	600	240	**Aih**
4	10.90	11.20	420	600	200	120	**Aih**
A vaiin			960			1,140	

Tui zat hmuh vaiin (1,140 m³) hian tui zat bo vaiin (960 m³) a khum a, mahse band 3 leh 4 chu 60 m³ leh 300 m³-in an tlakchham. A hnuai lama a tam chu an tan chhiar theih a ni lo: hnuai lama khawlna chu tuilian tinah a hmain a khat a, lei vurin peak hnaia khawlna a lak laiin a awm tawh lo. He design hi Clause 7.6.4(b) a tling lo a, band chung lam-te chuan an bo ang tal an hmuh nan siam ṭhat leh (regrade) ngei ngei tur a ni, tihchhin hmasaa ang hian.

BUNG 8 BELHCHIAN

Tui Ṭhatna leh Recharge

Heng belhchiante hian Bung 8 an ṭanpui. Tui ṭhatna ruahtui tlak table-te ruangam, Level of Service leh Value Rating kalphung kimchang, BMP calibration programme ruangam, BMP tin tan design sheet, hnathawh laia erosion leh sediment control (lei kaih leh leidip thununna) standard detail, leh Clause 8.14-in a phut form pahnih an pe. Belhchian 8A leh 8C hian data la awm lo a mamawh a; chu chu an sawi a, chu chhung hman tur dan an pe. Form-te hi draft form an ni.

Belhchian 8A — Zone zela 3-month ARI darkar 24 zat leh IDF

Bung 8-a Clause 8.2, 8.4.1 leh 8.4.5 a ṭanpui.

Buatsaih tur. He belhchian hian Bung 2 ruahtui zone tin tan, darkar 24 3-month ARI (thla 3 zela vawi khat a lo thlen ṭhin) zat P_3m leh Q_wq tana hman 3-month ARI intensity–duration inzawmna a keng ang. Ni tin leh ni khat aia tawi (sub-daily) ruahtui tlak record rei tak (IMD station leh grid data, NIH chu Bung 2 hnar ber atan), partial-duration series anga zirchian, a mamawh. A tlangzarh hma chuan, design siamtu (designer) chuan site zone tana ni tin record rei ber awm aṭangin P_3m chu a chhut tur a ni, kum khatah chawhrual vawi li a inang emaw a pel ṭhin darkar 24 zat angin (Clause 8.2), record, a rei zawng leh kalphung chu Tui Ṭhatna Sheet (Form 8-1)-ah a tarlang tur a ni a, P_wq = max (P_ret, P_3m) a hmang tur a ni (Clause 8.4.1). Climate factor hman a ni lo (Clause 8.4.3).

8A.1 Belhchian buatsaih nana kalphung hman tur

- (a) A awm chuan kum 30 tal ni tin record hmang rawh (Bung 2-a station IDF ang).
- (b) Darkar 24 zat partial-duration series siam rawh, event inzawm lo-te chu ni ro khat tal inkar nen.
- (c) A chunga event zat chu kum khatah chawhrual vawi li a nih theih nan threshold thlang rawh; P_3m chu chu threshold chu a ni.
- (d) Minute 10 aṭanga darkar 24 thleng duration tan 3-month ARI intensity chu ni khat aia tawi record aṭangin, emaw ni tin value aṭanga scale Bung 2 kalphung hmangin chhut chhuak rawh, khawi nge tih sawiin.
- (e) Climate factor hmang suh (Clause 8.4.3).

Table 8A.1 — Zone zela tui ṭhatna ruahtui tlak zat (layout)

Zone (Bung 2)	Station emaw grid aiawhtu	Record (kum)	P_ret, Belhchian 2E (mm)	P_3m (mm)	P_wq = max (mm)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Table 8A.2 — Duration zela 3-month ARI intensity (layout)

Zone	10 min (mm/h)	15 min (mm/h)	30 min (mm/h)	1 h (mm/h)	2 h (mm/h)	6 h (mm/h)	24 h (mm/h)
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

Belhchian 8B — Siam ṭhatna (redevelopment) LoS table leh treatment-train composite VR

Bung 8-a Clause 8.6.2 aṭanga 8.6.5 thleng a ṭanpui.

8B.1 Siam ṭhatna tana Level of Service mamawh

Buatsaih tur. He ṭhen hian siam ṭhatna site (site-a tui luh theih lohna hmun (impervious) awm mek 20% emaw a aia tam, Clause 8.6.2) tana Level of Service mamawh a pe ang. MARC/APWA BMP Manual (2012, Table 4.3) chuan siam ṭhatna LoS chu tihbuai area chhunga impervious cover percentage aṭangin a ruat; Mizoram value-te chu State Stormwater Technical Committee-in a ruat ang a, local siam ṭhatna case-te nena endik a ngai. A tlangzarh hma chuan, siam ṭhatna site tana LoS mamawh chu tihbuai area tan **6** a ni. Table 8.2, dinhmun awm mek aṭanga post-development thlenga CN danglamna-ah hman, chuan LoS sang zawk a pek chuan, chu LoS sang zawk chu hman a ni. He interim value hi he Kaihhruaina Bu-in a ruat a ni. Bung 4 hnuaia a WQv pum site-a khawl siam ṭhatna site chuan, pretreatment, hotspot control leh outfall (drain tui luan chhuahna) mamawh (Clause 8.4.4) bakah, chu area tan tihfaina dang a mamawh lo.

Table 8B.1 — Siam ṭhatna tana LoS mamawh (layout)

Tihbuai area chhunga impervious cover awm mek (%)	Impervious cover danglamna	LoS mamawh
_____	_____	_____
_____	_____	_____
_____	_____	_____

8B.2 Composite Value Rating: area-weighted kalphung

Site composite VR chu site ṭhen tin chhawmtu BMP-te VR area-weighted chawhrual a ni (Clause 8.6.3):

> $VR_{site} = \Sigma (A_i \times VR_i) / \Sigma A_i + VR_{signage}$

hetah hian:

- A_i = site ṭhen i zau zawng, ha;
- VR_i = ṭhen i chhawmtu BMP Value Rating (Table 8.3), BMP chuan A_i pum tan Clause 8.6.4 a tlin chauhin chhiar a ni;
- ΣA_i = site zau zawng pum: site ṭhen tin chu BMP pakhatah, emaw thing leh hnim pianpui humhalh (preserved native vegetation)-ah ruat a ni; BMP-in a chhawm loh ṭhen chu $VR_i = 0$ nen ziah a ni; leh
- $VR_{signage}$ = 0.25 mipui zirtirna signage a awm chuan (Table 8.3), a nih loh chuan 0.

$VR_{site} \geq$ LoS mamawh a nih chuan site chuan dan a zawm (Clause 8.6.3).

Entirna chauh — design value a ni lo. Site 1.0 ha, siam ṭhatna ni lo, ΔCN = 18. LoS mamawh = 8 (Table 8.2).

Table 8B.2 — Chhut dan entirna: composite VR (entirna)

Ṭhen	Zau zawng A_i (ha)	BMP	VR_i (Table 8.3)	A_i × VR_i
Bioretention-a luang in chung leh paving	0.60	Bioretention	8.5	5.100
Car park	0.25	Permeable pavement	7.5	1.875
Ramri zawh hmun humhalh	0.15	Thing leh hnim pianpui (humhalh)	9.25	1.388
A vaiin	1.00			8.363

- Area-weighted VR = 8.363 / 1.00 = 8.36
- Signage awm: + 0.25
- VR_site = 8.61 ≥ 8. Site chuan dan a zawm.

Permeable pavement tel lovin (car park tihfai lova luang, VR = 0): (5.100 + 0 + 1.388) / 1.00 + 0.25 = 6.74 < 8. Site chuan dan a zawm lo ang.

8B.3 Treatment train

Buatsaih tur. He ṭhen hian BMP indawt (treatment train (tihfaina kalphung indawt)) composite VR a pe ang, MARC/APWA BMP Manual (2012, Table 4.6) kalphung zuiin, Clause 8.13.4 calibration programme (Belhchian 8C)-in Mizoram tan value a nemnghet turin. A tlangzarh hma chuan, site ṭhen tin chu chu ṭhen tan Clause 8.6.4 tlin train-a BMP pakhat VR, a tlangpuiin luan chhuah hma BMP hnuhnung ber, chhiar sak a ni a, BMP indawt tan credit belh a awm lo. Credit nei BMP chunglama pretreatment device, silt trap (leidip dawnna) leh oil-grit separator-te hian VR an nei hran lo (Clause 8.6.4(c), 8.7.11(c) leh 8.7.12(c)).

Table 8B.3 — Treatment train composite VR (layout)

BMP hmasa	BMP pahnihna	Composite VR	Condition
_____	_____	_____	_____
_____	_____	_____	_____

Belhchian 8C — Mizoram BMP hnathawh calibration

Bung 8-a Clause 8.6.3, 8.13 leh 8.15.1 a ṭanpui.

Buatsaih tur. He belhchian hian State Stormwater Technical Committee BMP hnathawh calibration programme (Clause 8.13.4) a report ang: Mizoram-a BMP sak-te inflow leh outflow concentration leh tui zat tehte, leh chung aṭanga Value Rating siam ṭhat-te. Fûr hun (monsoon season) engemaw zat chhunga BMP-te ruah sur laia monitoring, CPCB kalphung anga laboratory analysis nen, leh Clause 10.17 hnuaia tlangzarh Clause 8.13.1-a outfall monitoring a mamawh. A tlangzarh hma chuan, Table 8.3-a Value Rating (MARC/APWA 2012) hman a ni a, proprietary device chuan test data finfiah aṭangin chauh VR a nei thei (Table 8.3).

A hnuaia ruangam-te hian programme-in a vawn tur record tlem ber a ruat, authority hrang hrang result-te an chawhkhawm theih nan.

Table 8C.1 — Monitoring site register (layout)

Site ID	BMP chi (Table 8.3)	Awmna leh authority	Catchment (ruahtui luan khawmna hmun) zau zawng (ha)	Impervious (%)	Lei leh leihnuai tui dinhmun	Hman ṭan ni	Pretreatment
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

Table 8C.2 — Event record (layout; Clause 8.13.2 parameter-te)

Site ID	Event ni	Ruahtui tlak (mm)	Inflow tui zat (m³)	Outflow tui zat (m³)	TSS lut / chhuak (mg/L)	BOD lut / chhuak (mg/L)	COD lut / chhuak (mg/L)	Faecal coliform lut / chhuak (MPN/100 mL)	TN lut / chhuak (mg/L)	TP lut / chhuak (mg/L)	Oil leh grease lut / chhuak (mg/L)	Heavy metal (industrial catchment)
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

Table 8C.3 — Hnathawh tlangpui leh VR rawt (layout)

BMP chi	Site	Event	Tui zat tihtlem (%)	Median effluent TSS (mg/L)	Hmuh dang	Table 8.3-a VR	VR rawt
_____	_____	_____	_____	_____	_____	_____	_____

Belhchian 8D — BMP design sheet, media specification, thing leh hnim tarlanna

Bung 8-a Clause 8.5, 8.7, 8.8 leh 8.11 a ṭanpui.

Design sheet tinin BMP pakhat tana Bung 8 mamawh-te a khawm. Clause 8.7.1-a "ṭan nana value rawt" tia chhinchhiah value-te chu chhan nen kalsan phal a ni. He Kaihhruaina Bu-in a ruat loh value-te chu "design-ah finfiah tur" tia chhinchhiah a ni; design siamtu chuan a sawi leh a chhan a pe tur a ni. BMP tinin heng hi a mamawh bawk: WQv emaw Q_wq tana size (Clause 8.6.4(a)), pretreatment (Clause 8.5.3), Q_wq aia tam tui luang tan bypass him (Clause 8.4.6) leh enkawlna kalna (maintenance access) (Bung 10).

8D.1 Design sheet

Table 8D.1 — Pretreatment (BMP zawng zawng)

Thil	Mamawh	Clause
A ngaihna	Bioretention cell, infiltration facility, run-on dawng permeable pavement, wet pond leh constructed wetland zawng zawngah, inflow khawm tinah	8.5.3
Chi	Sediment forebay, grass filter strip, silt trap emaw proprietary device	8.5.3
Size	A ruahtui luang lut zau zawng WQv 10% tal a khawl; emaw Q_wq tan size (flow-through device)	8.5.3
Kalna (access)	BMP ber luh emaw tihbuai lovin tihfai theih	8.5.4

Thil	Mamawh	Clause
Silt trap leh catch pit	Paving nei lo lei aṭanga ruahtui luang (runoff) dawng inlet (luan lutna) tinah, leh BMP emaw tui awmna (waterbody)-a luang drain (tui luanna) tin inlet-ah; sump chu outlet invert aia 300 mm tal hniam; VR an nei lo	8.7.12

Table 8D.2 — Bioretention leh rain garden (Milem 8.2)

Thil	Mamawh	Clause
Ponding thuk zawng	Mulch chunga ≤ 300 mm, ponding level sang berah overflow nen	8.7.2(a)
Ponding drawdown	Darkar 48 chhungin	8.7.2(b)
Filter media	600–900 mm engineered sandy loam, fines tlem, phosphorus tlem (Table 8D.12)	8.7.2(c)
Mulch	50–75 mm	8.7.2(c)
Transition (choker) leh gravel drainage layer	A ngai; thuk zawng leh grading chu design-ah finfiah tur	8.7.2(d)
Underdrain	Perforated; design infiltration rate-in darkar 48 drawdown a tlin theih lohnaah, emaw lined a nihnaah a ngai; diameter chu design-ah finfiah tur	8.7.2(e)
Lining	Clause 8.8 tlin theih lohnaah, leh hotspot-ah a ngai	8.7.2(f)
Thing leh hnim	Pianpui emaw naturalise tawh, tui chiah leh ni ro rei tuar thei (Table 8D.13 leh 8D.14)	8.7.2(g)
VR	8.5 (rain garden / infiltration 9.0)	Table 8.3

Table 8D.3 — Vegetated swale

Thil	Mamawh	Clause
Cross-section	Trapezoidal emaw parabolic; side slope chu 1V:3H aia chhoh lo	8.7.3(a)
Longitudinal slope	0.5% aṭanga 4% thleng; a chhoh zawknaah check dam	8.7.3(b)
Q_wq-a tui luang	Thuk zawng chu hnim sang zawng aia tam lo; velocity ≤ 0.3 m/s	8.7.3(c)
1% AEP emaw bypass flow	Erosion a awm lo (Bung 9 permissible velocity)	8.7.3(d)
Underdrain nei ("dry") swale	Slope < 1% emaw lei hnuai lam tui a luan chhuah ṭhat lohnaah; filter media Table 8D.12 angin	8.7.3(e)
VR	4.0 (native vegetation swale)	Table 8.3

Table 8D.4 — Vegetated filter strip

Thil	Mamawh	Clause
Inflow	Sheet flow chauh; tui khawm a lo thlennaah level spreader	8.7.4(a)
Tui luan zawnga a sei zawng	≥ 5 m	8.7.4(b)
Slope	1% aṭanga 8% thleng	8.7.4(b)
Hman dan	Bioretention, infiltration leh swale tana pretreatment atan ber	8.7.4(c)
VR	5.0	Table 8.3

Table 8D.5 — Permeable pavement

Thil	Mamawh	Clause
Run-on	Impervious run-on zau zawng ≤ 2 × permeable zau zawng; paving nei lo emaw erosion awmna aṭanga a awm lo	8.7.5(a)
Base reservoir	Aggregate fai open-graded, a void-ah WQv a chanvo khawl; void ratio chu test-in nemnghet	8.7.5(b)
Open (infiltrating) base	Clause 8.8 tlin a nihnaah chauh; a nih loh chuan underdrain nen lined a ni a, filtration chauh angin chhiar	8.7.5(c)
Structure	Kawng authority standard anga traffic loading tan design	8.7.5(d)
Hman lohna	Hotspot-ah hman loh; tui luh theih loh thil hmanga resurface a nih dawnnaah hman loh	8.7.5(e)
VR	7.5	Table 8.3

Table 8D.6 — Infiltration trench leh basin (Milem 8.3)

Thil	Mamawh	Clause
Pretreatment	Engtik lai pawhin (Table 8D.1)	8.7.6(a)
Fill	Aggregate fai sawp, void ratio test-in nemnghet; a sir leh a chungah geotextile; sand base	8.7.6(b)
Observation well	Trench tin base thleng	8.7.6(c)
Khawlna	WQv (emaw Bung 4 retention volume, a lian zawk chuan) void-ah khawl	8.7.6(d)
Drawdown	Design infiltration rate-ah darkar 72 chhungin a ruak	8.7.6(d), 8.8.7
Overflow	Lei chung level-ah, tui luanna system tenau emaw lian-ah	8.7.6(e)
Hman ṭanna (commissioning)	Ruahtui luang lut zau zawng a nghet hma chu hman loh	8.7.6(f)
Tehna (criteria)	Clause 8.8 zawng zawng (Table 8D.11)	8.8

Table 8D.7 — Wet pond (extended wet detention)

Thil	Mamawh	Clause
Permanent pool	≥ WQv	8.7.7(a)
Extended detention	Pool chunga WQv, darkar 24–48 chhunga luan chhuah tir	8.7.7(a), 8.4.7
Forebay	Inlet tinah	8.7.7(b)
Tui luan kawng	Sei leh zau ratio ≥ 3:1; short-circuiting a awm lo	8.7.7(c)
Pool thuk zawng	1.0–2.5 m, safety bench nen (Clause 7.9.4)	8.7.7(d)
Tui inmilna (water balance)	IMD ruahtui tlak leh pan evaporation hmanga thla tin inmilna: kum 10-a kum ro ber chhungin pool tui zat ≥ 50% vawn reng; leihnuai tui, in tur tui (potable water) emaw ek tui hmanga tihkhah loh	8.7.8
Tuilian detention	Bung 4 detention chu extended detention level chungah a awm thei	8.7.7(f)
VR	5.0	Table 8.3

Table 8D.8 — Constructed wetland

Thil	Mamawh	Clause
Ruangam	Inlet sedimentation pond (forebay), a hnuah macrophyte zone thuk lo	8.7.9(a)
Extended detention	Tui sang zawng pangngai chunga WQv, darkar 24–48 chhunga luan chhuah tir; thuk zawng ≤ 0.5 m	8.7.9(b)
Tui luan kawng	Sei leh zau ratio ≥ 3:1; tui luan kawng kal tlangin zone thuk	8.7.9(c)
Bypass	Tuilianin macrophyte zone a kaih chhiat loh nan high-flow bypass	8.7.9(d)
Dil (tank) inlet-ah	Dil setback (tui kam aṭanga hmun kalhlen tur) chhungah, a tui zau zawng (waterspread) pawnah; dil khawlna angin chhiar loh	8.7.9(e)
Tui inmilna	Wet pond ang (wetland thuk zawng tlem ber vawn reng)	8.7.8
VR	7.0 (extended detention wetland)	Table 8.3

Table 8D.9 — Gross pollutant trap leh outfall screen

Thil	Mamawh	Clause
Tihfai tur tui luang	Q_wq; 1% AEP thleng tui luang zawng zawng chu thil man tawh sawp chhuak lovin a kal tlang	8.7.10(a)
Man theih size	5 mm vel thleng	8.7.10(b)
Head loss	Drain HGL-ah (Bung 9), screen 50% tihtawp	8.7.10(c), 8.10.3(a)
Khawlna	O&M tihfai inkar hun tan; thla 3 zela tihfai aia tlem lo	8.7.10(d)
Kalna (access)	Suction emaw grab-a tihfai nan motor kalna; tihfaina platform him	8.7.10(e), 8.10.3(d)
Screen tihtawp	Screen tawp vekin in leh ram tuilianin a chim loh nan overflow emaw bypass kawng	8.10.3(b)
Bar inkar	Hlauhawmna (hazard) azirin thlan: bawlhhlawh man nan hnai zawk, tihtawpin tuilian a thlen theihnaah zau zawk; design-ah finfiah tur	8.10.3(c)

Table 8D.10 — Oil-grit separator

Thil	Mamawh	Clause
Awmna	Fuel station; motor siamna leh sawpna; bus leh truck depot; motor dah hmun 50 aia tam nei parking area	8.7.11(a)
Size	Q_wq, high-flow bypass nen	8.7.11(b)
A mal chauhin hman loh	Site-in VR 5 aia sang a mamawh chuan filtering BMP-in a zui; hotspot-ah infiltration reng reng hmaah lined filtering BMP	8.7.11(c), 8.8.8

Table 8D.11 — Infiltration leh recharge tehna (infiltrating BMP zawng zawng)

Thil	Mamawh	Clause
Leihnuai tui inhlatna	Hun bik-a leihnuai tui sang ber chu base hnuaia ≥ 1.0 m (notify (Gazette-a tarlan) coastal sand-a in chung tui chauh: mounding endikna nen ≥ 0.5 m, mound chu base hnuaia ≥ 0.3 m)	8.8.1, 8.8.9(d)
Lungpui (bedrock) emaw tui luh theih loh layer	Base chu a chungah ≥ 1.0 m, Clause 8.8.10 hnuaia lungpui aquifer recharge atana design a nih loh chuan	8.8.2

Thil	Mamawh	Clause
Test	Basin, bioretention, permeable pavement tan double-ring (ASTM D3385); trench, soakaway, pit, well tan falling-head borehole emaw trial-pit soakage (entirnan BRE Digest 365); facility tinah ≥ 2 leh base 100 m² tinah emaw trench 50 m tinah ≥ 1; Form 8-2	8.8.3
Design rate	Teh rate ÷ 2.0 (test-in 8.8.3(c) a tlin a, factor 2 aia tam a danglam loh chuan), a nih loh chuan ÷ 3.0	8.8.4
Rate tlem ber	Full infiltration ≥ 13 mm/h; partial 3–13 mm/h, underdrain nen, darkar 72 chhunga lei-a lut tui zat tan chauh credit; < 3 mm/h credit a awm lo	8.8.5
Setback (paving chung aṭanga ruahtui luang)	Foundation 3 m, basement 5 m; ram ri (property boundary) 1.5 m; in tur tui well emaw borewell 30 m; septic tank emaw soak pit 15 m; 1V:3H aia chhoh tlang pang chhip 6 m	8.8.6
Expansive soil	Foundation setback let hnih	8.8.11(b)
Drawdown	Design rate-ah darkar 72 chhungin a ruak; sak zawh hnuah test	8.8.7
Hotspot	Tihfai lovin infiltration a awm lo; bawlhhlawh paihna leh lei bawlhhlawh (contaminated land)-ah engmah a awm lo	8.8.8
Kawng ruahtui luang	Well, borewell emaw recharge shaft-ah engtikah mah luan lut nghal tir loh	8.11.3(b)

8D.2 Bioretention drawdown endikna

Darkar 48 ponding drawdown (Clause 8.7.2(b)) leh Clause 8.8.5-a rate tlem ber-te hian cell-in underdrain a mamawh em tih an thutlukpui.

- Ponding thuk zawng sang ber darkar 48-a luan chhuah nana rate mamawh = 300 mm / 48 h = 6.25 mm/h.
- Design rate ≥ 13 mm/h: full infiltration, underdrain a ngai lo, Clause 8.8 a tlin chuan.
- Design rate 6.25 mm/h aṭanga 13 mm/h thleng: ponding chu a hun takah a ruak, mahse Clause 8.8.5(b) a hman a, chuvangin underdrain a ngai.
- Design rate 6.25 mm/h aia hniam: infiltration-in darkar 48-ah ponding a ruak thei lo; underdrain a ngai (Clause 8.7.2(e)), leh 3 mm/h hnuaiah infiltration credit pek a ni lo.

Entirna chauh — design value a ni lo. Cell rawt base-a test pahnih chuan 30 mm/h leh 22 mm/h a pe. Result pahnih chu factor 30 / 22 = 1.36-in an danglam a, chu chu 2 aia tam a ni lo, leh test zat chuan Clause 8.8.3(c) a tlin, chuvangin safety factor chu 2.0 a ni. Result hniam zawk lain, design rate = 22 / 2.0 = 11 mm/h. Hei hi 6.25 mm/h aia sang a ni a, chuvangin ponding chu 300 / 11 = 27 h-ah a ruak, darkar 48 chhungin. 13 mm/h aia hniam a ni a, chuvangin cell hi underdrain nei partial-infiltration design a ni (Clause 8.8.5(b)).

8D.3 Filter media specification

Table 8D.12 — Bioretention filter media leh layer-te

Layer	Bung 8 mamawh	Design-a finfiah tur value
Mulch	50–75 mm (Clause 8.7.2(c)); thing sak tihsawm emaw organic mulch ang chi, ponding thuk zawngah a lang chhuak lo	Thil leh a hnar
Filter media	600–900 mm engineered sandy loam, fines tlem leh phosphorus tlem (Clause 8.7.2(c))	Particle size grading; fines (silt + clay) chin; organic matter zat; phosphorus chin; media tihkhauh saturated hydraulic conductivity; batch tin hnar leh test certificate
Transition (choker) layer	Media leh gravel inkarah, media gravel-a a luan luh loh nan (Clause 8.7.2(d))	Thuk zawng leh grading, media leh gravel nena inmil

Layer	Bung 8 mamawh	Design-a finfiah tur value
Gravel drainage layer	Transition layer hnuaiah, underdrain hual vel (Clause 8.7.2(d))	Thuk zawng, grading, sawp
Underdrain	Clause 8.7.2(e) a hman chuan perforated pipe, cleanout nen	Diameter, slope, perforation, outlet level
Liner	Clause 8.7.2(f) a hman chuan (Clause 8.8 a tlin thei lo; hotspot)	Liner chi leh a venhimna

Media chu dah hmain test tur a ni a, nasa taka tihkhauh lovin layer zelin dah tur a ni. State Stormwater Technical Committee chuan he belhchian a endik hunah grading, fines, organic matter leh phosphorus tan number chin, sand leh compost hnar local nen, a ruat a ṭha.

8D.4 Thing leh hnim tarlanna

He Kaihhruaina Bu zirchianna hunah ruahtui BMP tana thing leh hnim phun chungchang Mizoram thu hnar hmuh a ni lo, leh thu hnar chhiar zinga pakhatin mah State-a bioretention, swale, filter strip emaw constructed wetland-a hman tur thing leh hnim pianpui a sawi lo. Chuvangin he belhchian hian Mizoram tan **thing leh hnim chi engmah** a tarlang lo, leh Mizo thing leh hnim hming a pe lo, State dang tana buatsaih tarlanna lak chhawn emaw local hming siam chawp aiin. State Stormwater Technical Committee-in tarlanna a chhuah hma chuan, BMP tin tana thing leh hnim chi chu horticulturist emaw EF&CC-in, site-a Belhchian 2A sub-area, a sanzawng (altitude), a lei leh a leihnuai tui sang zawng (water table) azirin, heng dan (he Kaihhruaina Bu-in a ruat) hnuaiah thlan leh BMP design sheet-ah chhinchhiah tur a ni:

- (a) **Thing leh hnim pianpui emaw rei tawha naturalise chauh**, EF&CC-in site tan a nemnghet angin; Table 8D.15-a sawi emaw State-ah invasive (darh chak) tia hriat reng reng a awm tur a ni lo.
- (b) **Lei hnawng leh lei ro.** April ni 1 aṭanga October ni 31 thleng hun chhunga lei tui chiah tuar thei, leh a nghet tawh hnuah tui pek lovin December aṭanga March thleng thla ro chhunga nung thei chi.
- (c) **Tlang pang.** Tlang chhip leh an tlang pang-ah, terrace (tlang panga hmun zawl siam), kam, lei laih pang (cut slope) leh lui kam-a lei kaih ngheh nan thlan hmasak chi; tlang panga bioretention chu lined a ni (Clause 8.8.1).
- (d) **Tui luanna kawngah phun loh.** Lui bed emaw kam-ah, emaw embankment-ah, a enkawltu (custodian) (Aizawl Municipal Corporation, IWRD, EF&CC, Village Council emaw District Council, a nih dan azirin) remtihna tel lovin phun loh tur a ni a, channel, terrace swale, interceptor drain (cut chung lama ruahtui dangtu drain) emaw dil outlet tui luang dangtu tur pawh phun loh tur a ni.
- (e) **Tui awmna leh an catchment-ah phun loh.** He belhchian hnuaiah dil, tuikhur emaw a catchment humhalh-ah, emaw Palak Dil-ah phun loh tur a ni; Palak Dil thing leh hnim chu a enkawltu-in Bung 7 hnuaiah a enkawl.

Table 8D.13 — Bioretention, swale leh filter strip tana thing leh hnim kawhhmuhna

Hman dan	Botanical hming	Local hming	Hriat tur
Clause 8.7-a BMP zawng zawng	He draft-ah Mizoram tan tarlan a awm lo	—	A chunga dan (a) aṭanga (e) thleng hnuaia thlan leh BMP design sheet (Belhchian 8D)-a chhinchhiah

Table 8D.14 — Constructed wetland leh wet pond tana thing leh hnim kawhhmuhna

Zone	Botanical hming	Local hming	Hriat tur
Zone zawng zawng	He draft-ah Mizoram tan tarlan a awm lo	—	A chunga dan (a) aṭanga (e) thleng hnuaia thlan; constructed wetland chu tui awmna pangngai reng reng tui zau zawng (waterspread) pawnah sak a ni (Clause 8.7.9(e))

Table 8D.15 — Phun loh tur thing leh hnim chi

Botanical hming	Local hming	A chhan
EF&CC-in Mizoram-a invasive anga a tarlan chi reng reng	—	He Kaihhruaina Bu tan Mizoram invasive chi tarlanna reng reng chhiar a ni lo [TBC]

Belhchian 8E — Erosion leh sediment control standard detail

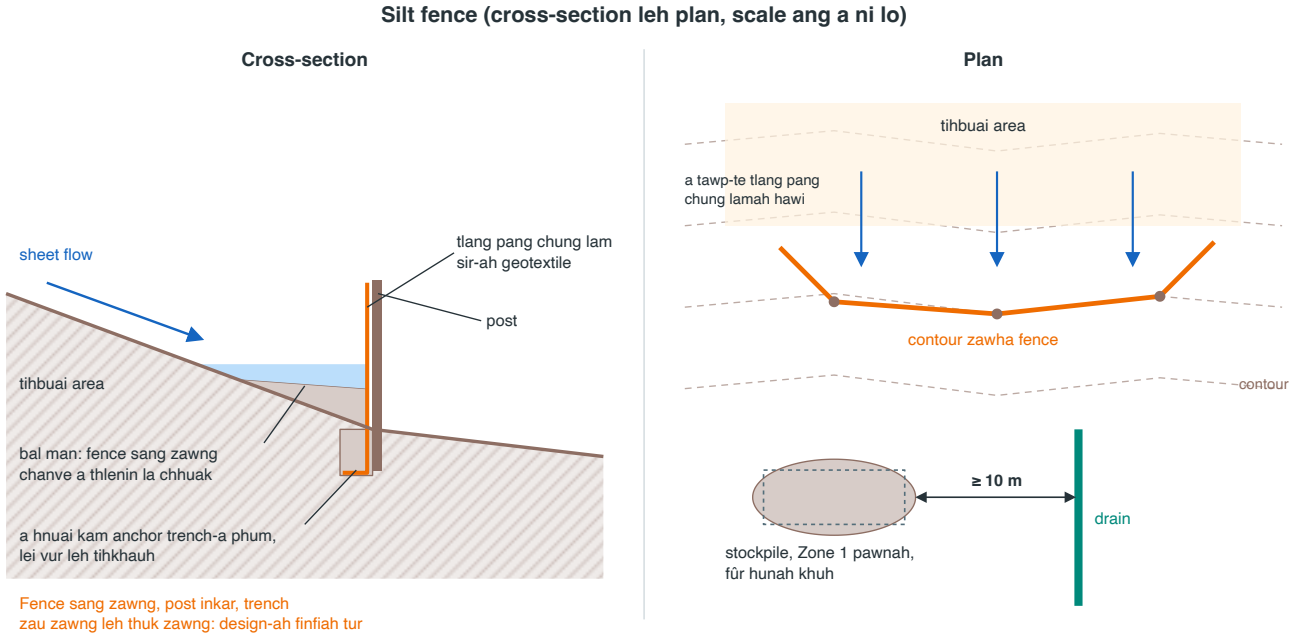
Bung 8-a Clause 8.12 a ṭanpui.

A hnuaia detail-te hian hmalakna tin ruangam a lantir. He Kaihhruaina Bu-in a ruat zat (dimension)-te pek a ni. He Kaihhruaina Bu-in a ruat loh zat-te chu "design-ah finfiah tur" tia chhinchhiah a ni a, ESC plan-ah lantir tur a ni (Clause 8.12.1). Hmalakna rei lo (temporary measure)-te chu Bung 2 ruahtui tlak leh climate factor 1.0 hmangin design a ni (Clause 8.12.4).

Table 8E.1 — Hmalakna thlan dan (Clause 8.12.3)

Dinhmun	Hmalakna	Detail
Tihbuai area aṭanga luang chhuak sheet flow, a tlang pang hnuai lam kam zawh	Silt fence	Milem 8E.1
Tihbuai area 2 ha thleng aṭanga tui luang khawm	Sediment trap	Milem 8E.2
Tihbuai area 2 ha aia tam	Surface dewatering outlet nei sediment basin	Milem 8E.2
Site ruahtui luang dawng drain (tui luanna) inlet awm mek	Inlet protection	Milem 8E.4
Public kawng-a motor chhuahna	Wheel washing nena stabilised construction exit	Milem 8E.3
Lei leh thil chhawp (stockpile)	Tui awmna setback (tui kam aṭanga hmun kalhlen tur) reng reng Zone 1 pawnah; drain reng reng aṭanga ≥ 10 m; fûr hunah khuh	Milem 8E.1 hriat tur
Dewatering	Sediment basin, settling tank emaw filter bag kal tlangin; drain emaw tui awmna-ah pump luh nghal engtikah mah loh	Milem 8E.2 hriat tur
Concrete washout	Lined pit; drain-ah engtikah mah loh	Milem 8E.3 hriat tur

8E.1 Silt fence



Milem 8E.1 — Silt fence: post-a geotextile, a hnuai kam chu tlang pang chung lam sir anchor trench-a phum, lantirna cross-section, leh a tawp-ah kir (return) nena contour zawha fence lantirna plan. He Kaihhruaina Bu-in a ruat loh zat-te chu design-ah finfiah tur a ni. He Kaihhruaina Bu tana milem siam thar, US EPA, NPDES Construction General Permit (2022), leh CIRIA, The SuDS Manual (C753), 2015 aṭanga siam danglam.

Buatsaih tur. Clause 8.12.3(a) hian silt fence tinah tui luang lut theih area chin tan he belhchian a kawhhmuh. Chu chin, leh fence chunga tlang pang sei zawng sang ber chu, Mizoram ruahtui tlak tan State Stormwater Technical Committee-in a ruat a ngai. An tlangzarh hma chuan, US hmanna pangngai aṭanga lak heng interim chin-te hi hman a ni (US EPA, Stormwater Best Management Practice fact sheet: Silt Fence):

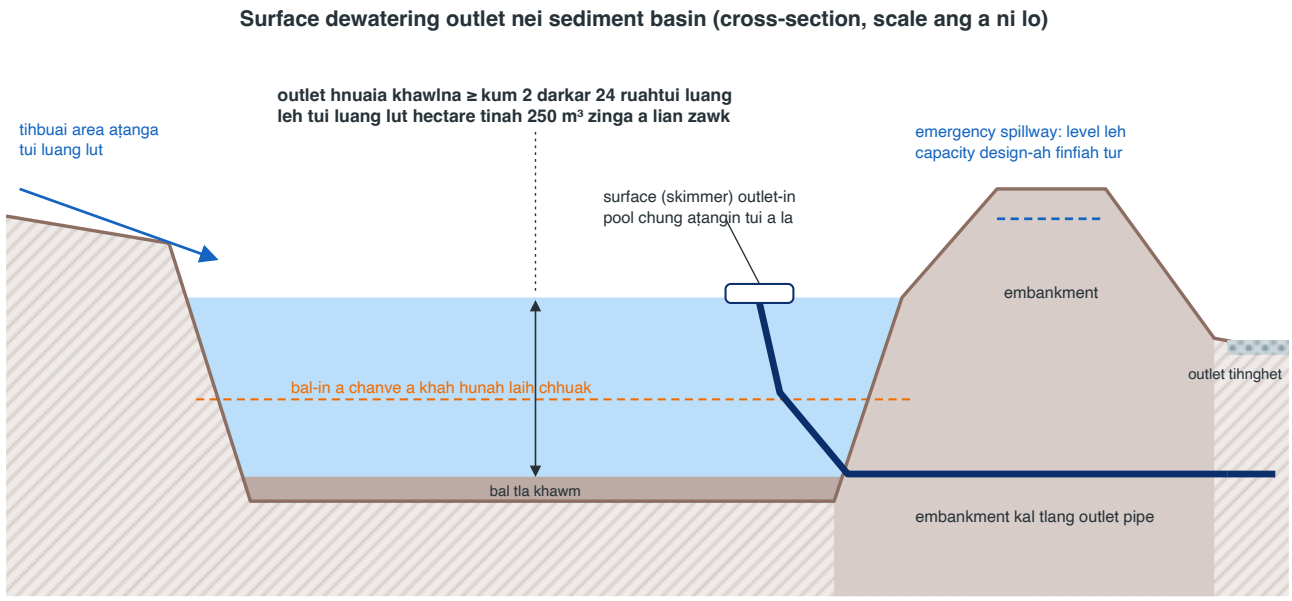
- tui luang lut area: **fence 30 m tinah 0.1 ha** aia tam lo;
- fence chunga tlang pang sei zawng: tlang pang 2% hnuaiah 30 m, 2–5%-ah 23 m, 5–10%-ah 15 m, 10–20%-ah 8 m leh 20% aia chhoh-ah 5 m aia tam lo;
- tui luang khawm a lo thlennaah emaw, chin pakhat tlin theih a nih lohnaah, a aiah sediment trap (Milem 8E.2) hman a ni.

Design siamtu (designer) chuan fence tinin a chhawm tui luang lut area leh tlang pang sei zawng chu ESC plan-ah a lantir tur a ni.

Hriat tur:

1. Tihbuai area tlang pang hnuai lam kam-ah contour zawhin dah rawh, tui luang khawm kawng kal tlangin engtikah mah dah suh.
2. A tawp-te chu tlang pang chung lamah hawitir rawh, tuiin a hual luan loh nan.
3. Kar tin leh ruahpui tin hnu darkar 24 chhungin endik rawh; darkar 48 chhungin siam ṭha rawh; bal (sediment) chu fence sang zawng chanve a thlen hunah la chhuak rawh (Clause 8.12.5).
4. A chunga tui luang lut area a nghet hnu chauhin la chhuak rawh (Clause 8.12.6).
5. Lei leh thil chhawp: Zone 1 pawnah, drain reng reng aṭanga 10 m tal, leh fûr hun chhungin khuh (Clause 8.12.3(f)).

8E.2 Sediment trap leh sediment basin



Milem 8E.2 — Sediment trap emaw basin cross-section: inflow, outlet hnuaia khawl tui zat, pool chung aṭanga tui la surface dewatering outlet (skimmer), emergency spillway, leh khawl tui zat chanve-a bal laih chhuah level. He Kaihhruaina Bu tana milem siam thar, US EPA, NPDES Construction General Permit (2022) aṭanga siam danglam.

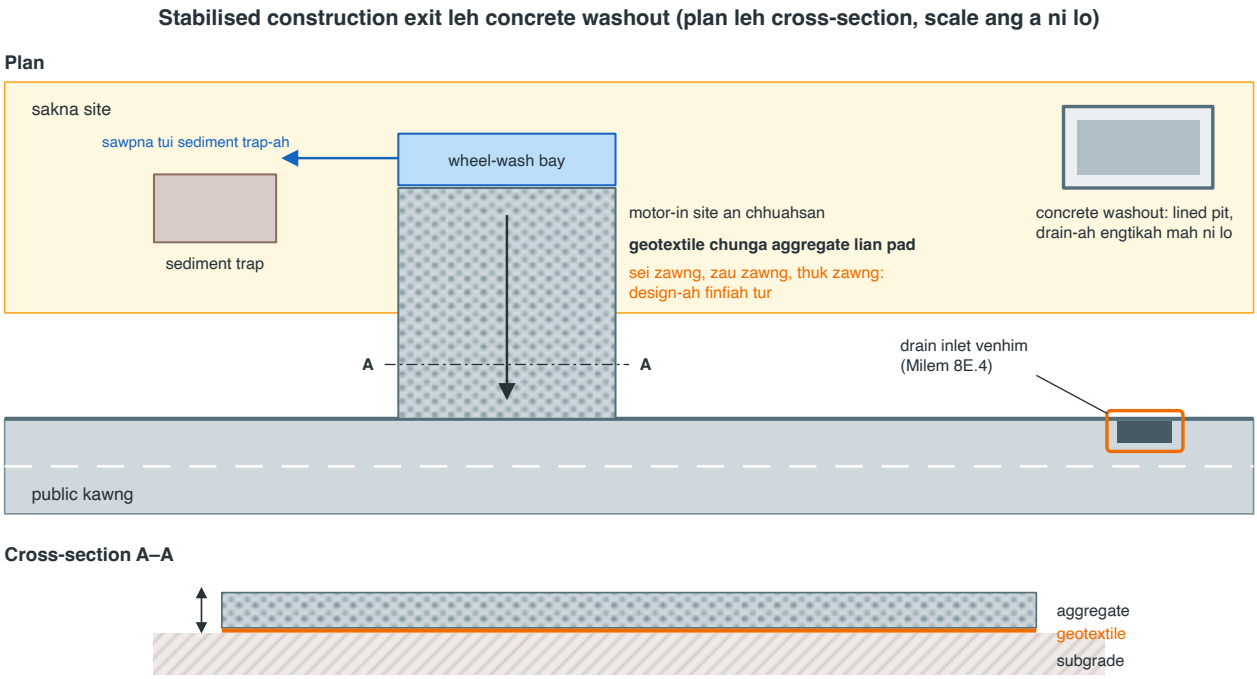
Hriat tur:

1. **Sediment trap:** tihbuai area 2 ha thleng aṭanga tui luang khawm tan (Clause 8.12.3(b)). Khawl tui zat, thuk zawng leh outlet: design-ah finfiah tur.
2. **Sediment basin:** tihbuai area 2 ha aia tam tan. Outlet hnuaia khawlna ≥ (a) 50% AEP (kum 2) darkar 24 ruahpui ruahtui luang leh (b) tui luang lut area hectare tinah 250 m³ zinga a lian zawk (Clause 8.12.3(c)).
3. Dewatering outlet chuan chung lam aṭangin tui a la (Clause 8.12.3(c)).
4. Emergency spillway leh a capacity: design-ah finfiah tur. Basin hi detention facility nghet a nih bawk chuan, Bung 4 spillway dan-te hman a ni.
5. Bal-in a chanve a khah hunah laih chhuak rawh (Clause 8.12.5). Facility nghet reng reng chu a as-built survey hmain bal la chhuak rawh (Clause 8.12.6).
6. Lei laih (excavation) dewatering chu sediment basin, settling tank emaw filter bag kal tlangin a kal tur a ni (Clause 8.12.3(g)).

Entirna chauh — design value a ni lo. Sediment basin chuan tihbuai ram 3.0 ha a chhawm. Kum 2 darkar 24 ruahtui tlak 100 mm (climate factor 1.0, Clause 8.12.4) leh Bung 2 antecedent moisture condition hnuaia lei ruak tihkhauh tan curve number 86 ngai ta ila.

- S = 25,400 / 86 − 254 = 41.35 mm; Ia = 0.2S = 8.27 mm
- Q = (P − Ia)² / (P − Ia + S) = (100 − 8.27)² / (100 − 8.27 + 41.35) = 8,414 / 133.08 = 63.2 mm
- (a) Ruahtui luang tui zat = 10 × Q × A = 10 × 63.2 × 3.0 = 1,896 m³
- (b) 250 m³/ha × 3.0 ha = 750 m³
- Outlet hnuaia khawlna mamawh = max (1,896, 750) = 1,896 m³. Hetah chuan kum 2 ruahtui luang hian a thunun.

8E.3 Stabilised construction exit leh concrete washout



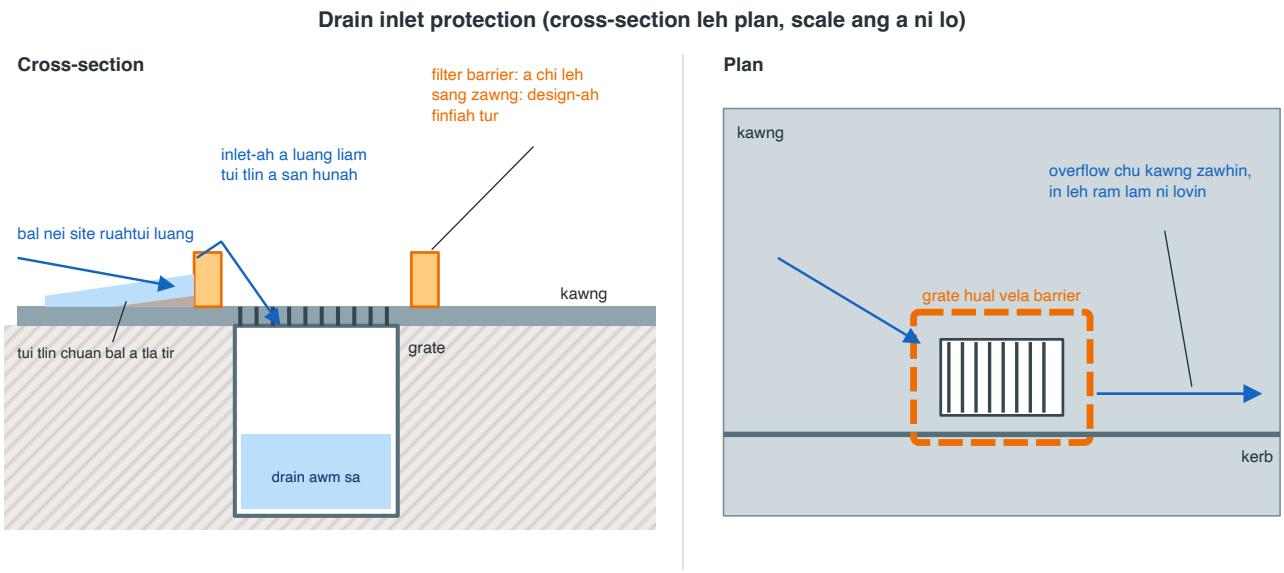
Clause 8.12.3(e) leh (h). Ni tin hna tawpah public kawnga bal kal pawh chu hrut fai rawh.

Milem 8E.3 — Stabilised construction exit: site leh public kawng inkara geotextile chunga aggregate lian pad, sediment trap-a luang wheel-wash bay, leh lined concrete washout pit lantirna plan leh cross-section. He Kaihhruaina Bu-in a ruat loh zat-te chu design-ah finfiah tur a ni. He Kaihhruaina Bu tana milem siam thar, US EPA, NPDES Construction General Permit (2022) aṭanga siam danglam.

Hriat tur:

1. Motor-in site an chhuahsan a public kawng an luhna hmun tinah, wheel washing nen, siam rawh (Clause 8.12.3(e)).
2. Pad sei zawng, zau zawng, thuk zawng leh aggregate size: design-ah finfiah tur.
3. Sawpna tui chu sediment trap emaw basin-ah a luang a, drain-ah engtikah mah a luang lo.
4. Concrete washout chu lined pit-ah, drain-ah engtikah mah ni lovin (Clause 8.12.3(h)).
5. Ni tin hna tawpah public kawnga bal kal pawh chu hrut fai rawh.

8E.4 Inlet protection



Clause 8.12.3(d). Ruahpui thil thleng tin hnuah bal la chhuak rawh (Clause 8.12.5). Humhalhna hian inlet a khap loh ngei ngei tur a ni.

Milem 8E.4 — Drain inlet awm mek-a inlet protection: grate emaw kerb inlet hual vela filter barrier, tui tlin (ponding)-in kawng emaw in leh ram a chim loh nan overflow kawng nen. He Kaihhruaina Bu tana milem siam thar, US EPA, NPDES Construction General Permit (2022), leh CIRIA, The SuDS Manual (C753), 2015 ataṇga siam danglam.

Hriat tur:

1. Site ataṇga ruahtui luang dawng drain inlet awm mek tinah (Clause 8.12.3(d)).
2. Protection hian inlet a tihtawp tur a ni lo: a hnunga tui tlin chu inlet-ah emaw kawng zawhin a liam thei ngei ngei tur a ni.
3. Barrier chi leh sang zawng: design-ah finfiah tur.
4. Ruahpui tin hnuah bal la chhuak rawh (Clause 8.12.5).

8E.5 Hun leh endikna

Table 8E.2 — ESC hun leh endikna (Clause 8.12.2 leh 8.12.5)

Thil	Mamawh
Lei hna zawh tawh	March ni 31 hmain thing leh hnim, mulch, matting emaw paving hmangin tihnghet
April ni 1 leh October ni 31 inkara ram thing hnim tihfai	Tihfai hmain sediment control dah
Fûr hunah area hawng	A theih chin chinah tê
Endikna	Kar tin, leh ruahpui tin hnu darkar 24 chhungin (Bung 10)
Siam ṭhatna	Darkar 48 chhungin
Tihfaina	Bal-in a chanve a khah hunah
Lak chhuahna	Hmalakna-a tui luang lut area a nghet hnu chauhin

Form 8-1 — Tui Ṭhatna Sheet

Bung 8-a Clause 8.4, 8.6 leh 8.14 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

Table 8F.1 — Form 8-1, Section A: Site leh ruahtui tlak

No.	Field	Ziah luh tur	Clause
A1	Project hming leh Authority file number	_____	—
A2	Tier (A / B) leh site zau zawng, ha	_____	8.6.1
A3	Ruahtui zone (Bung 2)	_____	8.4.1
A4	P_ret, mm (Belhchian 2E)	_____	8.4.1
A5	P_3m, mm (Belhchian 8A, emaw interim chhutna: record, kum, kalphung)	_____	8.4.1
A6	P_wq = max (P_ret, P_3m), mm (climate factor tel lo)	_____	8.4.1, 8.4.3
A7	WQv kalphung: SCS-CN, emaw Rv (site < 0.5 ha leh Tier B simplified method chauh)	_____	8.4.2
A8	Siam ṭhatna (redevelopment) (impervious awm mek ≥ 20%)?	_____	8.6.2

Table 8F.2 — Form 8-1, Section B: Drainage area zela tui ṭhatna tui zat leh tui luang

Area ID	Zau zawng (ha)	Impervious I (%)	Q_wq ruahtui luang thuk zawng (mm) emaw Rv	WQv (m³)	Q_wq (m³/s)	Tui zat khawl, Bung 4 (m³)	WQv khawl loh (m³)	Area chhawmtu BMP	Pretreatment
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
A vaiin	_____			_____		_____	_____		

Table 8F.3 — Form 8-1, Section C: Level of Service leh Value Rating (Tier A)

No.	Field	Ziah luh tur	Clause
C1	Pre-development CN; post-development CN; ΔCN	_____	8.6.2
C2	LoS mamawh (Table 8.2, emaw siam ṭhatna tan Belhchian 8B)	_____	8.6.2
C3	Composite VR (Belhchian 8B chhutna belh)	_____	8.6.3
C4	Composite VR ≥ LoS mamawh?	_____	8.6.3
C5	Tier B: Clause 8.6.5 hnuaia route hman (a) site-a khawl / (b) bioretention, rain garden emaw infiltration	_____	8.6.5

Table 8F.4 — Form 8-1, Section D: Thehluh tur dangte (Clause 8.14)

No.	Thil	Belh (aw / aih / a huam lo)	Clause
D1	Clause 8.7 leh Belhchian 8D anga BMP design, pretreatment nen	_____	8.14(3)
D2	Infiltration Test Record (Form 8-2), hun bik-a leihnuai tui sang ber level leh a hnar, design rate, drawdown time, setback	_____	8.14(4)
D3	Ek tui (sewage) leh in chhunga tui bal (sullage) inzawmna plan; dye emaw smoke test record	_____	8.9.2, 8.14(5)
D4	Tui awmna-a outfall reng reng tan GPT leh first-flush (ruah tlak hmasa ber tui bal) design	_____	8.10, 8.14(6)
D5	Ruahtui khawl khawm, recharge leh detention hrang taka lantirtu RWH ruangam	_____	8.11, 8.14(7)
D6	ESC plan	_____	8.12, 8.14(8)
D7	Hotspot control, Clause 8.8.8 a hman chuan	_____	8.8.8

Table 8F.5 — Form 8-1, Section E: Buatsaihtu

Field	Ziah luh tur
Hming, registration leh empanelment number (Clause 10.6)	_____
Signature leh ni	_____

Form 8-2 — Infiltration Test Record

Bung 8-a Clause 8.8.1 aṭanga 8.8.7 thleng leh 8.11.4 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Facility tin tan record pakhat. Test hmunte lantirna plan leh test tin chhiar (reading) belh rawh.

Table 8F.6 — Form 8-2, Section A: Facility

No.	Field	Ziah luh tur	Clause
A1	Project leh facility ID; facility chi	_____	8.8.3
A2	Infiltration base zau zawng (m²) emaw trench sei zawng (m)	_____	8.8.3(c)
A3	Facility base level rawt, m (datum)	_____	8.8.3
A4	Ruahtui luang hnar: in chung chauh / paving / a pawlh; hotspot (aw / aih)	_____	8.8.6, 8.8.8
A5	Lei dinhmun: sandy coastal / laterite emaw lung khauh / delta clay emaw black cotton / a dang	_____	8.8.9–8.8.11

Table 8F.7 — Form 8-2, Section B: Test

Test no.	Awmna (grid ref.)	Ni	Kalphung: double-ring (ASTM D3385) / falling-head borehole emaw trial-pit soakage (entirnan BRE Digest 365)	Test level, m	Test hunlaia leihnuai tui level, m	Teh rate (mm/h)
1	_____	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____	_____

Test zat tlem ber: facility tinah 2, leh base area 100 m² tinah emaw trench 50 m tinah 1 (Clause 8.8.3(c)).

Table 8F.8 — Form 8-2, Section C: Design rate leh drawdown

No.	Thil	Ziah luh tur	Clause
C1	Test siam zat; mamawh zat	_____	8.8.3(c)
C2	Teh rate sang ber leh hniam ber; ratio (sang ber ÷ hniam ber)	_____	8.8.4
C3	Safety factor: 2.0 (test-in 8.8.3(c) a tlin a, ratio ≤ 2) emaw 3.0	_____	8.8.4
C4	Design rate = teh rate hman ÷ safety factor, mm/h (teh rate khawi nge hman tih sawi rawh)	_____	8.8.4
C5	Category: ≥ 13 mm/h full infiltration / 3–13 mm/h partial, underdrain nen / < 3 mm/h credit awm lo	_____	8.8.5
C6	Lei-a luh tur tui thuk zawng, mm; drawdown time = thuk zawng ÷ design rate, h (≤ 72 h)	_____	8.8.7

Table 8F.9 — Form 8-2, Section D: Inhlatna leh setback

No.	Thil	Ziah luh tur	Clause
D1	Hun bik-a leihnuai tui sang ber level, m, leh a hnar (Clause 3.10.2)	_____	8.8.1
D2	Facility base aṭanga hun bik-a leihnuai tui sang ber inhlatna, m (≥ 1.0; notify coastal sand-a in chung tui chauh tan mounding endikna nen ≥ 0.5)	_____	8.8.1, 8.8.9(d)

No.	Thil	Ziah luh tur	Clause
D3	Base hnuaia lungpui emaw tui luh theih loh layer thuk zawng, m (Clause 8.8.10 a nih loh chuan ≥ 1.0)	_____	8.8.2
D4	Hlatna: foundation / basement / ram ri / in tur tui well emaw borewell / septic tank emaw soak pit / 1V:3H aia chhoh tlang pang chhip, m	_____	8.8.6
D5	Expansive soil: foundation setback let hnih em?	_____	8.8.11(b)

Table 8F.10 — Form 8-2, Section E: Puanchhuahna

Field	Ziah luh tur
Testtu: hming, geotechnical testing thiamna, hnathawhna pawl (organisation)	_____
Kei hian test-te hi hmun leh level sawi-ah, kalphung sawi hmangin siam a ni a, chhiar (reading) belh-te hi a kim a ni tih ka nemnghet e. Signature leh ni	_____
Design siamtu (Clause 10.6): hming leh signature	_____

BUNG 9 BELHCHIAN

Structure-te Hydraulic Design

Heng belhchiante hian Bung 9 an ṭanpui. Belhchian 9A hian SI units-a FHWA HDS-5 inlet-control equation-te, inlet pangngai tana coefficient tlangzarh nen, leh culvert (kawng hnuaia tui kalna) entirna chhutna kim tak a pe. Belhchian 9B hian Bung 9 leh Bung 6-in an ruat tawh lenzawng chauh nei standard drawing-te a pe; lenzawng dang zawng zawng chu "design-ah finfiah tur" tia chhinchhiah a ni. Belhchian 9C hi Clause 9.9 aṭanga lak control philosophy pangngai nen pump station design checklist a ni. Form 9-1 hi draft form a ni: Clause 9.14-in a phut chu a tarlang a, a belhchah lo.

Belhchian 9A — HDS-5 inlet-control coefficient leh SI units-a culvert entirna chhutna

Bung 9-a Clause 9.4.1 aṭanga 9.4.7 thleng leh Bung 6-a Clause 6.12 a ṭanpui.

9A.1 Inlet-control equation

FHWA *Hydraulic Design of Highway Culverts*, HDS-5, 3rd edition (2012), Appendix A hian inlet-control equation pathum a pe. SI units-in:

> Unsubmerged (tui hnuaia pil lo), Form 1: HWi/D = Hc/D + K · [Ku · Q / (A · D^0.5)]^M + Ks · S

> Unsubmerged, Form 2: HWi/D = K · [Ku · Q / (A · D^0.5)]^M

> Submerged (tui hnuaia pil): HWi/D = c · [Ku · Q / (A · D^0.5)]² + Y + Ks · S

chutah HWi chu inlet control hnuaia inlet invert (tui luanna hniam ber) chunga headwater (culvert luhna lama tui sang zawng) thuk zawng (m), D chu barrel chhung sang zawng (rise) (m), Hc chu critical depth-a specific head, dc + Vc²/2g (m), Q chu tui luang zat (m³/s), A chu barrel cross-section area kim (m²), S chu barrel slope (m/m), K, M, c leh Y chu Table 9A.1-a constant-te, Ku = 1.811 SI units-ah (US units-ah 1.0), leh Ks chu slope siam dikna: −0.5, emaw mitred inlet tan +0.7 a ni.

Equation khawi nge hman tur chu X = Ku · Q / (A · D^0.5) azirin a ni:

- X ≤ 3.5: unsubmerged equation (Table 9A.1-a tarlan angin Form 1 emaw Form 2);
- X ≥ 4.0: submerged equation;
- 3.5 < X < 4.0 (transition): HDS-5 transition hmang FHWA HY-8 hmang rawh. Kut hmanga chhutna hman a nih chuan, unsubmerged leh submerged result zinga sang zawk la rawh. Hei hi he belhchian-in a siam fimkhurna awlsam (conservative simplification) a ni a, HDS-5 dan a ni lo.

Table 9A.1 — Inlet pangngai tana HDS-5 inlet-control coefficient

Barrel	Inlet kam	Form	K	M	c	Y
Concrete kual	Headwall nei, kam square	1	0.0098	2.0	0.0398	0.67
Concrete kual	Headwall nei, groove (socket) end	1	0.0018	2.0	0.0292	0.74
Concrete kual	Groove (socket) end, a chhuak (projecting)	1	0.0045	2.0	0.0317	0.69
Corrugated metal kual	Headwall	1	0.0078	2.0	0.0379	0.69
Corrugated metal kual	Slope ang zela tan (mitred)	1	0.0210	1.33	0.0463	0.75
Corrugated metal kual	A chhuak (projecting)	1	0.0340	1.50	0.0553	0.54
Rectangular box	Wingwall 30° aṭanga 75° thleng flare	1	0.026	1.0	0.0347	0.81
Rectangular box	Wingwall 90° leh 15° flare	1	0.061	0.75	0.0400	0.80
Rectangular box	Wingwall 0° (sir chhunzawm)	1	0.061	0.75	0.0423	0.82
Rectangular box	19 mm (3/4 in) chamfer nei 90° headwall	2	0.515	0.667	0.0375	0.79
Rectangular box	45° bevel nei 90° headwall	2	0.495	0.667	0.0314	0.82
Rectangular box	33.7° bevel nei 90° headwall	2	0.486	0.667	0.0252	0.865

Thu lakna: FHWA HDS-5 (2012), Appendix A, Table A.1 (coefficient-te hi dimension nei lo an ni a, Ku = 1.811 nen SI units-ah an huam). Value-te hi HIF-12-026, Table A.1 (chart leh scale number 1/1–1/3, 2/1–2/3, 8/1–8/3 leh 10/1–10/3) nen endik a ni. HDS-5 edition hnuhnung zawk a danglam chuan, table hnuhnung zawk chuan a thunun. Outlet control tana entrance loss coefficient-te chu Bung 9-a Table 9.1-ah a awm.

9A.2 Entirna chhutna: collector kawng hnuaia pipe culvert

Entirna chauh — design value a ni lo. A hnuaia input-te hi kalphung lantir nan siam chawp an ni; result-te hi site reng reng tan design value an ni lo.

Input-te.

Table 9A.2 — Entirna chhutna tana input-te

Thil	Value	Hnar
Kawng class	Collector; design AEP 4% (kum 25), check event (endikna atana ruahpui) 2% (kum 50), leh 1% AEP endikna	Table 6.1, Clause 6.12.2
Design tui luang, 4% AEP	1.80 m³/s (climate factor tiamin)	Entirna
Check tui luang, 2% AEP	2.20 m³/s	Entirna
1% AEP tui luang	3.00 m³/s	Entirna
Barrel	Collar joint nei 1,200 mm RCC pipe pakhat, n = 0.015	Table 6.6
Inlet	Headwall nei, kam square: ke = 0.5; K = 0.0098, M = 2.0, c = 0.0398, Y = 0.67, Form 1	Table 9.1 leh 9A.1
Sei zawng leh slope	L = 20.0 m; S = 0.005 (inlet invert 20.00 m, outlet invert 19.90 m, local datum)	Entirna
Inlet-a kawng level	Shoulder kam 22.00 m; kawng chhip (crest) hniam ber 22.10 m	Entirna
Outlet invert chunga tailwater (outfall hnuailama tui sang zawng), TW	1.80 m³/s-ah 0.60 m; 2.20 m³/s-ah 0.70 m; 3.00 m³/s-ah 0.85 m (luanna hnuailam channel-a normal depth)	Entirna; Clause 9.4.4

Thil	Value	Hnar
Tui dawngtu channel	Lined lo sandy loam	Table 9.2

Size tlem ber: 1,200 mm ≥ 900 mm (Clause 6.12.5). Span chu 1.5 m aia a tlem avangin, tihtawp (blockage) endikna chuan inlet area 50% tihtawp a hmang (Clause 6.12.4(a)).

Step 1 — Barrel nihphung. A = π · 1.2² / 4 = 1.131 m²; barrel khat hydraulic radius R = D/4 = 0.300 m; D^0.5 = 1.095.

Step 2 — Critical depth. Tui luang tin tan, dc chu cross-section kual tana critical-flow dinhmun, $Q^2 \cdot T / (g \cdot A_c^3) = 1$ aṭangin enchhin (trial)-in hmuh chhuah a ni, chutah Ac leh T chu thuk zawng dc-a tui luanna area leh chung zau zawng (top width) a ni.

Table 9A.3 — Critical depth leh specific head (D = 1.2 m)

Q (m³/s)	dc (m)	Ac (m²)	T (m)	Vc = Q/Ac (m/s)	Hc = dc + Vc²/2g (m)	Hc/D
1.80	0.737	0.728	1.168	2.471	1.048	0.873
2.20	0.817	0.820	1.119	2.683	1.184	0.987
3.00	0.952	0.962	0.972	3.118	1.447	1.206

Step 3 — Inlet control hnuaia headwater. X = 1.811 · Q / (1.131 × 1.095) = 1.462 · Q.

Table 9A.4 — Inlet-control headwater

Q (m³/s)	X	Equation	HWi/D	HWi (m)
1.80	2.631	Unsubmerged, Form 1: 0.873 + 0.0098 × 2.631² − 0.5 × 0.005 = 0.873 + 0.068 − 0.003	0.939	1.127
2.20	3.216	Unsubmerged, Form 1: 0.987 + 0.0098 × 3.216² − 0.003 = 0.987 + 0.101 − 0.003	1.085	1.302
3.00	4.385	Submerged: 0.0398 × 4.385² + 0.67 − 0.003 = 0.765 + 0.67 − 0.003	1.433	1.719

Step 4 — Outlet control hnuaia headwater (Clause 9.4.3). Friction term chu 19.63 · n² · L / R^1.33 = 19.63 × 0.015² × 20.0 / 0.300^1.33 = 0.0883 / 0.2016 = 0.438 a ni a, chuvangin H = (1 + 0.5 + 0.438) · V²/2g = 1.938 · V²/2g. L · S = 20.0 × 0.005 = 0.100 m.

Table 9A.5 — Outlet-control headwater

Q (m³/s)	V = Q/A (m/s)	V²/2g (m)	H (m)	(dc + D)/2 (m)	TW (m)	ho (m)	HWo = ho + H − L·S (m)
1.80	1.592	0.129	0.250	0.969	0.60	0.969	1.119
2.20	1.945	0.193	0.374	1.009	0.70	1.009	1.283
3.00	2.653	0.359	0.695	1.076	0.85	1.076	1.671

Step 5 — Headwater thununtu (Clause 9.4.1): HWi leh HWo zinga lian zawk.

Table 9A.6 — Headwater thununtu leh endikna

Ruahpui	Q (m³/s)	HWi (m)	HWo (m)	Control	HW (m)	HW level (m)	HW/D
Design, 4% AEP	1.80	1.127	1.119	Inlet	1.127	21.13	0.94
Check, 2% AEP	2.20	1.302	1.283	Inlet	1.302	21.30	1.09
1% AEP	3.00	1.719	1.671	Inlet	1.719	21.72	1.43

Step 6 — Design AEP-a headwater tehna (Clause 9.4.5):

- (a) HW/D = 0.94 ≤ 1.2. A zawm.
- (b) HW level 21.13 m ≤ shoulder kam 22.00 m − 0.30 m = 21.70 m. A zawm.
- (c) Luanna chunglama building leh ram ri-a tui sang zawng chu Clause 6.12.2(d) hnuaiah dinhmun awm mek nen khaikhin a ni. Hei hian luanna chunglam survey a mamawh a, hetah lantir a ni lo.

Step 7 — Kawng chunga tui kal (Clause 6.12.2, 6.12.3 leh 9.4.6). 1% AEP headwater level, 21.72 m, chu kawng chhip hniam ber, 22.10 m, aia a hniam avangin, check emaw 1% AEP ruahpui-ah kawng chungah tui a kal lo. Headwater chuan crest a pel ta se, kawng chunga tui luang Qr = Cd · L · h^1.5 (Cd ≤ 1.66) chu headwater inang-ah culvert tui luang nen inbuktlak a ni ang a, kawng chunga tui thuk zawng chu Clause 6.12.2(a) nen endik a ni ang.

Step 8 — Outlet velocity (Clause 9.4.7). Inlet control hnuaiah, outlet velocity chu barrel-a normal depth velocity a ni. Barrel khat theihna chu (1/n) · A · R^(2/3) · S^0.5 = (1/0.015) × 1.131 × 0.448 × 0.0707 = 2.39 m³/s a ni.

- 1.80 m³/s: normal depth 0.778 m, outlet velocity 2.32 m/s.
- 2.20 m³/s: normal depth 0.908 m, outlet velocity 2.40 m/s.
- 3.00 m³/s: barrel khat theihna aia a tam a, chuvangin outlet-ah barrel a khat; velocity = Q/A = 2.65 m/s.

Tui dawngtu channel chu lined lo sandy loam a ni a, velocity phal 0.53 m/s (Table 9.2) a nei, chuvangin outlet humhalhna a ngai (Clause 9.6.1). Barrel velocity zawng zawng hi 3.0 m/s aia an hniam (Clause 6.7.3(b)).

Step 9 — Riprap apron (Clause 9.6.3; Milem 9.2). D50 = 0.2 · D · [Q / (g^0.5 · D^2.5)]^(4/3) · (D/TW), g^0.5 · D^2.5 = 3.132 × 1.577 = 4.941 nen.

Table 9A.7 — Riprap apron size ruatna

Q (m³/s)	TW (m)	Q / (g^0.5 · D^2.5)	[ ]^(4/3)	D50 (m)
1.80	0.60	0.364	0.260	0.2 × 1.2 × 0.260 × 2.00 = 0.125
2.20	0.70	0.445	0.340	0.2 × 1.2 × 0.340 × 1.71 = 0.140
3.00	0.85	0.607	0.514	0.2 × 1.2 × 0.514 × 1.41 = 0.174

Clause 9.4.7 hian design AEP leh 1% AEP tan outlet humhalh a phut a, chuvangin hetah apron chu D50 lian ber, 0.174 m, tan size ruat a ni. Table 9.3 aṭangin, Class 2 (D50 = 150 mm) chu a tê lutuk a, chuvangin **Class 3** (D50 = 250 mm) hman a ni:

- apron sei zawng 5D = 5 × 1.2 = 6.0 m;
- apron chah zawng 2.4 × D50 = 2.4 × 0.25 = 0.60 m;
- outlet-a apron zau zawng 3D = 3.6 m tal, luanna hnuailam channel thlenga zau chho;
- granular filter emaw geotextile chunga lung dah (Clause 9.6.4).

Step 10 — Tihtawp endikna (Clause 6.12.4(a)). 1% AEP tui luang tan inlet area 50% tihtawp nen Step 3 aṭanga 7 thleng nawn leh a ni a, result-te chuan Clause 6.12.2(a) leh (d) a zawm ngei ngei tur a ni. He Kaihhruaina Bu hian inlet tihtawp ṭhenkhat entir dan standard a la ruat lo, chuvangin he endikna hi HY-8-ah emaw Approving Authority (phalna petu Authority) nena inremna kalphung hmangin neih a ni. Hetah chhut a ni lo.

Table 9A.8 — Entirna chhutna tlangpui (Entirna chauh — design value a ni lo)

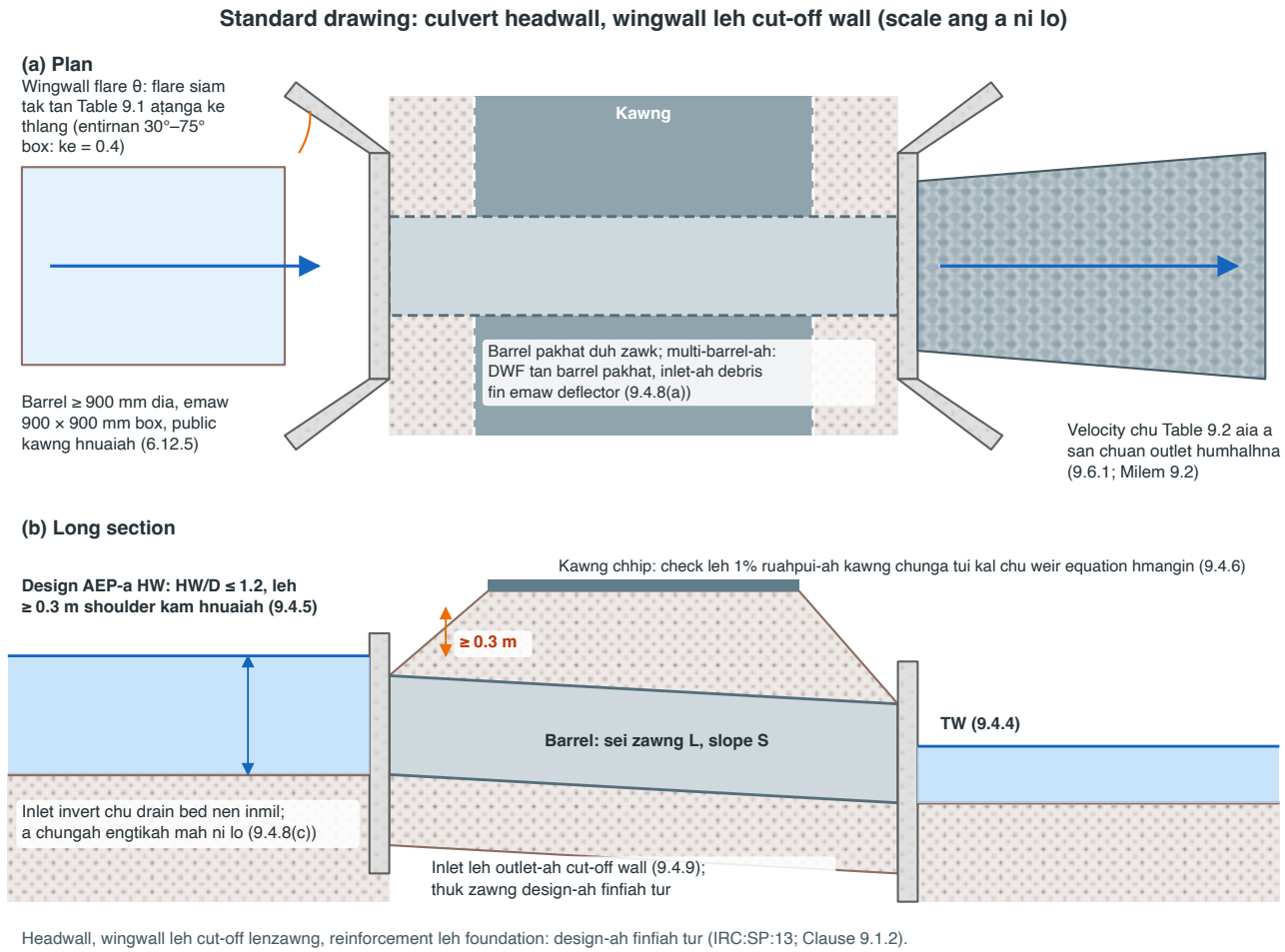
Endikna	A chhuah	Clause
Size tlem ber	1,200 mm ≥ 900 mm	6.12.5
Design HW/D	0.94 ≤ 1.2	9.4.5(a)
Shoulder kam hnuaia design HW	21.13 m ≤ 21.70 m	9.4.5(b)

Endikna	A chhuah	Clause
Check leh 1% ruahpui-a kawng chunga tui kal	A awm lo (21.72 m < 22.10 m)	6.12.2, 9.4.6
Outlet humhalhna	Class 3 riprap apron, 6.0 m sei, 0.60 m chah, outlet-ah 3.6 m zau	9.6.1, 9.6.3
Tihtawp endikna	HY-8-ah emaw kalphung inremna hmangin neih tur	6.12.4

Belhchian 9B — Standard drawing: headwall, riprap apron, drop structure, trash rack, detention riser

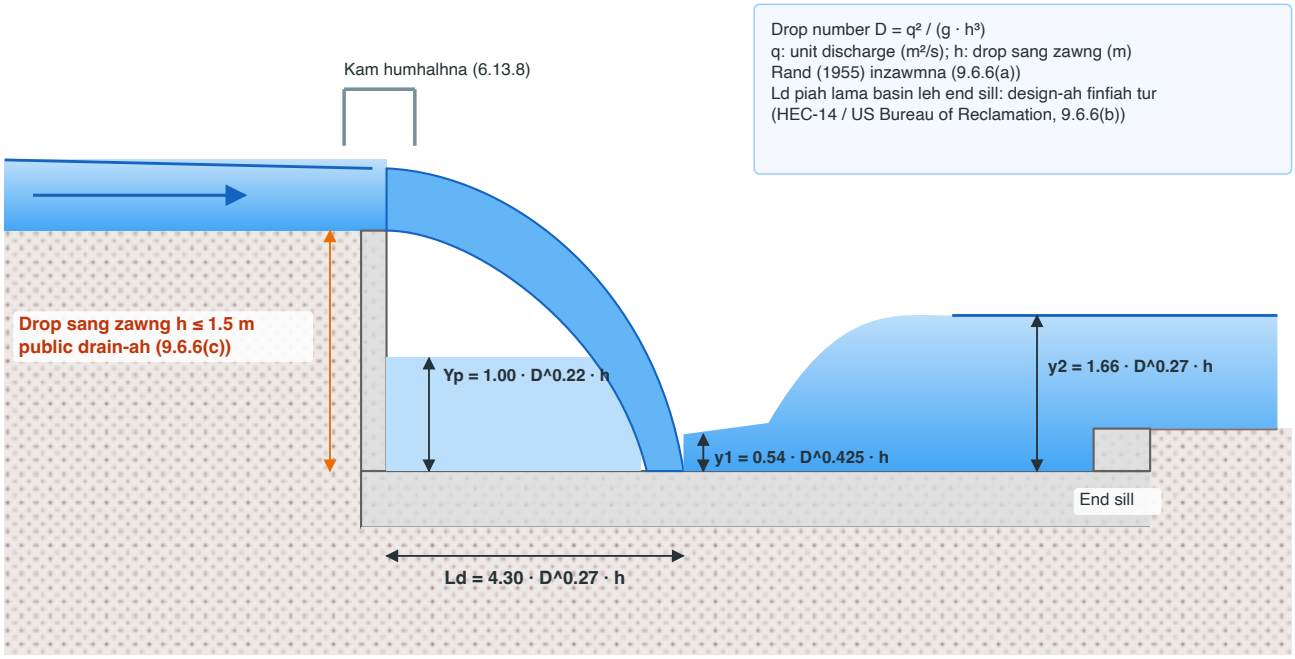
Bung 9-a Clause 9.4, 9.6, 9.7 leh 9.8 a ṭanpui.

A hnuaia drawing-te hi schematic standard drawing an ni. Bung 9 leh Bung 6-in an ruat lenzawng leh dan chauh an lantir. Structural lenzawng, reinforcement, foundation leh fixing-te chu design-ah finfiah tur a ni (Clause 9.1.2). Riprap (lung lian phah) apron standard drawing chu Bung 9-a Milem 9.2 a ni a, Table 9.3 aṭanga lenzawng nen; hetah nawn a ni lo. Table 9B.1 hian lenzawng lantir leh an hnar clause-te a tarlang.



Milem 9B.1 — Standard drawing: culvert headwall, wingwall leh cut-off wall, plan leh long section-ah, headwater tehna, invert dan leh bal ruahmanna nen. He Kaihhruaina Bu tana milem siam thar, FHWA, Hydraulic Design of Highway Culverts, HDS-5 (3rd ed., 2012) aṭanga siam danglam.

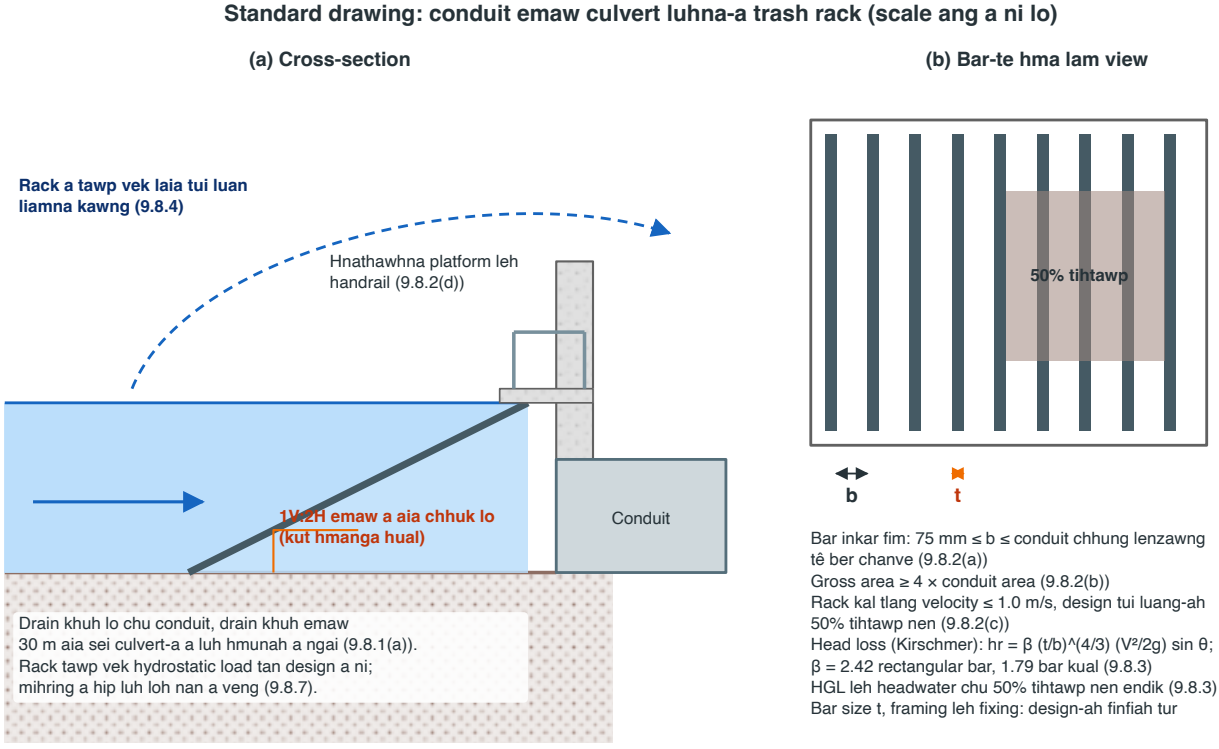
Standard drawing: drop ding dik structure (cross-section, scale ang a ni lo)



Wall leh floor chah zawng, reinforcement, cut-off leh luanna hnuailam scour humhalhna: design-ah finfiah tur.

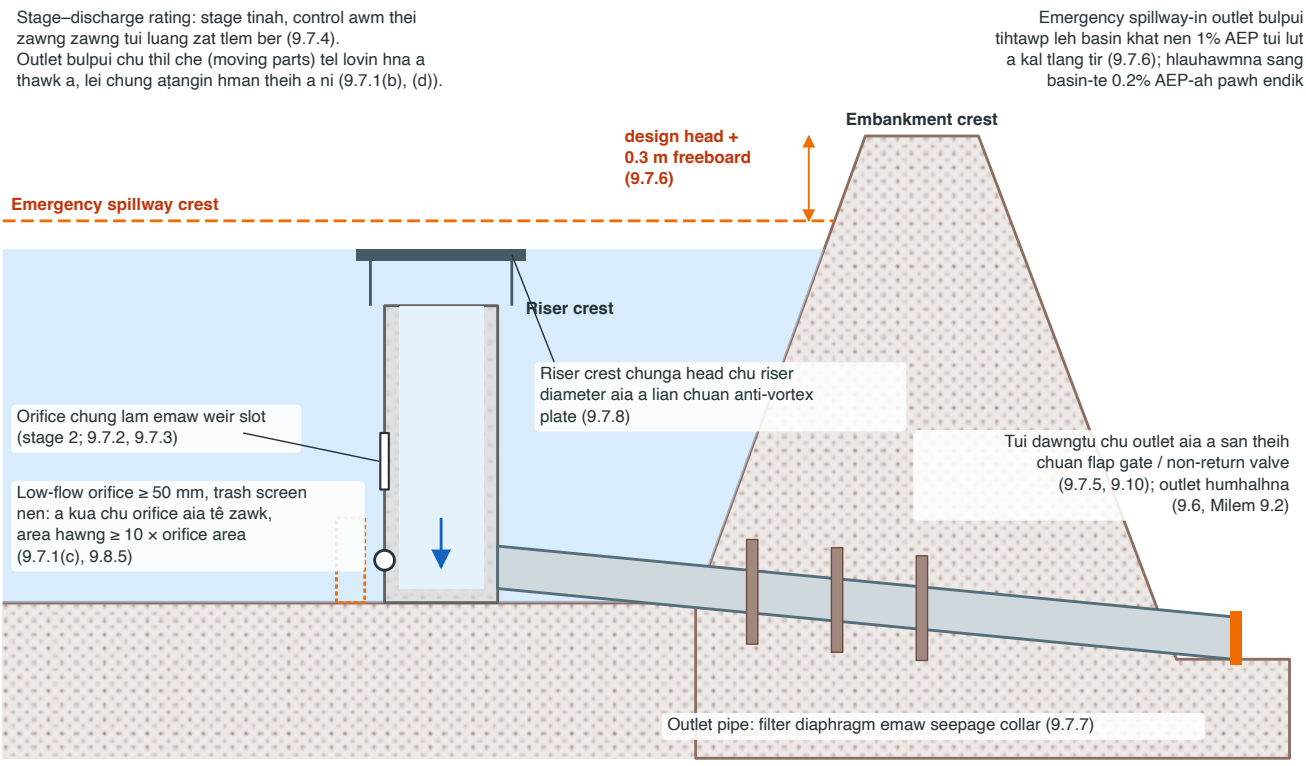
Milem 9B.2 — Standard drawing: Rand (1955) pool geometry leh 1.5 m sang zawng tehna nen drop ding dik structure (straight vertical drop structure). He Kaihhruaina Bu tana milem siam thar, Chow, Open-Channel Hydraulics (1959), leh FHWA, HEC-14 (3rd ed., 2006) aṭanga siam danglam.

Standard drawing: conduit emaw culvert luhna-a trash rack (scale ang a ni lo)



Milem 9B.3 — Standard drawing: conduit emaw culvert luhna-a trash rack (bal dangna), section leh hma lam view-ah, bar inkar, area, velocity, slope leh tui luan liamna mamawh nen. He Kaihhruaina Bu tana milem siam thar, CIRIA, Culvert, screen and outfall manual, C786 (2019), leh CPHEEO, Manual on Storm Water Drainage Systems (2019), §8.3.1.3 aṭanga siam danglam.

Standard drawing: detention basin outlet riser leh emergency spillway (cross-section, scale ang a ni lo)



Orifice size, stage level, riser size leh structural detail-te: design-ah finfiah tur.

Milem 9B.4 — Standard drawing: low-flow orifice leh screen, stage chung lam, anti-vortex plate, embankment kal tlang outlet pipe, flap gate leh emergency spillway nei detention basin outlet riser. He Kaihhruaina Bu tana milem siam thar, Kansas City Metro APWA, Section 5600 (2006, 5608.4) aṭanga siam danglam.

Table 9B.1 — Standard drawing-a lenzawng leh dan-te leh an hnar clause

Drawing	Thil	Lenzawng emaw dan	Clause
9B.1	Public kawng hnuaia culvert size tlem ber	Diameter 900 mm, emaw 900 mm × 900 mm box	6.12.5
9B.1	Design AEP-a headwater	HW/D ≤ 1.2; luanna chunglam hmai-a shoulder kam aia 0.3 m tal hniam	9.4.5
9B.1	Entrance loss coefficient	Inlet siam tan Table 9.1 aṭangin (entirnan 30°–75°-a wingwall nei box tan 0.4)	9.4.3
9B.1	Invert	Drain bed nen inmil; a chungah engtikah mah ni lo	9.4.8(c)
9B.1	Multi-barrel culvert	Bal tam theihna drain-ah hman loh; hman a nih chuan, ruah sur lohna hun tui luang tan barrel pakhat leh debris fin emaw deflector	9.4.8(a)
9B.1	Headwall, wingwall, cut-off wall	A ngai; lenzawng chu design-ah finfiah tur	9.4.9
9B.1	Kawng chunga tui kal	Qr = Cd · L · h^1.5, Cd ≤ 1.66	9.4.6

Drawing	Thil	Lenzawng emaw dan	Clause
Milem 9.2	Riprap apron	Outlet-a zau zawng ≥ 3D, channel thlenga zau chho; sei zawng leh chah zawng Table 9.3 aṭangin; filter emaw geotextile	9.6.3, 9.6.4
9B.2	Public drain-a vertical drop pakhat	Sang zawng h ≤ 1.5 m; kam humhalhna	9.6.6(c), 6.13.8
9B.2	Pool geometry	D = q²/(g h³); Ld/h = 4.30 D^0.27; Yp/h = 1.00 D^0.22; y1/h = 0.54 D^0.425; y2/h = 1.66 D^0.27	9.6.6(a)
9B.2	Ld piah lama basin, end sill	Design-ah finfiah tur (HEC-14 emaw US Bureau of Reclamation)	9.6.6(b)
9B.3	A ngaih hmun	Drain (tui luanna) khuh lo chu conduit, drain khuh emaw 30 m aia sei culvert-a a luh hmunah	9.8.1(a)
9B.3	Bar inkar fim b	75 mm aia tlem lo leh conduit chhung lenzawng tê ber chanve aia tam lo	9.8.2(a)
9B.3	Rack gross area	Conduit area let 4 tal	9.8.2(b)
9B.3	Rack kal tlang velocity	50% tihtawp nen design tui luang-ah 1.0 m/s aia sang lo	9.8.2(c)
9B.3	Inclination	Kut hmanga hual a nih chuan 1V:2H aia chhuk lo; hnathawhna platform leh handrail	9.8.2(d)
9B.3	Head loss leh tihtawp endikna	Kirschmer equation; 50% tihtawp nen HGL leh headwater endik	9.8.3
9B.3	Tui luan liamna leh himna	Rack tawp vek tan tui luan liamna kawng; hydrostatic load kim tan design	9.8.4, 9.8.7
9B.4	Low-flow orifice	50 mm aia tê lo; orifice aia kua tê zawk leh orifice area let 10 tal area hawng nei trash screen	9.7.1(c), 9.8.5
9B.4	Orifice leh weir tui luang	Q = Cd · A · (2gh)^0.5, kam hriam tan Cd = 0.60; Clause 9.7.3-a weir coefficient	9.7.2, 9.7.3
9B.4	Stage–discharge rating	Stage tinah control awm thei zawng zawng zinga tui luang zat tlem ber	9.7.4
9B.4	Anti-vortex plate	Riser crest chunga design head chu riser diameter aia a lian chuan	9.7.8
9B.4	Embankment kal tlang outlet pipe	Filter diaphragm emaw seepage collar; flare emaw headwall nei inlet	9.7.7
9B.4	Flap gate emaw non-return valve	Tui dawngtu chu outlet aia a sang thei chuan	9.7.5, 9.10
9B.4	Emergency spillway	Outlet bulpui tihtawp leh basin khat nen 1% AEP tui lut a kal tlang tir, embankment crest thlengin freeboard 0.3 m nen; hlauhawmna sang basin tan 0.2% AEP endikna	9.7.6
Zawng zawng	Structural lenzawng, reinforcement, foundation, bar size, orifice size leh stage level	Design-ah finfiah tur	9.1.2

Belhchian 9C — Pump station design checklist leh control philosophy pangngai

Bung 9-a Clause 9.8.6, 9.9 leh 9.10 a ṭanpui, Bung 6-a Clause 6.10.5 leh Bung 5-a outfall khar endikna nen.

9C.1 Design checklist

He checklist hi Clause 9.14, item 6-a pump station design report nen thehlut rawh.

Table 9C.1 — Pump station design checklist

No.	Thil	Mamawh	Clause	Pek (Aw / Aih / NA)
1	Pump mamawh	Gravity drainage-in Bung 5 leh 6 a phak thei lo; a chhan sawi	9.9.1	
2	Tui lut	Catchment (ruahtui luan khawmna hmun) leh luanna chunglama khawlna reng reng kal tlanga route inflow hydrograph	9.9.2	
3	Design standard	Element rawngbawl design AEP; underpass tan, 1% AEP endikna nen 2% AEP	9.9.2(a), 6.10.5(a)	
4	Tidal outfall	Tidal-lock rei zawng chhung outfall tihzim nen khawlna leh pump-in 48 h design tui zat a dawm (default 6 h zel tide sang pahnih)	9.9.2(b), Bung 5	
5	Head range	Tailwater hniam ber laia sump level hniam ber aṭanga tailwater sang ber (HAT + surge + 0.3 m) thleng pump thlan; pump leh system curve thehluh	9.9.2(c), 9.14	
6	Wet-well tui zat	Heng zinga lian ber: tui lut tlem ber 5 min (variable speed leh automatic control); tui lut sang ber 10 aṭanga 15 min thleng, emaw manufacturer cycle tui zat tlem ber; constant-speed pump tin tan $V = \Theta \cdot q / 4$	9.9.3	
7	Duty pump	Tih theih chinah size inang	9.9.4(a)	
8	Standby	Duty pump lian ber nen a inang tal, leh duty pump zat 50% aia tlem lo	9.9.4(b)	
9	Inthlak chhawk	Duty leh standby hna automatic-in an inthlak chhawk	9.9.4(c)	
10	Pump chi	Solids-handling (non-clog); axial-flow chu Clause 9.8.6 zawm screen hnungah chauh	9.9.5	
11	Sump leh intake	Manufacturer mamawh leh ANSI/HI 9.8; inkar fim 0.6 m (tê leh lai) emaw 1.0 m (unit lian)	9.9.6	
12	Model study	Pump reng reng 1 m^3/s aia a lian emaw sump chu ANSI/HI 9.8 geometry aṭanga a kal bo chuan physical model	9.9.6	
13	Leidip dawnna leh screen	Wet well luanna chunglamah; pump-te solids size aia screen inkar tê zawk; module paih theih; tui lut 1 m^3/s aia a tam chuan mechanical raking	9.9.7, 9.8.6	
14	Screen tui luan liamna	Screen a tawp vek laia tui luan liamna kawng	9.8.4	
15	Level control	A hrang float-switch back-up nen primary level sensor (ultrasonic, radar emaw pressure)	9.9.8(a)	
16	Alarm	High-level leh pump-fault alarm telemetry hmangin local body control room-ah	9.9.8(b)	
17	Record	Sump level, pump run hours leh power dinhmun ziak leh kum 5 tal vawn	9.9.8(c)	
18	Power hnar	Grid supply leh duty pump zawng zawng vawikhatah tlan tir thei standby generator emaw feeder hrang pahnihna	9.9.9(a)	
19	Fuel	Duty pump zawng zawng tan 72 h tal, Clause 9.9.10-a tuilian level chunga khawl	9.9.9(b)	
20	Inthlak	Standby power-a automatic inthlak	9.9.9(c)	
21	Tuilian laka humhalhna	Electrical leh control room chhuat, generator leh transformer chu 1% AEP tuilian level aia 0.5 m tal sang; 1% AEP ruahpui-ah motor luhna kawng hman theih	9.9.10	
22	Tui chhuahna	Rising main hrang, emaw main an inzawmnaah non-return leh isolating valve; flap gate emaw non-return valve nei delivery chamber emaw outfall; friction formula hriat lar hmanga main size ruat	9.9.11	

No.	Thil	Mamawh	Clause	Pek (Aw / Aih / NA)
23	Gate	1% AEP still-water level hnuaia outfall-ah flap emaw tide gate; 900 mm emaw a aia lian outfall leh pump hmang outfall tin tan luanna chunglamah penstock emaw stop-log slot; enchhin data aṭanga head loss	9.10.1, 9.10.3, 9.10.4	
24	Outfall-a sand leh bal	Beach, estuary leh creek outfall-ah lei chung aṭanga luh theih chamber-a gate, emaw elastomeric check valve	9.10.5	
25	Emergency inzawmna	Delivery chamber-a mobile pump tan hard-standing leh quick-coupling inzawmna	9.9.12	
26	Siamna thil	Clause 9.13-a exposure class; tuifinriat kam aṭanga 5 km chhungah stainless steel grade 316, galvanised leh coated steel, emaw metal ni lo fixing	9.13	
27	Design life	Civil hnathawh tan kum 50 tal leh mechanical leh electrical hmanrua tan kum 25 tal	9.2.4	
28	Underpass station	Carriageway-a 150 mm thuk zawngah thuk zawng chhinchhiahna leh automatic hriattirna emaw kal theih loh signal	6.10.5(d)	
29	Certification	Empanelled professional-in design leh empanelled professional hrang-in endik	10.6.1(d), 10.6.4	

9C.2 Control philosophy pangngai

Hei hi Clause 9.9 hnuaia design ruahtui pump station tana control philosophy pangngai a ni. Designer (design siamtu) chuan station ang zelin a siam rem a, design report nen a thehlut ang. "Thurawn" ("recommended") tia chhinchhiah item-te hi Bung 9-in a phut loh hmanna ṭha an ni; a dang zawng zawng hian clause an sawi nawn.

Table 9C.2 — Control level (value-te chu design-ah ruat tur)

Level	A ruat dan	Clause
Pump stop	Pump manufacturer leh ANSI/HI 9.8-in a phut submergence tlem ber aia hniam lo	9.9.6
Duty pump 1 start	Pump-stop level chungah Clause 9.9.3-a wet-well tui zat hman theih tal	9.9.3
Duty pump 2, 3 … start	Duty pump 1 start chungah stage-in; inkar chu design-ah finfiah tur	9.9.2
High-level alarm	Duty-pump start level sang ber chungah; design-ah finfiah tur	9.9.8(b)
Float back-up high	Float hrang; duty pump-te a ṭan tir	9.9.8(a)
Float back-up low	Float hrang; pump-te a tichawl	9.9.8(a)

1. **Hman dan pangngai (automatic).** Wet-well level chu duty pump 1 start level a thlen chuan, lead pump a ṭan. Level a la san zel chuan, duty pump dang tin chu an start level-ah an ṭan. Level chu pump-stop level a thlen chuan pump-te an chawl. Primary level sensor-in he indawtna hi a thunun (Clause 9.9.8(a)).
2. **Duty inthlak chhawk.** Lead pump chu pump-down cycle tin hnuah emaw design-a ruat run hours azirin automatic-in a inthlak a, duty leh standby hna an inthlak chhawk a, a chhiatna an insem (Clause 9.9.4(c)).
3. **Pump fault.** Pump trip emaw ṭan thei lo chu lock out a ni. Pump dawt hman theih, standby pump tiamin, chuan a hmun a luah a, pump-fault alarm telemetry hmangin thawn a ni (Clause 9.9.4(b) leh 9.9.8(b)).
4. **Level-sensor chhiat.** Primary sensor a chhiat emaw float switch nen a inmil loh chuan, control chu float back-up hrang hnenah a kal: float-high level-ah duty pump-te an tlan a, float-low level-ah an chawl. Alarm thawn a ni (Clause 9.9.8(a), (b)).
5. **Power tlakchham.** Supply chu standby generator emaw feeder pahnihna-ah automatic-in a inthlak (Clause 9.9.9(c)). Thurawn: inthlak hnuah generator chunga ṭanna load tihtlem nan pump-te pakhat zelin ṭan leh se.

6. **Level sang.** High-level alarm level-ah telemetry hmangin local body control room-ah alarm thawn a ni (Clause 9.9.8(b)). Underpass-ah, carriageway-a 150 mm thuk zawngah hriattirna emaw kal theih loh signal-te an hna a thawk (Clause 6.10.5(d)).
7. **Outfall leh gate.** Rising main-te chu flap gate emaw non-return valve nei delivery chamber emaw outfall (drain tui luan chhuahna)-ah an luang chhuak (Clause 9.9.11). Flap gate-te chu control hmalakna awm lovin head danglamna hnuaiah an hawng leh an hup. Luanna chunglama penstock emaw stop log chu enkawl nan chauh, emaw flap gate a hawng tlat chauhin hup a ni (Clause 9.10.3). Thurawn: penstock dinhmun chu control panel-ah lantir leh ziak se.
8. **Tide-lock hnathawh.** Outfall chu tide-lock a nih chuan, tidal-lock rei zawng chhung khawlna leh pump-in 48 h design tui zat an dawm (Clause 9.9.2(b) leh Bung 5). Station-in gravity outfall a neih bawk chuan, tide a hniam hunah flap gate kal tlangin gravity tui luang a ṭan leh.
9. **Screen.** Mechanically raked screen (tui lut 1 m³/s aia a tam chuan a ngai, Clause 9.8.6) chu automatic-in tlan tir a ni. Thurawn: timer leh screen kal tlang level danglamna hmangin hual ṭan tir se, danglamna a sang reng chuan alarm nen.
10. **Kut hmanga hman.** Thurawn: pump tin chuan panel-ah hand–off–auto selector a nei se, hand mode-ah float back-up high-level start a hna a thawk reng se.
11. **Mobile pump.** Pump nghet hman theih loh emaw an tuar zo loh hunah, mobile pump-te chu quick-coupling inzawmna kal tlangin delivery chamber-ah an luang chhuak (Clause 9.9.12).
12. **Record.** Sump level, pump run hours leh power dinhmun chu ziak leh kum 5 tal vawn a ni (Clause 9.9.8(c)). Thurawn: alarm, pump ṭan leh chawl, leh inthlak-te pawh ziak se.
13. **Enchhinna.** Control, float, alarm, telemetry, inthlak leh generator chu Bung 10-a fûr hma endikna (Clause 10.12)-ah enchhin a ni a, a result-te chu Kumtin Enkawlna Puanchhuahna (Form 10-7; Clause 10.10.3)-ah report a ni.

Form 9-1 — Hydraulic Structure Report checklist

Bung 9-a Clause 9.14 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Dan anga hman tur a ni lo.

He checklist hi Hydraulic Structure Report hmaah belh rawh. Thil tin tan, Aw, Aih emaw A huam lo ziak la, a lanna drawing emaw phêk ziak rawh.

Section A — Project

Table 9F.1 — Form 9-1, Section A: project

Field	Ziah luh tur
Project hming leh hmun	_____
Local body, leh Tier A emaw Tier B (Bung 1)	_____
Dilna thehluhtu (applicant)	_____
Designer (hming leh registration)	_____
Structure huam (culvert, channel, dissipator, outlet, screen, pump, gate, inlet, manhole)	_____
Tailwater dinhmun hman: MHWS, HAT + surge, sea-level allowance, joint case (Clause 9.2.1)	_____
Ni leh revision	_____

Section B — Clause 9.14-in a phut chhunga thu

Table 9F.2 — Form 9-1, Section B: Clause 9.14-in a phut chhunga thu

No.	Thil	Clause	Pek (Aw / Aih / NA)	Drawing emaw phêk
1	Culvert chhutna (HDS-5 emaw HY-8 output) HWi, HWo, outlet velocity, tailwater, kawng chunga tui kal leh tihtawp endikna nen	9.4, 6.12		
2	Channel tui chung profile, velocity, Froude number leh freeboard	9.5		
3	Outlet humhalhna leh dissipator design, riprap size ruatna nen	9.6		
4	Detention outlet stage–discharge table leh emergency spillway endikna	9.7		
5	50% tihtawp endikna nen screen leh rack design	9.8		
6	Pump station design report: inflow hydrograph, khawlna, pump leh system curve, wet-well tui zat, control, power supply leh Bung 5 outfall khar endikna (Belhchian 9C nen)	9.9		
7	Head-loss data nen gate leh valve thlan	9.10		
8	Inlet, grate leh khuh load class	9.11		
9	Exposure class leh siamna thil statement	9.13		

Section C — Dan zawm endikna

Table 9F.3 — Form 9-1, Section C: dan zawm endikna

No.	Endikna	Tehna	Clause	A zawm (Aw / Aih / NA)
C1	Design tui luang-ah climate factor telh	Clause 2.8	9.2.2	
C2	Bal-in a tihtawp theihna hmunah tihtawp dinhmun endik; tui luan liamna kawng him	—	9.2.5	
C3	Pipe leh box drain: design n (box drain ≥ 0.015); supercritical pipe: jump structure-a awm, air venting	—	9.3.1, 9.3.4	
C4	Pipe size luanna hnuailam panah a tlem lo; manhole emaw junction chamber-ah chauh inzawm; 90° aia tam kawng thlak danglamna awm lo	—	9.3.5	
C5	Culvert design headwater = HWi leh HWo zinga lian zawk	—	9.4.1	
C6	Design AEP-a culvert headwater	HW/D ≤ 1.2; shoulder kam aia ≥ 0.3 m hniam	9.4.5	
C7	Kawng chunga tui kal weir coefficient	Cd ≤ 1.66	9.4.6	
C8	Culvert invert drain bed nen inmil; headwall, wingwall leh cut-off wall	—	9.4.8(c), 9.4.9	
C9	Design tui luang-a channel Froude number	≤ 0.8; 0.8 leh 1.2 inkar awm lo	9.5.2	
C10	Channel velocity	Table 9.2	9.5.3	
C11	Engineered channel-a channel slope	≤ 0.4% natural, ≤ 0.2% concrete, emaw drop / chute	9.5.4	
C12	Sir slope; bed zau zawng ≥ 3 m-ah low-flow channel; uplift emaw weep hole	—	9.5.6, 9.5.7, 9.5.9	
C13	Outlet velocity chu Table 9.2 aia a san hmuna outlet humhalhna	Table 9.3 apron, emaw basin	9.6.1, 9.6.3	
C14	Vertical drop pakhat sang zawng	≤ 1.5 m	9.6.6(c)	
C15	Detention outlet bulpui: hmanrua che awm lo; orifice tlem ber	Screen nen ≥ 50 mm	9.7.1	
C16	Emergency spillway	1% AEP, outlet tihtawp, basin khat, freeboard 0.3 m; hlauhawmna sang basin tan 0.2% AEP	9.7.6	
C17	Embankment kal tlang outlet pipe; a ngaih hmunah anti-vortex plate	—	9.7.7, 9.7.8	
C18	Conduit luhna rack	Inkar 75 mm aṭanga conduit lenzawng tê ber chanve thleng; area ≥ 4×; 50% tihtawp-ah ≤ 1.0 m/s	9.8.2	
C19	Detention orifice screen	Orifice aia kua tê zawk; area hawng ≥ 10×	9.8.5	
C20	Pump station	Belhchian 9C checklist kim	9.9	
C21	1% AEP still-water level hnuaia outfall-a gate; hupna pahnihna; thir ei do thei fitting	—	9.10	
C22	Grate load class, parallel kua ≤ 25 mm, kerb kua ≥ 100 mm × 1.0 m, khuh lock	—	9.11	

No.	Endikna	Tehna	Clause	A zawm (Aw / Aih / NA)
C23	Manhole size (Table 9.4), luhna kua 600 mm, drop, benching, surcharge khuh	—	9.12	
C24	Exposure class (Table 9.5); coastal leh delta hmunah chloride leh sulphate test; sulphide humhalhna; tuifinriat kam aṭanga 5 km chhunga thir hnathawh	—	9.13	

Section D — Variance

Table 9F.4 — Form 9-1, Section D: variance

Clause	Mamawh zawm loh	A chhan leh thlan dang rawt	Phalna petu leh ni
_____	_____	_____	_____

Section E — Hmingziak

Report hi registered professional-in a buatsaih a, a hming a ziak tur a ni a, Professional Design Certificate (Form 10-3) belh tur a ni (Bung 10-a Clause 10.6.1 leh 10.6.3). Embankment nei facility, hlauhawmna sang basin, pump hmang facility, tide gate emaw regional facility tan, hming ziaktu chu empanelled Stormwater Design Professional a ni tur a ni a, empanelled professional hrang pahnihna-in endiktu angin hming a ziak tur a ni (Clause 10.6.1(c), (d) leh 10.6.4).

Table 9F.5 — Form 9-1, Section E: hmingziak

Mawhphurhna	Hming	Registration emaw empanelment no.	Hmingziak	Ni
Designer	_____	_____	_____	_____
Endiktu hrang (Clause 10.6.4, a huam chuan)	_____	_____	_____	_____

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0.

BUNG 10 BELHCHIAN

Thehluh tur, Endikna, Kalpui leh Enkawl, leh Dan Zawm Tirna

Heng belhchiante hian Bung 10 an ṭanpui. Compliance calculator (dan zawm endikna chhutna) specification leh a hman dan kaihhruaina (user guide) ruangam, GIS data specification, he Kaihhruaina Bu-in a ruat enkawlna atana luhna (maintenance access) zau zawng, facility chi tin tana O&M plan (kalpui leh enkawl plan) entawn tur, empanelment (thiamna list-a dah luhna) criteria entawn tur, leh Bung 10-in a phut form pariatte an pe. Design Ruahtui Tlak Sheet (Form 2-1) chu Bung 2 belhchian-ah a awm. Form-te hi draft form an ni. Entirna thuziak-te hi competent authority ngaihtuah tur a ni a, hman a ni lo.

Belhchian 10A — Compliance calculator leh a hman dan kaihhruaina

Bung 10-a Clause 10.4.1(g), 10.5 leh 10.9.1(b) a ṭanpui.

> **Dinhmun.** Compliance calculator hi a la awm lo. Clause 10.5.1-in State Stormwater Technical Committee chu a chhuah tur leh a enkawl turin a phut. He belhchian hi calculator-in a tlin tur specification leh a hman dan kaihhruaina ruangam a ni. Calculator chhuah a nih hma chu, design siamtu (designer) chuan Bung 4, 5 leh 8 chhutna aṭangin Form 10-2 chu kutin a ziah khah a, calculator version-ah "chhuah a ni lo" ("not issued") tiin a ziak a, chhutna-te chu a belh ang.

10A.1 Mamawh tlangpui

Calculator chu:

- (a) spreadsheet emaw web tool a ni tur a ni, a hman dan kaihhruaina leh a chhunga table tin hnar nen, man nei lovin tlangzarh a ni tur a ni (Clause 10.5.4);
- (b) output phêk tin leh file export tinah a version number leh a chhuah ni a chhut tur a ni (Clause 10.5.3);
- (c) mipui hmuh theih version log a vawng tur a ni. Version thar chu a chhuah aṭanga thla 6 hnuah thehluh tur (submittal) thar-ah hman a ni ang; thehluh tur pakhat chuan Stage 1 aṭanga Stage 4 thleng version pakhat a hmang reng ang, dilna thehluhtu (Applicant)-in version thar zawk a thlan loh chuan (Clause 10.5.3);
- (d) site pakhat zelin a hnathawk tur a ni, drainage area pakhat emaw a aia tam nen, pakhat zelin amah outfall (drain tui luan chhuahna) ngeiah a luang (Clause 4.5.1.3);
- (e) he Kaihhruaina Bu-in a tlangzarh loh value a hmang ngai loh tur a ni. A mamawh table chhuah a nih loh chuan (entirnan Belhchian 4B-a Table 4.3, emaw Belhchian 1C-a S-2 discharge table-te), calculator chuan value chhut thlap lovin chu route chu "hman theih a ni lo" ("not available") tiin a lantir tur a ni; leh
- (f) a input leh result-te chu Form 10-2 bakah computer-in a chhiar theih file (CSV emaw JSON) angin a export tur a ni, chutiang chuan Authority (phalna petu Authority)-in facility register-ah a dah lut thei ang (Clause 10.17.1(b)).

10A.2 Input-te

Table 10A.1 — Calculator input-te

No.	Input	Unit	Hnar
I1	Authority, tier (A emaw B) leh file number	—	Clause 1.6
I2	Site zau zawng; lei tihbuai (land disturbance) zau zawng	ha	Clause 1.5.2
I3	Tui luh theih lohna hmun (impervious) thar; tui luh theih lohna hmun thlak; tihchhiat hma-a tui luh theih lohna hmun awm mek	m²	Clause 1.5.2, 1.5.6, 4.5.6.1
I4	Hmasawnna hna (development) chi: thar, siam ṭhatna (redevelopment), linear public work, in pakhat chauh	—	Clause 1.5.6–1.5.8
I5	Tuilian hlauhawm catchment (ruahtui luan khawmna hmun) (aw / aih), leh phalna pek BSMP nei basin (aw / aih)	—	Clause 4.5.3, 4.13, 11.12
I6	Ruahtui zone	—	Belhchian 2A
I7	Retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) thuk zawng P_R; thla 3 ARI darkar 24 zat P_3m	mm	Belhchian 2E, 8A
I8	Duration (1–72 h) leh AEP zela design ruahtui tlak zat, climate factor nen, Form 2-1-a ziak angin	mm	Clause 2.5, 2.8, 2.13
I9	Minute 15 ruahtui tlak chakna i_10 leh i_2, climate factor nen (fixed-coefficient route chauh)	mm/h	Clause 4.14.4
I10	Drainage area-te: pakhat zelin, zau zawng, lei khuhna (land cover), tui luh theih lohna percentage, HSG leh curve number, hmasawnna hma leh hnu	ha, %, —	Clause 3.3, 3.7, 3.9
I11	Covenant register-a humhalh hmun-te	ha	Clause 4.4.7
I12	Retention practice tin bul hnuaia hun bik-a leihnuai tui sang ber thuk zawng	m	Clause 4.4.3(c), 8.8
I13	Practice tina infiltration (lei-a tui luh) rate teh	mm/h	Clause 4.4.3
I14	Practice zela retention tui zat siam; retention chu hman lehna (reuse) a nih chuan reuse mamawh zat	m³, m³/d	Clause 4.4.3, 4.4.5
I15	Route: hydrograph (hun hrang hranga tui luang zat) kalphung kimchang (Clause 4.6); design-aid S-1 (Clause 4.14.2); PSD S-2 (Clause 1.7); fixed-coefficient (Clause 4.14.3); constrained redevelopment (Clause 4.5.6)	—	Clause 1.7, 4.5.6, 4.6, 4.14
I16	Kalphung kimchang tan: AEP leh duration tin model result — hmasawnna hma leh hnu peak, khawlna hman, routing-a retention credit hmuh	m³/s, m³	Clause 4.4.6.2, 4.6
I17	Outlet (luan chhuahna): low-flow orifice (tui chhuahna khur tê) diameter emaw slot zau zawng tlem ber; routing aṭanga tui hniam hun (drawdown time)	mm, h	Clause 4.7, 4.8.2
I18	Outfall: tidal emaw tidal lo; outfall khar endikna result	—	Bung 5
I19	Basin tana notify (Gazette-a tarlan) a nih fee-in-lieu (site-a tih aia sum pek) unit rate, route a huam chuan	₹/m³	Clause 4.13.3
I20	Thehluh tur stage (1, 2 emaw 4) leh, Stage 4-ah, I14, I16 leh I17 as-built (siam zawh hnua a awm dan) value-te	—	Clause 10.5.2, 10.9.1(b)

10A.3 Chhutna-te, clause zelin

Table 10A.2 — Calculator-in a chhut tur-te

Step	Chhutna	Clause
C1	**A huam chin.** Development plan pum (common plan of development) chungah, lei tihbuai ≥ 0.1 ha emaw tui luh theih lohna hmun thar leh thlak ≥ 500 m² a nih chuan Bung 4 leh 5 a huam. Hmanlo theihna (exemption)-te report rawh. Dan pangngai (universal provision)-te chu size engkimah a huam tih flag rawh; RWH chu AMCBR regs. 5(6)(ix) leh 33 hnuaiah Aizawl Municipal Corporation area chhunga building tinah a huam tih, roof m² tin litre 25 tal khawlna angin (Clause 4.11, he Kaihhruaina Bu-in a ruat, regulation pahnih hian tui zat an ruat lo va, 2025 green-building chapter-in ruahtui khawl khawm (rainwater harvesting) chu 100 m² aia lian plot tan incentive chauhah a siam avangin), hman lehna kaltlangin chauh retention angin chhiar a ni a, detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) angin chhiar a ni ngai lo tih flag rawh; recharge (leihnuai tui tihpun) chu Clause 4.11 (recharge dan)-in a phalna hmunah chauh chhiar a ni, chu chu phai lui kam lei (valley alluvium) enchhin tawh leh lui kam zawl (river terrace)-ah, tlang pang aṭanga hla hmun zawl leh 1% AEP tuilian sang zawng chungah a ni a, tlang ram-ah chhiar a ni ngai lo (Clause 4.11, tlang dan) a, tuikhur aṭanga 15 m chhungah pawh chhiar a ni ngai lo (Bung 8-a tuikhur dan).	1.5.2–1.5.8
C2	**Process flag-te.** Stage 0 tih ngei ngei tur (≥ 2 ha, tuilian hlauhawm, variance emaw regional route, tidal outfall emaw tui awmna (waterbody)); Stage 1 leh 2 chu zawm khawm phal a ni (< 1 ha, tuilian hlauhawm lo); empanelled signatory a ngai; independent check a ngai.	10.3.2, 10.3.3, 10.6.1, 10.6.4
C3	**Route hman theihna.** Tier B kalphung awlsam: ≤ 2 ha, emaw tuilian hlauhawm catchment-ah ≤ 0.5 ha, Table 4.3 tlangzarh a nih hnu chauhin. Fixed-coefficient route: ≤ 1 ha leh Clause 4.14.3-a hman theih lohna (exclusion) pakhat mah a awm lo. Constrained redevelopment: tui luh theih lohna hmun awm mek ≥ 60% leh ≤ 1 ha. Regional detention emaw fee-in-lieu: phalna pek BSMP nei basin-ah chauh.	4.5.6.1, 4.13.1, 4.14.1, 4.14.3, 11.12.1(b)
C4	**Retention tui zat.** RRV = 10 × Q_R × A, Q_R chu sub-area tin tan AMC (ruahpui hma lei hnawnna dinhmun) II-a P_R aṭanga SCS-CN runoff, sub-area zawng zawng belh khawm. Ia = 0.2S leh Ia = 0.05S result lian zawk chuan a thunun. Rv form (RRV = 10 × P_R × Rv × A, Rv = 0.05 + 0.009 × I) hi site < 0.5 ha leh Tier B kalphung tan chauh pek a ni. Climate factor hman loh.	4.4.2, 3.8.5(c), 2.8.3
C5	**Humhalhna credit.** Humhalh hmun-te chu hmasawnna hnu dinhmun-ah an hmasawnna hma CN-in model a ni.	4.4.7
C6	**Retention endikna.** Design infiltration rate ≤ rate teh chanve; leihnuai tui chu bul hnuaiah ≥ 1.0 m; tui khawl chu design rate-in darkar 72 chhungin a hniam (emaw reuse mamawh tarlan angin). Endikna pakhat emaw a tlin loh practice chuan credit a hmu lo; a tlakchham apiang report a ni a, WQv angin chhiar a ni.	4.4.3–4.4.5, 4.4.6.4
C7	**Tui ṭhatna tui zat.** P_wq = max(P_ret, P_3m); WQv = 10 × Q_wq × A SCS-CN-in, emaw site < 0.5 ha leh Tier B kalphung tan (P_wq / 1000) × Rv × A (A chu m²-in). Tui khawl zat chu WQv-ah a vaiin chhiar a ni. Climate factor hman loh.	8.4.1–8.4.4, 3.8.5(c)
C8	**Retention credit.** Tier A: routing-a credit hmuh chu ziah luh a ni (I16); calculator-in a chhut lo. Tier B: V_credit = C_R × RRV siam, Belhchian 4B tlangzarh a nih hma chu C_R = 0.	4.4.6
C9	**Design-aid route (S-1).** V = SSR × A − V_credit; kum 2 leh kum 100 stage tan Q_PSD,T = PSD_T × A, Table 4.3 aṭangin. Table 4.3 tlangzarh a nih hma chu "hman theih a ni lo" tiin lantir.	1.7.2, 4.14.2
C10	**Site aṭanga luan chhuah phal zat (S-2).** AEP tin tan Q = PSD (m³/s/ha) × A, S-2 table aṭangin. Chhuah an nih hma chu "hman theih a ni lo" tiin lantir.	1.7.2, 1.7.3(e)
C11	**Fixed-coefficient route.** Q_cap,10 = 2.78 × C_10 × i_10 × A leh Q_cap,2 = 2.78 × C_2 × i_2 × A (L/s); V_100 leh V_2 = d = 1 aṭanga 72 h thleng tan d chunga [10 × C_v × P(d) × A − 1.8 × Q_cap × d] sang ber, d ≥ 12 h tan tui luh theihna hmun C ≥ 0.50 nen; V = max(V_100, V_2); retention chu credit nei lovin belh. Coefficient-te chu Table 4.3A (provisional) aṭangin.	4.14.4–4.14.7
C12	**Luan chhuah tir zat (release rate) screen (kalphung kimchang).** AEP leh duration tin tan: Q_post ≤ 0.9 × Q_pre (pangngai), emaw mixed-frequency cap pahnih (tuilian hlauhawm). Duration thunun leh a margin report rawh.	4.5.2, 4.5.3
C13	**Constrained redevelopment.** Duration tinah kum 2, 10 leh 100 tan Q_post ≤ 0.5 × Q_existing; tlakchham tui zat = greenfield khawlna − khawlna siam; fee = tlakchham × unit rate.	4.5.6.2, 4.5.6.3
C14	**Orifice tê ber.** Orifice < 50 mm apiang flag rawh. Cap chu stage inmil-a 50 mm orifice tui luang zat aia a hniam chuan, "50 mm orifice hi a tling angin ngaih a ni" ("50 mm orifice deemed to comply") tiin report rawh.	4.5.5.1, 4.8.2

Step	Chhutna	Clause
C15	**Tui hniam (drawdown).** Detention drawdown (kum 10 tui khawl 90% darkar 48 chhungin), WQv luan chhuah hun (darkar 24–48) leh retention ruak hun (≤ 72 h) report rawh.	4.7
C16	**Fee-in-lieu.** Fee = site-a detention tui zat mamawh × notify a nih unit rate.	4.13.3
C17	**Model screen.** Kalphung kimchang hman a nih chuan, model result (I16) chu calculator screen value (C9 aṭanga C11 thleng, a awm chuan) nen khaikhin la, hman dan kaihhruaina-a tolerance tarlan aia inthlauhna lian zawk apiang flag rawh.	10.5.2(c)
C18	**As-built chhut nawn.** Stage 4-ah, as-built value-te hmangin C4 aṭanga C17 thleng chhut nawn la, Stage 2 aṭanga danglamna tin report rawh.	10.9.1(b), 10.9.2

10A.4 Output-te

Calculator chuan a siam chhuak:

- (a) **Form 10-2**, ziah khah, phêk tinah calculator version leh a chhuah ni nen;
- (b) Table 10A.1 leh 10A.2-a input leh result tin computer-in a chhiar theih export; leh
- (c) flag chhuahte list (C1 aṭanga C3, C6, C14, C17), pakhat zelin a innghahna clause nen (Clause 10.7.7).

10A.5 Chhuah hma enchhinna

Chhuah tin hmain State Stormwater Technical Committee chuan calculator-in he Kaihhruaina Bu-a kalphung inang hmang chhut dan entirna-te, Clause 4.6.7 leh 4.14-a entirna-te leh, a huam chuan, Belhchian 3C-a benchmark test problem (software enchhinna atana chhut tur)-te, a round-na chhungin a chhut chhuak nawn thei tih a endik tur a ni. Enchhinna result-te chu version log nen tlangzarh tur a ni.

10A.6 Hman dan kaihhruaina ruangam

Hman dan kaihhruaina chuan a tlem berah heng hi a keng tur a ni:

1. Calculator tum, dinhmun leh a huam chin: design-aid route pawn lamah tlangpui leh screening endikna a ni (Clause 10.5.2(c)).
2. Version thar ber lak dan, leh Clause 10.5.3-a version dan.
3. Table 10A.1-a input tin, Kaihhruaina Bu leh a belhchiante-a a awmna nen.
4. Table 10A.2-a chhutna tin, a equation leh clause nen.
5. Step C17-a tolerance hman, leh a pel chuan drainage report-in a hrilhfiah ngei ngei tur (Clause 10.5.2(c)).
6. Form 10-2 chhiar dan leh signature thun dan, leh belh tur.
7. Route tin tan chhut dan entirna pakhat tal, "Entirna chauh — design value a ni lo" tia chhinchhiah.
8. Calculator chhunga table tin hnar (Clause 10.5.4), leh version log.

Belhchian 10B — GIS data specification leh attribute schema

Bung 10-a Clause 10.4.4, 10.14.1(d), 10.14.3 leh 10.17 a ṭanpui.

10B.1 Format leh reference system-te

- (a) **Format.** Thehluh tur pakhatah OGC GeoPackage (.gpkg) pakhat hi duh zawk a ni. Shapefile pawh lo pawm a ni, layer pakhatah pakhat zelin, a component file zawng zawng nen zip-a khung. Field hming-te chu Table 10B.2 aṭanga 10B.6 thleng ang a ni tur a ni; shapefile hming chu hawrawp 10-ah a tawp a, a hnuaia hming-te hian chu

chin chu an tling.

- (b) **Horizontal reference.** WGS 84 geographic (EPSG:4326), emaw WGS 84 / UTM zone 46N (EPSG:32646), State pum tan, site awmna apiang (Clause 10.4.4(c)). Layer zawng zawng tan system pakhat hman tur a ni.
- (c) **Vertical reference.** Level zawng zawng chu hming nei vertical datum nena inzawm metre-in a ni tur a ni, metadata-ah tarlan. Metadata chuan chu datum leh tui dawngtu luipui-te chunga CWC level-monitoring site-te river datum (hnar hmuh reng rengah tarlan a ni lo), NEEPCO-in metre-a a tlangzarh Tuirial dam (tui khuahna) reservoir level (datum tarlan a ni lo) leh Serlui B (hmuh a ni lo), leh Bung 5-a hman gauge nei lo lui, luipui leh dil-te chunga tuilian chhinchhiahna survey-te inzawmna pawh a tarlang tur a ni (Clause 10.4.4(d)).
- (d) **A dik zawng.** Awmna (position)-te chu site survey emaw phalna pek drawing aṭanga lak a ni tur a ni. Stage 4 leh hlan (handover) hunah, awmna leh level-te chu as-built (siam zawh hnua a awm dan) survey aṭanga lak a ni tur a ni (Clause 10.9.1(a)).
- (e) **File hming.** `<Authority file number>_<stage>_<yyyymmdd>.gpkg`, entirnan `AIZ–BP–2026–0123_S2_20261015.gpkg`.
- (f) **Identifier-te.** Feature tin hian thehluh tur chhunga inang lo identifier a nei (FAC_ID, OUT_ID, CAT_ID, FLP_ID). Authority (phalna petu Authority) chuan lo pawm (acceptance) hunah register identifier-in a thlak a, a inzawmna (mapping) chu dilna thehluhtu (Applicant) hnenah a pe kir ang.

10B.2 Layer-te

Table 10B.1 — Layer-te

Layer	Geometry	A chhunga thu	A ngaina
SW_SITE	Polygon	Site ri	Stage 1, 2, 4
SW_CATCH	Polygon	Site-a leh site kaltlanga luang catchment (ruahtui luan khawmna hmun) ri-te, hmasawnna hma leh hnu (Clause 10.4.1(b))	Stage 1, 2, 4
SW_FAC	Polygon (5 m aia tê leihnuaia phum thil tan point)	Ruahtui facility tin: he Kaihhruaina Bu hnuaia design retention, detention, tui ṭhatna, pump, gate, tui luan tirna (conveyance) element	Stage 2, 4; hlanna
SW_OUTF	Point	Site aṭanga outfall (drain tui luan chhuahna) tin, leh public outfall tin	Stage 1, 2, 4; hlanna
SW_FLOW	Line	Site kaltlang leh site aṭanga major-system tui luan kawng-te, leh pianphung tui luan kawng-te (Clause 10.15.1(g))	Stage 1, 2, 4
SW_CONV	Line	Bung 6 hnuaia design drain (tui luanna) leh pipe-te	Public works tan Stage 4; hlanna
SW_META	Table (geometry nei lo)	Table 10B.6 metadata	Stage tin

10B.3 Attribute schema

Type-te: T = text, I = integer, R = real, D = date (ISO 8601, yyyy-mm-dd). "Req." chuan a ruak loh tur field-te a chhinchhiah; field dang chu a huam chuan ziah khah a ni.

Table 10B.2 — SW_FAC (facility-te) attribute-te

Field	Type	Unit	Req.	A chhunga thu	Hnar
FAC_ID	T	—	Aw	Facility identifier	10B.1(f)
FAC_TYPE	T	—	Aw	Table 10B.7 aṭanga code	Clause 4.10, Table 10.3
FAC_NAME	T	—		Drawing-a hming	—

Field	Type	Unit	Req.	A chhunga thu	Hnar
OWNER_TYP	T	—	Aw	PRIVATE / ASSOC / DEVELOPER / ULB / DEPT	Clause 10.10, 10.14
OWNER_NM	T	—	Aw	Company neitu emaw association hming chauh; mimal tan, "mimal" ("private individual") (Clause 10.17.3)	Clause 10.17.3
CTRL_AREA	R	ha	Aw	Facility-a luang lut area	Clause 4.5.1.3
V_RET	R	m³		Retention tui zat siam	Clause 4.4
V_WQ	R	m³		Tui ṭhatna tui zat siam	Clause 8.4
V_DET	R	m³		Design level chung berah detention tui zat	Clause 4.6
Q_2	R	L/s		50% AEP (kum 2) design level-a luan chhuah zat	Clause 4.5
Q_10	R	L/s		10% AEP (kum 10) design level-a luan chhuah zat	Clause 4.5
Q_100	R	L/s		1% AEP (kum 100) design level-a luan chhuah zat	Clause 4.5
ORIF_MM	R	mm		Low-flow orifice diameter emaw slot zau zawng tlem ber	Clause 4.8.2
INV_OUT	R	m		Outlet invert (tui luanna hniam ber) level	Clause 10.9.1(a)
TWL_DES	R	m		Design tui level chung ber	Clause 10.9.2(a)
SPILL_LV	R	m		Spillway emaw overflow crest level	Clause 4.9
PUMPED	T	—	Aw	Y / N	Clause 10.10.3
REGIONAL	T	—	Aw	Y / N	Clause 4.13
EMPANEL	T	—	Aw	Y / N: Clause 10.6.1(c) emaw (d) hnuaia facility	Clause 10.6.1
STATUS	T	—	Aw	Table 10B.8 aṭanga code	Clause 10.17.1(a)
APPR_DATE	D	—		Stage 2 phalna pek ni	Clause 10.3
ASB_DATE	D	—		As-built certificate lo pawm ni	Clause 10.9
DECL_REF	T	—		Enkawlna Puanchhuahna (Maintenance Declaration) (Form 10-6) registration reference	Clause 10.10.1(e)
HAND_DATE	D	—		Asset Hlanna Certificate (Form 10-8) ni	Clause 10.14
LAST_INSP	D	—		Endikna hnuhnung ber ni	Clause 10.12
INSP_RES	T	—		Table 10B.9 aṭanga code	Clause 10.17.1(a)
OUT_ID	T	—	Aw	Facility tui luan chhuahna outfall	—

Table 10B.3 — SW_OUTF (outfall-te) attribute-te

Field	Type	Unit	Req.	A chhunga thu	Hnar
OUT_ID	T	—	Aw	Outfall identifier	10B.1(f)
RECEIVER	T	—	Aw	Tui drain dawngtu, channel, tui awmna (waterbody) emaw tuifinriat, a hmingin	Clause 4.5.1.3
RECV_TYPE	T	—	Aw	PUBLIC_DRAIN / CANAL / RIVER / TANK / SEA / OTHER	Bung 5
INV_LEVEL	R	m	Aw	Outfall invert level	Clause 10.9.1(a)
SIZE_MM	R	mm	Aw	Diameter, emaw drawing-a ziak zau zawng × sang zawng	Bung 6
TIDAL	T	—	Aw	Y / N	Bung 5

Field	Type	Unit	Req.	A chhunga thu	Hnar
GATE_TYPE	T	—		NONE / FLAP / TIDE / DUCKBILL / PENSTOCK / NRV	Clause 5.11, 9.10
GATE_REQ	T	—	Aw	Y / N: invert chu 1% AEP still-water level hnuaiah a awm	Clause 5.11.1
GPT	T	—		Y / N: gross pollutant trap (bawlhhlawh dawnna) dah	Clause 8.10.1
Q_100	R	L/s		Design 1% AEP tui luang zat	Bung 5

Table 10B.4 — SW_CATCH (catchment-te) attribute-te

Field	Type	Unit	Req.	A chhunga thu	Hnar
CAT_ID	T	—	Aw	Catchment identifier	10B.1(f)
CONDITION	T	—	Aw	PRE / POST / EXTERNAL (site pawn lama ram, site kaltlanga luang)	Clause 10.4.1(b)
AREA_HA	R	ha	Aw	Zau zawng	—
IMPERV_PC	R	%	Aw	Tui luh theih lohna percentage	Clause 3.9
HSG	T	—	Aw	A / B / C / D, emaw NOTES-a area hlawm nena inpawlh	Clause 3.7
CN	R	—		Curve number, AMC II	Bung 3
OUT_ID	T	—	Aw	A tui luan chhuahna outfall	Clause 4.5.1.3
FLOODSENS	T	—	Aw	Y / N	Clause 4.5.3
NOTES	T	—		Ziah zalen	—

Table 10B.5 — SW_FLOW leh SW_CONV (tui luan kawng leh tui luan tirna) attribute-te

Field	Type	Unit	Req.	A chhunga thu	Hnar
FLP_ID	T	—	Aw	Line identifier	10B.1(f)
LINE_TYPE	T	—	Aw	OVERLAND / NATURAL / OPEN_DRAIN / COVERED_DRAIN / PIPE / CULVERT	Bung 6
US_LEVEL	R	m		Luanna chunglam (upstream) invert emaw lei level	Bung 6
DS_LEVEL	R	m		Luanna hnuailam (downstream) invert emaw lei level	Bung 6
SIZE_MM	R	mm		Pipe diameter, emaw drain zau zawng (thuk zawng chu NOTES-ah)	Clause 6.7.6
Q_DES	R	L/s		Design tui luang zat	Bung 6
AEP_DES	T	—		Design AEP, entirnan "10%" emaw "1%"	Clause 6.4
RESERVE_M	R	m		Drainage reserve zau zawng, a awm chuan	Clause 6.9.7
NOTES	T	—		Ziah zalen	—

Table 10B.6 — Metadata (SW_META)

Field	A chhunga thu
FILE_NO	Authority file number
STAGE	1, 2, 4 emaw HANDOVER
H_CRS	Horizontal reference system EPSG code
V_DATUM	Vertical datum hming

Field	A chhunga thu
TIDE_REL	Vertical datum leh tui dawngtu luipui-te chunga CWC level-monitoring site-te Bung 5 river datum (hnar hmuh reng rengah tarlan a ni lo), NEEPCO-in metre-a a tlangzarh Tuirial dam reservoir level (datum tarlan a ni lo) leh Serlui B (hmuh a ni lo), leh gauge nei lo lui, luipui leh dil-te chunga tuilian chhinchhiahna survey-te inzawmna (entirnan, site datum-ah MSL = x.xx m)
SURVEYOR	Surveyor hming leh licence number
SURV_DATE	Survey ni
PREP_BY	Certify-tu professional hming leh registration number
CALC_VER	Compliance calculator version (Belhchian 10A), emaw "chhuah a ni lo" ("not issued")
DATE	File buatsaih ni

10B.4 Code list-te

Table 10B.7 — Facility chi code-te (FAC_TYPE)

Code	Facility	Table 10.3-a endikna row
RET_SOAK	Soakaway, recharge pit emaw shaft	Retention / infiltration
RET_TRENCH	Infiltration trench emaw basin	Retention / infiltration
RET_BIO	Bioretention emaw rain garden	Retention / infiltration
RET_PERM	Permeable pavement	Retention / infiltration
RET_REUSE	Hman lehna (reuse) hmanga retention (mamawh nei tank)	Leihnuai emaw podium detention tank, gravity outlet
DET_BASIN	Lei chung detention basin	Lei chung detention basin emaw hman tam theih open space area
DET_OSR	Open space, park emaw infiamna hmun (playfield)-a hman tam theih detention	Lei chung detention basin emaw hman tam theih open space area
DET_ROOF	Roof chung detention	Leihnuai emaw podium detention tank, gravity outlet
DET_PODIUM	Podium emaw landscape-deck detention	Leihnuai emaw podium detention tank, gravity outlet
DET_PARK	Motor dahna (parking-lot) detention	Lei chung detention basin emaw hman tam theih open space area
DET_TANK	Leihnuai tank emaw vault, gravity outlet	Leihnuai emaw podium detention tank, gravity outlet
DET_PUMP	Pump hmang detention emaw pump station	Pump hmang detention, pump leh control-te
WQ_POND	Wet pond emaw constructed wetland	Lei chung detention basin emaw hman tam theih open space area
WQ_SWALE	Swale emaw filter strip	Mimal drain leh inlet-te
WQ_GPT	Gross pollutant trap, first-flush device emaw oil-grit separator	Gross pollutant trap / first-flush device
GATE	Flap emaw tide gate, non-return valve (tui kir leh dangtu valve)	Flap / tide gate, non-return valve
CONV	Mimal drain, inlet emaw culvert (kawng hnuaia tui kalna)	Mimal drain leh inlet-te

Table 10B.8 — Dinhmun code-te (STATUS)

Code	Awmzia
PROPOSED	Stage 1 emaw Stage 2 thehluh tur-ah
APPROVED	Stage 2 phalna pek; sak a la ni lo
ASBUILT	As-built certificate lo pawm (Clause 10.9)
HANDEDOVER	ULB-in lo pawm (Clause 10.14)
ALTERED	Authority phalna nena thlak danglam (Clause 10.3.5)
REMOVED	Authority phalna nena paih

Table 10B.9 — Endikna result code-te (INSP_RES)

Code	Awmzia
OK	Design angin a hnathawk; chhiatna a awm lo
MINOR	Chhiatna hmuh leh siam ṭhat; ni chu endikna record-ah
MAJOR	Khawlna, outlet emaw himna tichhe chhiatna; notice pek (Clause 10.15.2, step 1)
NOACCESS	Endikna tih theih a ni lo
NOTFOUND	Facility a bo, vur khat, khuh emaw a hman dan thlak (Clause 10.15.1(c))

10B.5 Facility register lakchhawn

Clause 10.17.1(a)-a public facility register hi SW_FAC aṭanga lakchhawn a ni: FAC_ID, FAC_TYPE, awmna (centroid), V_DET (leh V_RET, V_WQ), Q_100 (leh Q_2, Q_10), OWNER_NM, ASB_DATE, LAST_INSP leh INSP_RES. Clause 10.17.4-a licence hnuaiah CSV leh GeoPackage angin tlangzarh a ni. Mimal data chu tlangzarh a ni lo (Clause 10.17.3).

Belhchian 10C — Enkawlna atana luhna zau zawng

Bung 10-a Clause 10.13 a ṭanpui.

Clause 10.13 chuan luhna (access) chu a hnathawh zelin a ruat. He belhchian hian he Kaihhruaina Bu-in bung dangah a ruat tawh luhna zau zawng-te a khawn khawm a, a ruat loh zau zawng-te a tarlang. Zau zawng pakhat he Kaihhruaina Bu-in a ruat loh chuan, design siamtu chuan drawing-ah a tarlang tur a ni a, O&M plan-a hming tarlan plant leh hmanrua (equipment) nen a inmil tih a lantir tur a ni (Clause 10.11.1(h)), leh "design-ah finfiah tur" ("to be confirmed in design") tiin a chhinchhiah tur a ni.

Table 10C.1 — He Kaihhruaina Bu-in a ruat luhna zau zawng-te

Element	Mamawh	Clause
A chung zau zawng 2 m emaw a aia tam drain (tui luanna) khuh lo	Kam khatah zau zawng 3.5 m tal enkawlna luhna kawng (maintenance access strip), m 500 aia hla lo inkarah public road nena inzawm	6.9.4
Drainage reserve-te	Drain size mamawh innghahin, zau zawng chu Table 6.9 aia tlem lo; Clause 6.9.4-a luhna kawng a zau zawk chuan, a zau zawk chuan a thunun	6.9.7
Drain khuh, cross-section tê ber	0.6 m × 0.6 m awl	6.7.6

Element	Mamawh	Clause
Drain khuh, khuhna paih theih	Panel-te chu m 10 aia hla lo centre-ah, pakhat zelin 0.6 m tal a sei a, zau zawng awl pum a huam, hnathawktu pahnihin emaw kuta khawih hmanruain emaw chawi theih	6.13.2(a)
Drain khuh, access chamber-te	Inzawmna, kawi leh cross-section danglamna tinah, leh kawng dik-ah m 30 aia hla lo centre-ah, 0.6 m × 0.6 m tal kawngka awl	6.13.2(b)
Public drain-a manhole leh access chamber-te	Luhna kawngka awl 600 mm tal	9.12.3
Public road-a inlet chamber-te	Outlet pipe invert (tui luanna hniam ber) hnuaiah 300 mm tal thuk silt sump (leidip dawnna khur), a chung aṭanga tihfai theih	6.6.7
Leihnuai tank leh vault-te	Outlet chamber chung leh inlet tin chungah luhna kawngka; 500 m² aia lian tank-ah, m 30 aia hla lo inkar; chhuat chu outlet-a sump lamah 1% tal a chhuk	4.10.2(b), (c)
1 ha aia tam tan detention outlet	Outlet tihhran theihna (stop-log slot emaw penstock)	4.8.6
Outfall gate-te	600 mm aia lian outfall-ah (Bung 5) leh 900 mm emaw a aia lian emaw pump hmang emaw khawlna system tan outfall-ah (Bung 9) luanna chunglamah stop-log slot emaw penstock; gate chamber chu tide zawng zawngah luh theih, a luhna chu HAT + surge + sea-level allowance chungah	5.11.3(d), (e); 9.10.3
Pump station-te	1% AEP thil thlengah hman theih enkawlna motor luhna kawng; mobile pump tan lei khauh hmun leh quick-coupling connection; pump emaw motor kiang inkara hmun awl 0.6 m (unit tê leh lai lawk) emaw 1.0 m (unit lian)	9.9.6, 9.9.10, 9.9.12
Pretreatment device-te	BMP ber lut lovin emaw tibuai lovin tihfai theih	8.5.4
Outfall, culvert (kawng hnuaia tui kalna) inlet leh pump sump-a screen-te	Platform him aṭanga tihfai theih, motor luhna kawng nen	8.10.3(d)
Infiltration trench-te	Trench tin bul thlengin observation well	8.7.6(c)
Mipui luh theih khawlna	Sir pang chu 4H:1V aia chhoh lo, a vel ri ṭhena li ṭhena khat tal chu 6H:1V emaw a aia phei	4.15.1(c)
Wet basin-te	Zau zawng 3 m tal himna bench, tui level pangngai hnuaiah 0.3 m aia thuk lo	4.15.2
Hung (fencing)	Clause 4.15.3-in a phut chuan, 1.2 m tal a sang, lawn theih loh, lock theih kawngka nen	4.15.3

Table 10C.2 — He Kaihhruaina Bu-in a ruat loh luhna zau zawng-te (design-ah finfiah tur)

Element	Design siamtu-in a tarlan tur	A hnathawh ruattu Clause
Basin, pond emaw open channel inlet, outlet leh bul thlenga motor luhna kawng	O&M plan-a plant tan zau zawng, chhoh zawng, her kirna hmun leh design load	10.13.2
Basin emaw pond sira enkawlna kawng	Sir khat tal zawh zau zawng	10.13.2
Basin-a luhna ramp	Leidip laih chhuahna plant tan zau zawng, chhoh zawng leh a chung lam	10.13.2
Mimal tank luhna kawngka-te	Inlet, outlet leh chamber tin chunga kawngka tin size awl	10.13.3(a)
Kailawn leh kailawn ke	Chi leh inkar; hmun khap (confined space) luhna tan boruak luh tirna (ventilation)	10.13.3(b)
Leihnuai tank-a lu chung awl	Kuta tihfai nan sang zawng awl	10.13.3(d)
Orifice (tui chhuahna khur tê) leh screen thlen theihna	Facility khat lut lova outlet tihfai dan	10.13.4

> **Hrilhfiahna.** APWA 5600 (2006, §5608) chuan detention facility tan 15 ft (4.5 m vel) enkawlna luhna kawng a phut. He Kaihhruaina Bu hian mimal site tan zau zawng nghet a hmang lo, Mizoram khawpui-te-ah plot size a inang lo nasa avangin (Clause 10.13, Hrilhfiahna). State Stormwater Technical Committee chuan Belhchian 6C leh 9B-a standard drawing-te a chhuah hunah Table 10C.2-ah standard value a belh thei.

Belhchian 10D — Facility chi zela O&M plan entawn tur-te

Bung 10-a Clause 10.11, 10.12 leh 10.13 a ṭanpui.

A hnuaia plan entawn tur-te hi ṭanna an ni. Design siamtu chuan facility tin atan a siam rem a, "_____" tia chhinchhiah thil-te a ziah khah ang. Endikna zat chu Table 10.3-a zat tlem ber a ni; plan chuan endikna zing zawk a ruat thei a, a tlem zawk erawh a ruat thei lo. He belhchian hian value pakhat design siamtu kutah a dah chuan, he Kaihhruaina Bu hian a ruat lo tihna a ni.

10D.1 O&M plan tinin a keng tur-te

Plan tin chuan Clause 10.11.1-a thil-te a keng tur a ni:

Table 10D.1 — O&M plan-in a keng tur-te

Thil	A chhunga thu	Clause
1	Facility tin inventory leh plan drawing, design level, tui zat leh outlet chipchiar nen (SW_FAC aṭangin, Belhchian 10B)	10.11.1(a)
2	Hna pangngai leh a zat (Table 10D.2 aṭanga 10D.8 thleng)	10.11.1(b)
3	Leidip laih chhuah phut ṭanna (trigger), thuk zawng (mm) emaw design tui zat percentage angin: _____	10.11.1(c)
4	Form 10-7 nena inmil endikna checklist	10.11.1(d)
5	Pump, gate leh valve tan: kalpui dan (operating rule), test schedule, standby power, leh cyclone emaw ruahpui hriattirna (warning) hunah thil tih tur	10.11.1(e)
6	Tui ding reng leh thosi pung dodalna, Clause 4.7-a tui hniam hun nena inmil	10.11.1(f)
7	Himna: hmun khap, tui thuk, mipui luhna	10.11.1(g)
8	Luhna kawng leh hmanrua (Belhchian 10C)	10.11.1(h)
9	Kumtin senso chhut lawk (kum khatah ₹ _____) leh a pe tur	10.11.1(i)
10	Record vawn tur, leh a rei zawng: kum _____ (pump record kum 5 tal, Clause 9.9.8(c))	10.11.1(j)

10D.2 Plan entawn tur-te

Table 10D.2 — Retention leh infiltration (soakaway, trench, bioretention, permeable paving)

Hna	A zat	Standard emaw phut ṭanna	Clause
A chung, inlet, pretreatment leh overflow endik	Thla 6 tlan zelin; March ni 31 hmain; ruahpui ni tin hnuah	Tihtawp (blockage) a awm lo; overflow a awl	Table 10.3
Observation well emaw a chungah tui hniam (drawdown) endik	Ruah hnua endikna tinah	Ruah tawp aṭanga darkar 72 chhungin a ruak; a ruak loh chuan clogging (bal avanga tihtawp) zir chiang	4.4.5, 8.7.6(c)

Hna	A zat	Standard emaw phut ṭanna	Clause
Pretreatment (forebay, filter strip, silt trap) tihfai	Leidip phut ṭanna (thil 3) a thlen hunah	BMP ber tibuai lovin pretreatment tihfai	8.5.3, 8.5.4
Bioretention: mulch, thlai, tui tlin	Thla 6 tlan zelin	Tui tlin chu darkar 48 chhungin a ruak; thlai thi thlak; mulch 50–75 mm	8.7.2
Permeable paving: a chung	Thla 6 tlan zelin	Phiat emaw vacuum-in tihfai; tui luh theih loh thilin siam thar (resurfacing) loh	8.7.5(e)
Tui luang lutna area chu a nghet reng tur	Endikna tin	Lei dawh tihnghet; leidip a luang lut lo	10.8.3(b)
Facility chu a hmunah leh hman reng tur	Endikna tin	Phalna nei lovin vur khat, khuh, paving emaw a chunga sak a ni lo	10.10.1(d)

Table 10D.3 — Lei chung detention basin emaw hman tam theih open space area

Hna	A zat	Standard emaw phut ṭanna	Clause
Inlet, outlet, orifice, trash rack leh spillway endik	Thla 6 tlan zelin; March ni 31 hmain; ruahpui ni tin hnuah	Orifice leh rack a awl; spillway a dal lo	Table 10.3, 4.8, 4.9
Bal (debris) leh leidip laih chhuah	Leidip phut ṭanna a thlen hunah, leh thil thleng hnuah	Design tui zat siam ṭhat leh	10.11.1(c)
Basin tui a ruak tih endik	Ruah hnuah	Hmun hniam reng rengah darkar 72 aia rei tui a tlin lo	4.15.7
Thlai	Plan-a ruat angin	Hlo tan; embankment (dai) emaw outlet zone-ah thing a to lo	10.11.1(b)
Himna thil-te	Thla 6 tlan zelin	Mizo leh English ṭawnga chhinchhiahna (sign) leh thuk zawng tehna a awm; a ngaiah hung leh kawngka a ṭha	4.15.3, 4.15.5
Embankment (a awm chuan)	Thla 6 tlan zelin leh thil thleng hnuah	Thuang, tla, tui chiar (seepage) emaw ramsa khur a awm lo	4.9.6

Table 10D.4 — Leihnuai emaw podium detention tank, gravity outlet

Hna	A zat	Standard emaw phut ṭanna	Clause
Luhna kawngka aṭanga endik: inlet, outlet, orifice, screen, sump, vent	Thla 6 tlan zelin; March ni 31 hmain; ruahpui ni tin hnuah	A awl; vent a inhawng	Table 10.3, 4.10.2
Sump leh chhuat tihfai	Leidip phut ṭanna a thlen hunah	Chhuat chu sump lamah a chhuk fel	4.10.2(c)
Inlet silt trap emaw GPT	Thla 3 tlan zelin (GPT tan Table 10.3 row)	Tihfai	4.10.2(e)
Overflow kawng	Endikna tin	Outlet a tawp hunah a hnathawk; lei chunga tui luan kawng (overland path) thlenga kawng a dal lo	4.9.5
Hmun khap luhna	Luh tin	Enkawlna puanchhuahna-a luh dan tarlan zawm; a hnuah khuhna tala khar	4.15.6
Hmun hman dan	Endikna tin	Motor dahna emaw thil khawlna atan hman a ni lo; tui zat tihtlem a ni lo	10.10.1(d)

Table 10D.5 — Pump hmang detention, pump leh control-te

Hna	A zat	Standard emaw phut ṭanna	Clause
Pump tin, duty leh standby, tihchhin	Thla tin	Pump tin chu level control-in a ṭan; hna an inthlak chhawk	Table 10.3, 9.9.4(c)
Duty test kimchang	March ni 31 hmain	Station-in a design duty point a tling	Table 10.3, 10.9.3
Standby power	Thla tin, tihchhin nen; March ni 31 hmain test kimchang	Automatic changeover a hnathawk; duty pump zawng zawng darkar 72 tal tan fuel site-ah a awm	9.9.9
Level sensor, float back-up, alarm, telemetry	Thla tin	High-level leh fault alarm chu control room-ah a thleng	9.9.8
Screen leh silt trap	Thla 3 tlan zelin leh thil thleng hnuah	A fai	9.9.7
Record	Chhunzawm reng	Sump level, a tlan darkar leh power dinhmun ziah; kum 5 tal vawn	9.9.8(c)
Hriattirna hunah thil tih tur	IMD ruahpui emaw cyclone hriattirna hunah	Plan-a thil tih tur ziak: _____ (entirnan site-ah hnathawktu, fuel tihkhat, mobile pump connection endik)	10.11.1(e), 9.9.12

Table 10D.6 — Flap emaw tide gate, non-return valve

Hna	A zat	Standard emaw phut ṭanna	Clause
Endik leh tihhnathawh	Thla 3 tlan zelin; ruahpui ni tin hnuah	Head tê-ah a inhawng; bal, sand emaw thil to-in a dang lo	Table 10.3, 9.10.4
Seal test	March ni 31 hmain	Tui dawngtu laka a khar fel	Table 10.3, 10.9.3
Tuifinriat kam, estuary leh creek outfall-te	Fûr hun chhunga high-tide emaw surge thil thleng tin hnuah	Sand leh bal paih fai	9.10.5(b)
Tihhranna (isolation)	March ni 31 hmain	Stop-log slot emaw penstock hman theih	9.10.3
Hinge, pin leh fixing-te	March ni 31 hmain	Gate hnathawh dang thei thir ei a awm lo	9.10.6
In leh ram non-return valve-te	Thla 3 tlan zelin	Cleaning eye thlen theih; valve a khar fel	5.11.4

Table 10D.7 — Gross pollutant trap emaw first-flush device

Hna	A zat	Standard emaw phut ṭanna	Clause
Endik leh tihruak	Thla 3 tlan zelin; March ni 31 hmain; ruahpui ni tin hnuah	Capture chamber a khat hmain tihruak; bypass a awl	Table 10.3, 8.4.6
Screen-te	Endikna tin	A fai; overflow kawng a awl	8.10.3(b)
Paihna	Tihfai tin	Thil chu phalna nei bawlhhlawh (solid-waste) facility-ah thlen	—

Table 10D.8 — Mimal drain leh inlet-te

Hna	A zat	Standard emaw phut ṭanna	Clause
Drain, inlet leh silt sump endik leh tihfai	Thla 6 tlan zelin; March ni 31 hmain	Leidip leh bal a awm lo	Table 10.3

Hna	A zat	Standard emaw phut ṭanna	Clause
Ek tui (sewage) connection awm leh awm loh endik	Endikna tin	A awm lo; cross-connection reng reng paih	1.5.4, 8.9
Lei chunga tui luan kawng-te	Endikna tin	Bang, lei vur emaw thil dah khawmin a dal lo	6.9.2, 10.15.1(g)

Belhchian 10E — Stormwater Design Professional leh reviewer-te empanelment criteria

Bung 10-a Clause 10.6, 10.7.4 leh 11.4.3 a ṭanpui.

> *Competent authority ngaihtuah tura entirna thuziak. Hman a ni lo.* Clause 10.6.2 chuan empanelment (thiamna list-a dah luhna) criteria chhuah hna chu UD&PA hnenah a ruat. A hnuaia thuziak hi entirna a ni. "[ ]" tia lantir value-te chu competent authority-in a ruat tur a ni; he Kaihhruaina Bu hian a ruat lo.

10E.1 Criteria entawn tur

1. **List-te.** Competent authority chuan mipui hmuh theih list pathum a vawng tur a ni:
   - (a) **Stormwater Design Professional-te**, Clause 10.6.1 hnuaia design-a signature thun thei leh Clause 10.6.4 hnuaia independent checker hna thawk thei;
   - (b) **Empanelled Reviewer-te**, Clause 10.7.4 hnuaia Authority tana thehluh tur endik thei; leh
   - (c) **basin modelling endorsement (thiamna pawmpuina)**, Clause 11.4.3 hnuaia BSMP buatsaih emaw kaihhruai thei Stormwater Design Professional-in a neih.
2. **List (a) tlin theihna.** Dilna thehluhtu chuan:
   - (a) civil engineering degree, emaw competent authority-in a pawmpui qualification inang a nei tur a ni (Clause 10.6.2);
   - (b) Aizawl Municipal Corporation Building Regulations 2012 leh Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations 2017 hnuaiah professional angin register a ni tur a ni (Clause 1.4);
   - (c) graduate hnuah drainage design-ah kum [ ] tal tawnhriat a nei tur a ni, project [ ] tal list, project tina dilna thehluhtu hna nen, hmanga lantir (Clause 10.6.2); leh
   - (d) dilna thehluh hma kum [ ] chhungin he Kaihhruaina Bu chungchang training course, enchhinna (assessment) nen, a zo tawh tur a ni (Clause 10.6.2).
3. **List (b) tlin theihna.** List (a) ang, kum [ ] tal tawnhriat nen, chung zinga kum [ ] tal chu he Kaihhruaina Bu emaw standard inang hnuaia drainage design emaw endikna-ah.
4. **Basin modelling endorsement (c).** Study [ ] tal-ah calibration tel basin-scale 1D–2D modelling tawnhriat lantir thei Stormwater Design Professional (Clause 11.4.3).
5. **Checker zalenna.** Clause 10.6.4 hnuaia checker chu design siamtu firm emaw dilna thehluhtu hnathawktu emaw partner a ni loh tur a ni a, design-ah a thawk tel tawh loh tur a ni.
6. **Reviewer-a hamṭhatna inkalh (conflict of interest).** Empanelled Reviewer chuan amah emaw a firm-in eng hna-ah pawh a thawhna site a endik loh tur a ni (Clause 10.7.4), leh endikna a lo pawm hmain hamṭhatna dang reng reng a puang chhuak tur a ni. Authority chu thutlukna siamtu a ni reng (Clause 10.7.4).
7. **Dilna.** Dilna chuan degree leh registration finfiahna, reference nena project list, training certificate, leh thu pek a dik tih signature thun puanchhuahna a keng tur a ni.
8. **Hun leh siam tharna.** Empanelment chu kum [ ] chhung a dik. Siam tharna atan hna thawh chhunzawm finfiahna leh he Kaihhruaina Bu siam ṭhatna hnua refresher training chhuah reng reng finfiahna a ngai (Clause 1.12).

9. **Tihtawp rihna leh paihna.** Competent authority chuan empanelled mi chu certificate dik lo emaw fimkhur lo taka siam hnuah (Clause 10.6.5), Table 10.4 step 6 hnuaia report-ah, emaw registration a bo hunah, a tihtawp rih emaw a paih thei. Chu mi chu notice leh a thu sawi theihna hun pek tur a ni. Tihtawp rihna leh paihna tin chu list-ah tlangzarh tur a ni.
10. **Tlangzarhna.** List-te chu tlangzarh leh tihdik reng tur a ni, mi tin hming, registration number, list, endorsement leh a dik chhung ni nen.

Form 10-1 — Drainage Report Checklist

Bung 10-a Clause 10.4.1 aṭanga 10.4.4 thleng leh 10.7.1 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Stage 1 leh Stage 2 thehluh tur (submittal) tin nen thehluh tur a ni. Thil tin tan a sawina phêk emaw sheet, emaw a huam loh chhan pe rawh. Form 10-1 ziah khah kim lovin Authority (phalna petu Authority) chuan technical endikna a ṭan lo (Clause 10.4.3).

Table 10F.1 — Form 10-1, Section A: Thehluh tur

No.	Field	Ziah luh tur
A1	Authority leh file number	_____
A2	Site hming leh address; survey number-te	_____
A3	Stage: 1 / 2 / 1 leh 2 zawm khawm (Clause 10.3.3) / public work DPR emaw tender (Clause 10.3.4)	_____
A4	Dilna thehluhtu (Applicant)	_____
A5	Certify-tu professional (hming, registration leh empanelment number)	_____

Table 10F.2 — Form 10-1, Section B: Stage 1-in a keng tur-te (Clause 10.4.1)

No.	Thil	Clause	Phêk / sheet	A huam lo: a chhan
B1	Form 1-1; variance emaw waiver dil a nih chuan Form 1-2	10.4.1(a)	_____	_____
B2	Site plan: level awm mek leh rawt, tui luh theih lohna hmun (impervious), site-a leh site kaltlanga catchment (ruahtui luan khawmna hmun) ri-te	10.4.1(b)	_____	_____
B3	Lei (HSG), hun bik-a leihnuai tui sang ber, infiltration (lei-a tui luh) test emaw test plan	10.4.1(c)	_____	_____
B4	Design Ruahtui Tlak Sheet (Form 2-1)	10.4.1(d)	_____	_____
B5	Hmasawnna hma lam (pre-development) dinhmun leh hydrology kalphung	10.4.1(e)	_____	_____
B6	Hmalakna indawt dan: hmun humhalh, retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) kalphung, detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) ngaihdan, tui luan tirna (conveyance)	10.4.1(f)	_____	_____
B7	Retention, WQ leh detention tui zat leh luan chhuah tir zat (release rate) hmasa, Form 10-2 nen	10.4.1(g)	_____	_____
B8	Luanna hnuailam (downstream) zau zawng leh tailwater (outfall hnuailama tui sang zawng) case	10.4.1(h)	_____	_____
B9	Tui awmna (waterbody), setback (tui kam aṭanga hmun kalhlen tur) leh 1% AEP level	10.4.1(i)	_____	_____
B10	Facility leh enkawlna luhna atana ram hauh	10.4.1(j)	_____	_____
B11	Professional Design Certificate (Form 10-3)	10.4.5	_____	_____

Table 10F.3 — Form 10-1, Section C: Stage 2-in a keng tur-te (Clause 10.4.2)

No.	Thil	Clause	Phêk / sheet	A huam lo: a chhan
C1	Stage 1-in a keng tur siam thar (Section B)	10.4.2	_____	_____

No.	Thil	Clause	Phêk / sheet	A huam lo: a chhan
C2	Khawlna duration leh AEP tin tan chhutna tawp, outfall (drain tui luan chhuahna) khar endikna nen	10.4.2(a)	_____	_____
C3	Stage–storage–discharge table-te; emergency spillway design	10.4.2(b)	_____	_____
C4	Tui luan tirna, inlet leh structure-te hydraulic design	10.4.2(c)	_____	_____
C5	Tui ṭhatna design; a ngaiah first-flush device emaw GPT	10.4.2(d)	_____	_____
C6	Facility tin construction drawing, detail leh specification	10.4.2(e)	_____	_____
C7	Construction indawt dan, retention leh infiltration area venhimna nen	10.4.2(f)	_____	_____
C8	Hold point (endik hmaa hna chhunzawm loh tur hun) schedule (Form 10-4, Section A)	10.4.2(g)	_____	_____
C9	O&M plan (kalpui leh enkawl plan) draft leh Enkawlna Puanchhuahna (Maintenance Declaration) draft (Form 10-6)	10.4.2(h)	_____	_____
C10	Model input file leh GIS data	10.4.2(i)	_____	_____
C11	Certificate-te (Form 10-3, design siamtu leh, a ngaiah, checker-in signature thun)	10.4.2(j)	_____	_____

Table 10F.4 — Form 10-1, Section D: Digital thehluh tur (Clause 10.4.4)

No.	Thil	Clause	Pek (aw / aih)	A chipchiar
D1	Report leh drawing-te, zawn theih PDF angin	10.4.4(a)	_____	_____
D2	Model-te a format ngeia tlan theih angin; software hming leh version	10.4.4(b)	_____	_____
D3	Belhchian 10B anga GIS data; horizontal reference system (EPSG code)	10.4.4(c)	_____	_____
D4	Vertical datum hming; tui dawngtu luipui-te chunga CWC level-monitoring site-te Bung 5 river datum (hnar hmuh reng rengah tarlan a ni lo), NEEPCO-in metre-a a tlangzarh Tuirial dam (tui khuahna) reservoir level (datum tarlan a ni lo) leh Serlui B (hmuh a ni lo), leh gauge nei lo lui, luipui leh dil-te chunga tuilian chhinchhiahna survey-te nena a inzawmna	10.4.4(d)	_____	_____

Table 10F.5 — Form 10-1, Section E: Puanchhuahna leh a kim leh kim loh endikna

Field	Ziah luh tur
Kei hian he checklist hi a kim a, a dik tih ka nemnghet e. Certify-tu professional: hming, signature, ni	_____
Authority tan: dawn ni	_____
A kim leh kim loh endik ni (hna ni 5 chhungin, Clause 10.7.1)	_____
Result: endik turin lo pawm / pek kir	_____
Thil tlachham, pek kir a nih chuan	_____
Officer: hming, designation, signature	_____

Form 10-2 — Compliance Calculator Tlangpui

Bung 10-a Clause 10.4.1(g), 10.5 leh 10.9.1(b) a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Compliance calculator (dan zawm endikna chhutna) (Belhchian 10A)-in Stage 1, 2 leh 4 thehluh tur nen a siam chhuak. Calculator chhuah a nih hma chu, kutin ziah khah la, A3-ah "chhuah a ni lo" ("not issued") tiin ziak rawh. Site-in outfall pakhat aia tam a neih chuan drainage area pakhatah column pakhat.

Table 10F.6 — Form 10-2, Section A: Site leh route

No.	Field	Ziah luh tur	Clause
A1	Authority, file number, stage (1 / 2 / 4)	_____	10.5.2(a)
A2	Site zau zawng, ha; lei tihbuai (land disturbance), ha; tui luh theih lohna hmun thar + thlak, m²	_____	1.5.2
A3	Calculator version leh a chhuah ni	_____	10.5.3
A4	Tier (A / B); tuilian hlauhawm (aw / aih); basin tan phalna pek BSMP (aw / aih)	_____	1.6, 4.5.3, 11.12
A5	Route: kalphung kimchang / S-1 / S-2 / fixed-coefficient / constrained redevelopment / regional emaw fee-in-lieu (site-a tih aia sum pek)	_____	1.7, 4.5.6, 4.13, 4.14
A6	Calculator-in flag a chhuahte (list)	_____	Belhchian 10A.4

Table 10F.7 — Form 10-2, Section B: Ruahtui tlak leh lei

No.	Field	Ziah luh tur	Clause
B1	Ruahtui zone; Form 2-1 reference	_____	2.13
B2	Retention thuk zawng P_R, mm; thla 3 ARI zat P_3m, mm	_____	2.10, 8.4.1
B3	Climate factor hman (≤ 6 h; > 6–72 h)	_____	2.8
B4	Sub-area zela HSG; hun bik-a leihnuai tui sang ber, bul hnuaiah m	_____	3.7, 4.4.3
B5	Infiltration rate teh leh design rate, mm/h	_____	4.4.3

Table 10F.8 — Form 10-2, Section C: Tui zat-te

No.	Zat	Mamawh (m³)	Siam (m³)	Clause
C1	Retention tui zat (RRV)	_____	_____	4.4.2
C2	Tui ṭhatna tui zat (WQv)	_____	_____	8.4.2
C3	Detention laka retention credit	_____	—	4.4.6
C4	Detention tui zat	_____	_____	4.6, 4.14
C5	Fee-in-lieu emaw regional tui zat, leh fee (₹)	_____	_____	4.5.6.3, 4.13.3

Table 10F.9 — Form 10-2, Section D: Luan chhuah tir zat (outfall tin)

AEP	Q_pre emaw cap (L/s)	Q_post (L/s)	Duration thunun (h)	Criterion a tling (aw / aih)	Clause
50% (kum 2)	_____	_____	_____	_____	4.5

AEP	Q_pre emaw cap (L/s)	Q_post (L/s)	Duration thunun (h)	Criterion a tling (aw / aih)	Clause
10% (kum 10)	_____	_____	_____	_____	4.5
1% (kum 100)	_____	_____	_____	_____	4.5

Table 10F.10 — Form 10-2, Section E: Outlet, tui hniam (drawdown) leh stage khaikhinna

No.	Field	Ziah luh tur	Clause
E1	Low-flow orifice (tui chhuahna khur tê), mm (a tê ber 50 mm)	_____	4.8.2
E2	Detention: kum 10 tui khawl 90% luan chhuah hun, h (≤ 48 h)	_____	4.7.1
E3	WQv luan chhuah hun, h (24–48 h)	_____	4.7.2
E4	Retention ruak hun, h (≤ 72 h)	_____	4.7.3
E5	Model result chu calculator screen aiin guide tolerance aia tamin a inthlau em? Aw a nih chuan, a hrilhfiahna report section	_____	10.5.2(c)
E6	Stage 4 chauh: Stage 2 value aṭanga danglamna (list), leh criterion tin a la tlin em	_____	10.9.2
E7	Buatsaihtu (hming, registration number), signature, ni	_____	10.6.3(b)

Form 10-3 — Professional Design Certificate

Bung 10-a Clause 10.6.1 aṭanga 10.6.5 thleng a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Stage 1 leh Stage 2 thehluh tur tin nen design siamtu (designer)-in signature a thun a, Clause 10.6.1(c) leh (d) hnuaia facility tan independent checker-in a thun bawk.

Table 10F.11 — Form 10-3, Section A: Project leh signature thuntu

No.	Field	Ziah luh tur	Clause
A1	Authority, file number, stage	_____	—
A2	He certificate-in a huam site leh facility-te	_____	—
A3	Design siamtu: hming, qualification, AMCBR/SD&SM registration number	_____	10.6.1
A4	Empanelment number, a ngaiah, leh a chhan: Tier A ≥ 1 ha / tuilian hlauhawm / embankment emaw high-hazard basin / pump hmang, tide gate emaw regional facility	_____	10.6.1(a)–(d)
A5	Variance emaw waiver phalna pek (Form 1-2 reference), emaw "a awm lo"	_____	10.6.3(a)

Table 10F.12 — Form 10-3, Section B: Design siamtu certificate

No.	Kei hian heng hi ka certify e:	Initials
B1	A5-a variance tarlan, phalna pek tawh bak chu, design hi Mizoram Ruahtui Luanna Design Kaihhruaina Bu nen a inmil	_____
B2	Ruahtui tlak, lei leh tailwater input-te chu Form 2-1 leh Form 10-2-a ziak ang a ni	_____
B3	Model thehluhte hian result report-te an chhuah nawn thei	_____
B4	Certificate dik lo emaw fimkhur lo taka siam chu Clause 10.15 hnuaia dan bawhchhiatna (contravention) a ni tih ka hre thiam	_____

Table 10F.13 — Form 10-3, Section C: Independent checker certificate (Clause 10.6.4)

No.	Field emaw thusawi	Ziah luh tur
C1	Checker: hming, registration leh empanelment number	_____
C2	Design siamtu leh dilna thehluhtu laka ka zalen a, he design-ah hian ka thawk lo	_____
C3	Facility tarlan-te ka endik a: _____, Section B-a certificate nen ka inrem	_____
C4	Ka remtih loh thil, a awm chuan	_____

Table 10F.14 — Form 10-3, Section D: Signature-te

Mawhphurhna	Hming	Hmingziak	Ni
Design siamtu	_____	_____	_____
Independent checker (a ngaiah)	_____	_____	_____

Form 10-4 — Hold-Point Endikna Record

Bung 10-a Clause 10.4.2(g), 10.8 leh 10.9.3 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Section A hi hold point (endik hmaa hna chhunzawm loh tur hun) schedule a ni, Stage 2-ah phalna pek. Section B chu hold point tinah ziah khah a ni, ni leh geotag nei milem nen (Clause 10.8.2). Section B signature thun a nih hma chu hold point pel chhuakin hna chhunzawm loh tur a ni. Milem 10.2 en rawh.

Table 10F.15 — Form 10-4, Section A: Hold-point schedule

Hold point	Facility (FAC_ID)	Hna stage	Ruat ni	Authority hnena notice thawn (ni)*	Authority a tel (aw / aih)
(a) Bul laih zawh, media, liner emaw structure dah hmain	_____	_____	_____	_____	_____
(b) Outlet structure, orifice leh trash screen, backfill emaw tihkhat hmasak hmain	_____	_____	_____	_____	_____
(c) Infiltration leh finfiahna test (Clause 10.9.3)	_____	_____	_____	—	_____
(d) Outfall, flap emaw tide gate leh non-return valve (tui kir leh dangtu valve), luanna hnuailam inzawm hmain	_____	_____	_____	—	_____
(e) Pump leh control-te, commissioning hunah	_____	_____	_____	—	_____
Authority-in hold point dang a belhte	_____	_____	_____	_____	_____

* Clause 10.6.1 hnuaia site tan, hold point (a) leh (b) chungchang hna ni 3 tal hmaa notice (Clause 10.8.2).

Table 10F.16 — Form 10-4, Section B: Endikna record (hold point pakhatah pakhat)

No.	Field	Ziah luh tur
B1	Hold point leh facility	_____
B2	Endikna ni leh hun; khawchin	_____
B3	Endiktu (certify-tu professional); a tel dangte	_____
B4	Phalna pek drawing leh revision, a nena khaikhin	_____
B5	Level, zau zawng leh thil hman hmuh, phalna pek value nena khaikhin	_____
B6	(a) tan: retention leh infiltration area chu motor leh thil dah khawm laka venhim (Clause 10.8.3(a))	_____
B7	(b) tan: orifice size leh invert; screen a awm	_____
B8	(c) tan: infiltration test result leh ruak hun (≤ 72 h); pump duty point; gate inhawn leh khar fel	_____
B9	(d) leh (e) tan: gate chi, a dahna leh test; pump commissioning record	_____
B10	Milem reference (ni leh geotag nei)	_____
B11	Result: phalsak / phalsak lo; siam ṭhat tur hna	_____
B12	Siam ṭhat hna endik (ni, endiktu)	_____
B13	Certify-tu professional signature, ni	_____

Form 10-5 — As-built Certificate

Bung 10-a Clause 10.9 leh 10.3.5 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Completion certificate hmain thehluh a ni. He form hi lo pawm a nih hma chu Authority chuan completion certificate a chhuah loh tur a ni (Clause 10.9.4).

Table 10F.17 — Form 10-5, Section A: Project leh survey

No.	Field	Ziah luh tur	Clause
A1	Authority, file number; Stage 2 phalna reference leh ni	_____	—
A2	Licensed surveyor: hming, licence number, survey ni	_____	10.9.1(a)
A3	Vertical datum	_____	10.4.4(d)
A4	Belhchian 10B anga GIS data, as-built (siam zawh hnua a awm dan) (file hming)	_____	10.4.4(c)

Table 10F.18 — Form 10-5, Section B: Phalna pek leh as-built khaikhinna (facility pakhatah block pakhat)

Thil	Phalna pek	As-built	Lo pawm (aw / aih)	Clause
Design level tina khawlna tui zat, m³	_____	_____	_____	10.9.2(a)
Outlet zau zawng (orifice, weir), mm	_____	_____	_____	10.9.2(b)
Outlet leh outfall (drain tui luan chhuahna) invert, m	_____	_____	_____	10.9.2(b)
Spillway emaw overflow level, m	_____	_____	_____	4.9
Retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) tui zat, m³	_____	_____	_____	4.4

Table 10F.19 — Form 10-5, Section C: Chhut nawn leh test-te

No.	Field	Ziah luh tur	Clause
C1	As-built value hmanga compliance calculator chhut nawn: version, leh Form 10-2 (Stage 4) belh	_____	10.9.1(b)
C2	As-built value hmanga model tlan nawn (model hman a nih chuan): file hming	_____	10.9.1(b)
C3	Chhut nawnah Bung 4 leh 5 criterion tin a tling (aw / aih; a tlin loh apiang list rawh)	_____	10.9.2(c)
C4	Infiltration retention: ruak hun teh, h (≤ 72 h)	_____	10.9.3
C5	Pump: duty point a tling (head-a tui luang zat)	_____	10.9.3
C6	Tide gate leh non-return valve-te: an inhawng a, an khar fel tih lantir	_____	10.9.3
C7	Kalsanna (deviation)-te, leh Clause 10.3.5 hnuaia siam ṭhat dan emaw certify nawn dan	_____	10.9.2

Table 10F.20 — Form 10-5, Section D: Thil belh leh certificate

No.	Field	Ziah luh tur
D1	Hold-point record ziah khah (Form 10-4)	_____

No.	Field	Ziah luh tur
D2	O&M plan (kalpui leh enkawl plan) tawp	_____
D3	Signature thun Enkawlna Puanchhuahna (Maintenance Declaration) (Form 10-6) emaw hlanna thuziak (Form 10-8)	_____
D4	Kei hian facility tarlan-te hi C7-a tarlan bak chu phalna pek angin sak a ni a, design angin a hnathawk tih ka certify e. Certify-tu professional: hming, registration number, signature, ni	_____
D5	Authority tan: lo pawm / pek kir; officer, ni	_____

Form 10-6 — Enkawlna Puanchhuahna (Maintenance Declaration)

Bung 10-a Clause 10.10.1, 10.10.2, 10.10.4 leh 10.13.1 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Competent authority ngaihtuah tura entirna thuziak. Hman a ni lo. Completion certificate chhuah a nih hmain mimal ruahtui facility tin neitu-in signature a thun a, ram nena a kal zel theih nan register a ni.

> **Thuziak buatsaihna hriat tur D10A.1.** He puanchhuahna register-na thuziak (instrument), leh Authority hnena luh theihna dikna (right of entry) leh neitu-in a tih loh hna thawh theihna (works in default) petu Act chu competent authority-in a nemnghet tur a ni. He form hian statute section a tarlang lo.

Table 10F.21 — Form 10-6, Section A: Inremtu leh ram

No.	Field	Ziah luh tur
A1	Neitu (puangtu): hming leh address; company emaw association tan, a registration number	_____
A2	Authority	_____
A3	Ram: survey number, khua, sub-division, district; a zau zawng	_____
A4	Phalna reference (file number, Stage 2 phalna pek ni)	_____
A5	Neitu tam tak development tan: developer hnua thuneitu association emaw pawl (Clause 10.10.2)	_____

Table 10F.22 — Form 10-6, Section B: Facility tarlanna

Facility (FAC_ID)	Chi	Plan belh-a a awmna	Design tui zat (m³)	Outlet	O&M plan reference
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Entirna puanchhuahna. Kei/Keini, Section A-a neitu hming tarlan hian, keimah/keimahni tan leh ram rochungtu (successor in title) tin tan, heng hi kan puang a, kan intiam e:

1. Section B-a facility tin chu phalna pek O&M plan hnuaiah kalpui, endik leh enkawl tur, leh Clause 10.12-a endikna-te tih tur (Clause 10.10.1(b));
2. Authority, a officer-te leh a contractor-te hnenah facility tin leh plan-a lantir luhna kawng endik nan luh theihna dikna (right of entry) pek tur, leh Clause 10.15 hnuaia neitu-in a tih loh hna thawh theihna, a senso neitu hnen aṭanga lak theih nen (Clause 10.10.1(c));
3. Authority-in ziaka phalna a pek lovin, facility reng reng paih, vur khat, khuh, tihtlem emaw a hman dan thlak loh tur, emaw a luhna kawng dal loh tur (Clause 10.10.1(d), 10.13.5);
4. Clause 10.10.3 a huam chuan, kum tin March ni 31 thlengin Kumtin Enkawlna Puanchhuahna leh Endikna Report (Form 10-7) thehluh tur;
5. leihnuai tank tan, hetah tarlan hmun khap (confined space) luh dan zawm tur: _____ (Clause 4.15.6);
6. ram emaw a ṭhenkhat hralh emaw hlan hunah, he puanchhuahna leh Form 10-7 thar ber chu leitu hnenah puang chhuak tur, leitu chuan hlan ni aṭangin heng mawhphurhna hi a la ang (Clause 10.10.4); leh
7. neitu tam tak development tan, A5-a pawl hming tarlan chu dan angin din a nih a, he puanchhuahna hi ziakin a lo pawm hma chu developer chu mawhphurtu a ni reng ang (Clause 10.10.2).

Table 10F.23 — Form 10-6, Section C: Signature thunna leh registration

Field	Ziah luh tur
Neitu: signature, hming, ni	_____
Thuhretu 1: signature, hming, address	_____
Thuhretu 2: signature, hming, address	_____
A5-a association emaw pawl-in lo pawmna (din a nih hunah): signature, ni	_____
Registration: office, document number, ni	_____
Authority tan: dawn leh facility register-ah ziah luh; officer, ni	_____

Form 10-7 — Kumtin Enkawlna Puanchhuahna leh Endikna Report

Bung 10-a Clause 10.10.3, 10.11.1(d) leh 10.12 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Tier A area-a facility neitu tin leh, khawi hmunah pawh, pump hmang facility, tide gate emaw regional facility neitu tin hnen aṭangin kum tin **March ni 31** thlengin thehluh tur a ni (Clause 10.10.3). Milem 10.3 en rawh.

Table 10F.24 — Form 10-7, Section A: Neitu leh facility-te

No.	Field	Ziah luh tur
A1	Report kum (April ni 1 aṭanga March ni 31 thleng)	_____
A2	Neitu emaw association; Enkawlna Puanchhuahna registration reference	_____
A3	A huam facility-te (FAC_ID leh chi)	_____
A4	Clause 10.6.1(c) emaw (d) hnuaia facility a awm em (aw / aih). Aw a nih chuan, Section E a ngai	_____

Table 10F.25 — Form 10-7, Section B: Kum chhunga endikna tih-te (Table 10.3)

Facility	Endikna pangngai (ni-te)	Fûr hma endikna (ni)	Ruahpui thil thleng hnuah (ni-te)	Thla tin pump tihchhin (zat)
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Table 10F.26 — Form 10-7, Section C: Fûr hma checklist (facility pakhatah pakhat)

No.	Thil	Dinhmun (OK / chhiatna)	Chhiatna leh siam ṭhat ni
C1	Inlet, pretreatment leh silt trap a awl	_____	_____
C2	Orifice, trash screen leh outlet a awl; orifice size thlak a ni lo	_____	_____
C3	Leidip chu O&M plan-a phut ṭanna hnuaiah a awm	_____	_____
C4	Khawlna tui zat tihtlem a ni lo; vur khat, khuh emaw hman dan thlak a awm lo	_____	_____
C5	Overflow leh spillway kawng a awl	_____	_____
C6	Retention chu darkar 72 chhungin a ruak (observation well emaw a chung)	_____	_____
C7	Pump: duty test kimchang; standby pump leh standby power enchhin; darkar 72 tan fuel site-ah	_____	_____
C8	Alarm leh telemetry enchhin	_____	_____
C9	Flap emaw tide gate leh non-return valve-te: tihhnathawh leh seal test	_____	_____
C10	Himna: khuhna tala khar, hung, chhinchhiahna (sign) leh thuk zawng tehna a awm	_____	_____
C11	Luhna kawng a awl a, motor dahna atan hman a ni lo	_____	_____

Table 10F.27 — Form 10-7, Section D: Neitu puanchhuahna

Field	Ziah luh tur
Kei/Keini hian Clause 10.12-a fûr hma endikna chu tih a ni tawh a, chhiatna hmuhte chu Section C-a tarlan angin siam ṭhat a ni a, facility-te chu phalna pek O&M plan hnuaiah enkawl a ni tih kan puang e. Neitu: hming, signature, ni	_____

Table 10F.28 — Form 10-7, Section E: Empanelled professional (Clause 10.6.1(c) leh (d) hnuaia facility-te)

Field	Ziah luh tur
Kei hian facility tarlan-te ka endik a, Section C chu ka nemnghet e. Hming, empanelment number, signature, ni	_____

Table 10F.29 — Form 10-7, Section F: Authority tan

Field	Ziah luh tur
Dawn ni; hun takah (March ni 31 thlengin) aw / aih	_____
Facility register-ah ziah luh (Clause 10.17), ni	_____
Hmalakna zawm, a awm chuan (Clause 10.15)	_____

Form 10-8 — Asset Hlanna Certificate

Bung 10-a Clause 10.14 a ṭanpui.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. Developer-in a sak drain (tui luanna), open space facility, regional facility emaw ruahtui asset dang hlan an nih hunah developer leh ULB-in signature an thun.

Table 10F.30 — Form 10-8, Section A: Asset leh inremtu-te

No.	Field	Ziah luh tur
A1	Developer: hming leh address	_____
A2	ULB	_____
A3	Layout emaw project, phalna reference	_____
A4	Asset hlan (FAC_ID, chi, a sei zawng emaw tui zat), plan nen	_____

Table 10F.31 — Form 10-8, Section B: Hlanna thuthlung (Clause 10.14.1)

No.	Thuthlung	A tling em (aw / aih)	Reference emaw ni
B1	As-built certificate (Form 10-5) lo pawm	_____	_____
B2	Facility tihfai; pipe leh culvert (kawng hnuaia tui kalna)-te a chhung lam endik (CCTV emaw mihring lut), record hlan	_____	_____
B3	Ram, emaw a chunga easement (mi ram kal tlanga hman phalna), ULB hnenah hlan	_____	_____
B4	O&M plan, drawing, GIS data (Belhchian 10B) leh warranty-te hlan	_____	_____

Table 10F.32 — Form 10-8, Section C: Defects liability leh register

No.	Field	Ziah luh tur	Clause
C1	Defects liability period (chhiatna mawhphurh hun): _____ aṭanga _____ thleng (hlan hnua fûr hun pum khat tal, April ni 1 aṭanga October ni 31 thleng, a huam)	_____	10.14.2
C2	Hun chhunga chhiatna leh enkawlna pangngai mawhphurtu developer	_____	10.14.2
C3	ULB-in security deposit a vawn, ₹, leh a pek chhuah ni	_____	10.14.2
C4	ULB GIS drainage asset register leh facility register-ah ziah luh: ni	_____	10.14.3

Table 10F.33 — Form 10-8, Section D: Signature-te

Inremtu	Hming leh designation	Hmingziak	Ni
Developer	_____	_____	_____
Certify-tu professional	_____	_____	_____
ULB	_____	_____	_____

BUNG 11 BELHCHIAN

Basin leh Khawpui Ruahtui Luanna Master Plan

Heng belhchiante hian Bung 11 an ṭanpui. Basin Ruahtui Luanna Master Plan (BSMP) tana terms of reference (hna tur tarlanna) template, basin list leh boundary layer ruangam, depth–damage curve (tui thuk zawng leh chhiatna inzawmna) ruangam leh kalphung, BSMP data leh model tlangzarh dan standard, leh kumtin hmalakna report form an pe. Belhchian 11B leh 11C hian tun dinhmuna hmuh theih loh data an mamawh; chu chu an sawi a, chu chhung hman tur dan an pe. Template leh form hi competent authority ngaihtuah tura entirna leh draft form an ni a, hman an ni lo.

Belhchian 11A — BSMP hna tur tarlanna (terms of reference) template

Bung 11-a Clause 11.1 aṭanga 11.12 thleng a ṭanpui.

> *Competent authority ngaihtuah tura entirna thuziak. Hman a ni lo.* Lead Authority (hmahruaitu Authority) chuan basin tin tan he template hi a siam rem ang. "[ ]" chhunga item-te hi Lead Authority-in a tihkim tur an ni. Clause kawhhmuhna-te hi he Kaihhruaina Bu-a mi an ni a, consultant chuan a zavaiin a zawm tur a ni.

11A.1 A bul leh a tum

1. [Lead Authority] chuan Mizoram Ruahtui Luanna Design Kaihhruaina Bu Bung 11 hnuaiah [hming] basin tan Basin Ruahtui Luanna Master Plan buatsaih a tum.
2. BSMP hian (Clause 11.1.2):
    - (a) dinhmun awm mek leh hmalam huna basin tuilian hlauhawmna map a siam tur a ni;
    - (b) tui luanna (drainage) system ṭhen tin tan level of service (tuilian laia system hlen tur tehna) a ruat tur a ni;
    - (c) chu level of service thlen nana hna, khawlna leh ram mamawh a hriatchian, a man a chhut leh a indawt tur a ni;
    - (d) regional khawlna, dil leh tank siam ṭhatna leh tui luan kawng lian tan statutory land-use plan-a dah hran tur ram a hriatchian tur a ni;
    - (e) site design tana basin input: regional facility, fee-in-lieu unit rate, leh Bung 4 aia khauh zawk basin luan chhuah tir zat (release rate) reng reng a ruat tur a ni; leh
    - (f) tuilian hlauhawm (flood-sensitive) anga notify (Gazette-a tarlan) tur catchment (ruahtui luan khawmna hmun) a rawt tur a ni.
3. BSMP hian basin tan Bung 4 aṭanga 8 thleng site criteria a tikhauh thei. A tihzangkhai loh tur a ni, Clause 4.13 leh 4.5.6 regional detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan) leh fee-in-lieu kawng hmang chauh lo chu (Clause 11.1.3).

11A.2 Client, ṭanpuitu leh zirchian ram

1. **Client:** [Lead Authority] (Clause 11.4.1).
2. **Ṭanpuitu (partner):** IWRD, basin-in a thununna hnuaia luipui, canal emaw tank a huam apiangah, leh [local body dang, planning authority emaw UD&PA, MSDMA] (Clause 11.4.1).

3. **Zirchian ram:** Clause 11.3 hnuaia ri ruat [hming] basin pum, [outfall (drain tui luan chhuahna)]-a luang, client ri pawna awm ṭhente tiamin (Clause 11.3.1). Ri rih (provisional boundary) chu [Belhchian 11B / map belh]-ah a awm. Consultant chuan Task 2-ah a nemnghet tur a ni.
4. **Basin dang nena inzawmna:** [entirnan tui dawngtu luipui, lui, dil emaw reservoir corridor]. Canal, drain (tui luanna) emaw surplus course hmanga basin inkara tui sawn (diversion) chu map-ah dah leh model-ah lantir tur a ni (Clause 11.3.2).

11A.3 Hnathawktu pawl

1. Zirchianna hi Belhchian 10E basin modelling endorsement (thiamna pawmpuina) nei Stormwater Design Professional anga empanel (thiamna list-a dah luh) engineer-in a hruai tur a ni (Clause 11.4.3).
2. Hnathawktu pawl-ah hian a tlem berah heng hi an tel tur a ni: [hydrologist; hydraulic modeller; basin-in tidal outfall a neih chuan coastal emaw tidal specialist; GIS leh survey hruaitu; planner; cost engineer; khawtlang inhmuhkhawmna hruaitu]. Client chuan an tin qualification leh tawnhriat tlem ber a ruat.

11A.4 Hna-te

Task 1 — Inception. Basin chhunga zirchianna, data leh project awm mek endik rawh. Table 11.1 nena khaikhinin data inventory, tlachham list, survey plan, inrawnna plan leh hna programme buatsaih rawh. Inception report pe rawh.

Task 2 — Data leh survey. Table 11.1 item tin chu khawn khawm, a tlachhamna-ah survey, leh a ṭhatna endik rawh (Clause 11.5.1):

- (a) ram pianphung: khawpui ramah vertical accuracy 0.15 m RMSE emaw a aia ṭha nei LiDAR emaw photogrammetry aṭanga DEM, Survey of India datum nena inzawm, accuracy test report nen;
- (b) drain network: public drain, culvert (kawng hnuaia tui kalna) leh outfall tin, invert level, lenzawng, dinhmun leh leidip thuk zawng nen; 600 mm chunga private drain;
- (c) tui awmnate: Bung 7 hnuaia tank, dil, dil tê (pond) leh marsh (hmun hnawng) tin: FTL, MWL, bund level, stage–storage, sluice, surplus weir, tui lakna channel leh luah hneh (encroachment), Belhchian 7A field-te-ah;
- (d) luipui leh canal: 200 m aia hla lo inkara leh structure tinah cross-section;
- (e) outfall, lui, luipui, dil leh reservoir: phai (valley floor) rama outfall invert level, datum hming nei chungah, CWC level-monitoring site hnai bera tui dawngtu luipui HFL (gauge-a tuilian sang ber) (State-ah pakhatin warning emaw danger level a nei lo) emaw tuilian chhinchhiahna survey nena khaikhin, local gauge reng reng chu series hrang angin vawn a, value tlangzarh inkalh reng reng sawi; tlang chhip khawpui outfall zalen (free outfall) tan, inzawmna (confluence) dawt thleng tui dawngtu lui chhuat leh kam profile leh a leidip, bal leh bawlhhlawh nena 1% AEP level; Tuirial reservoir emaw Tuirial leh Serlui B dam hnuai lui chhung-a outfall tan, NEEPCO leh State power department aṭanga reservoir level khat, hniam ber leh sang ber leh spillway leh tui chhuah tir data, leh dil-te an survey spill level-ah; basin chunga leimin hlauhawm zone, 60° aia nasa tlang pang, lung laihna (quarry), lei chim chhuk zelna hmun (sinking area) leh bal kawng; leh outfall-a flap gate, debris rack (bal dangna), sediment trap, debris basin, check dam leh pumping station, an theihna leh kalpui dan nen;
- (f) ruahtui tlak leh tui sang zawng: record awm zawng zawng (IMD, a Meteorological Centre Aizawl leh Lengpui-a gauge pangngai, pakhat mah IMD *Extremes*-ah a awm lo, leh Mizoram University, Kolasib, Champhai, Khawzawl, Serchhip, Hnahthial, Saiha leh Chawnhu-a a automatic weather station-te (record rei zawng [TBC]) tiamin; Mz-SWIC hnuaia tarlan automatic rain gauge leh weather station, site 30 vel (kalpuitu hming chu thu hnarah kimchangin a ziak lo; ṭan kum leh logging inkar [TBC]); Directorate of Science and Technology State Meteorological Centre, a series 1980s aṭanga 2021 thleng (gauge list hmuh a ni lo [TBC]); Serchhip, North Vanlaiphai, Lunglei, Haulawng leh Tlabung-a Agriculture Department gauge pangngai; CWC ruah tehna, Bairabi, Dapchhuah, Mat-1, Tlabung, Tuichawng, Tuipui D leh Shitlangpui te zingah, leh Sairang leh Turial-a a level-monitoring site-te; Tuirial dam-a NEEPCO reservoir record [TBC]; leh Aizawl Municipal Corporation, MSDMA emaw IWRD-in an vawn gauge emaw sensor reng reng [TBC]), May ni 28, 2024 (Cyclone Remal: Melthum leh Hlimen inkara lung laihna (quarry) hman tawh loh chu zing dar 6 velah a chim a, Aizawl-ah leimin dang a awm bawk; May ni 29 thlengin Aizawl district-ah mi 29 an thi a, mi 7 an bo tih report a ni a, a hnuah quarry-ah mi 15 leh

Hlimen-ah mi 5, emaw Aizawl hmun pasarihah mi 34, leh State pumah mi 27–29 tih a ni (a zavaia chanchin tlangzarh angin); May ni 27–28, 2024-a Aizawl ruahtui tlak zat hmuh a ni lo a, May ni 28-a IMD thuchhuaha Mizoram University-a 20 mm chu hun eng chhunga mi nge tih a chiang lo), May ni 24, 2025 aṭanga June ni 3, 2025 thleng (leimin 598, mi panga thi, in 171 chhe leh kawng tihtawp hmun 257, Champhai 209, Serchhip 116, Khawzawl 75, Lunglei 61 leh Aizawl 21, DM&R chhiarna (chanchin tlangzarh angin); ni khatah Serchhip 104.6 mm, Kolasib 98.3 mm leh Aizawl 97.4 mm, chu ni chu chiang lo (chanchin tlangzarh angin); he ruahpui tan IMD series hmuh a ni lo), June 2018 (ni khatah Aizawl-ah 148 mm, June ni 12 a ni maithei, leh June ni 1 aṭanga 13 thleng Serchhip district-ah 677 mm, June ni 5-ah leiminah mi sawm an thi, Tiperabagh, Serhuan leh Tlabung-ah in tuilianin a chim a, Sairang-ah chhungkua an tang (a zavaia chanchin tlangzarh angin)), July 2019 (Tlabung-ah Khawthlangtuipui tuilianin in 400 vel a chim, a zinga 150 chu khawpui chhungah, leh State-ah mi pathum an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) leh June 2017 (Tlabung-a Khawthlangtuipui tuilian, chhiarna pakhatin sub-division-ah in 350 vel tuiin a chim a ti a, chhiarna dangin in 9 a kim vek leh 60 aia tam a ṭhen a chim a ti, mi 8–10 an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) thil thlengte tiamin;
- (g) tuilian finfiahna: thil thleng hmasa tuilian chhinchhiahna survey leh tuilian zau zawng map, public report, thlalak leh khaw mite record tiamin;
- (h) ram hman dan (land use): ram hman dan awm mek leh tui luh theih lohna (imperviousness); statutory master plan aṭanga hmalam ram hman dan;
- (i) lei leh leihnuai tui (groundwater): HSG map (Belhchian 3A emaw Clause 3.7.2), hun bik-a leihnuai tui sang ber, aquifer leh recharge (leihnuai tui tihpun) zone; leh
- (j) sewer inzawmna: cross-connection hriat, drain-a ruah sur lohna hun tui luang (DWF), bawlhhlawh hmun tam.

Basin ri leh basin inkara tui sawn-te nemnghet rawh (Clause 11.3.2). Data report leh data chu Belhchian 11D format-in pe rawh.

Task 3 — Model siam. Tui luanna system tenau (minor), tui luanna system lian (major, lei chung), luipui, canal leh tank-te, leh outfall-te coupled 1D–2D hydraulic model siam rawh (Clause 11.7.1; Milem 11.2). Bung 3 kalphung-te leh Bung 5 tidal leh luipui boundary-te hmang rawh. Bung 2 design ruahpui, darkar 24, 48 leh 72 ruahpui tiamin, a tlem berah 50%, 10%, 1% leh 0.2% AEP tan, Clause 2.7.3 hnuaia areal reduction nen tlan rawh (Clause 11.7.2). Basin-in tank cascade (dil cascade) a neih chuan, Clause 3.13 hnuaiah continuous simulation (kum tam tak ruahtui hmanga model) chu IMD grid ni tin record kim, a awm chuan, leh a tlem berah kum 30, Belhchian 2D temporal pattern (ruahtui tlak dan)-in ṭhen darh, nen tlan rawh. Clause 3.13.5 step pahnih kalphung hman theih a ni: continuous run aṭanga ṭan tank level leh antecedent dinhmun (ruahpui hma lei hnawnna) chu design-storm run-ah hlan a ni (Clause 11.7.3).

Task 4 — Calibration leh validation. Clause 3.15 hnuaiah model chu calibrate leh validate rawh, data a awmna apiangah May ni 28, 2024 (Cyclone Remal: Melthum leh Hlimen inkara lung laihna (quarry) hman tawh loh chu zing dar 6 velah a chim a, Aizawl-ah leimin dang a awm bawk; May ni 29 thlengin Aizawl district-ah mi 29 an thi a, mi 7 an bo tih report a ni a, a hnuah quarry-ah mi 15 leh Hlimen-ah mi 5, emaw Aizawl hmun pasarihah mi 34, leh State pumah mi 27–29 tih a ni (a zavaia chanchin tlangzarh angin); May ni 27–28, 2024-a Aizawl ruahtui tlak zat hmuh a ni lo a, May ni 28-a IMD thuchhuaha Mizoram University-a 20 mm chu hun eng chhunga mi nge tih a chiang lo), May ni 24, 2025 aṭanga June ni 3, 2025 thleng (leimin 598, mi panga thi, in 171 chhe leh kawng tihtawp hmun 257, Champhai 209, Serchhip 116, Khawzawl 75, Lunglei 61 leh Aizawl 21, DM&R chhiarna (chanchin tlangzarh angin); ni khatah Serchhip 104.6 mm, Kolasib 98.3 mm leh Aizawl 97.4 mm, chu ni chu chiang lo (chanchin tlangzarh angin); he ruahpui tan IMD series hmuh a ni lo), June 2018 (ni khatah Aizawl-ah 148 mm, June ni 12 a ni maithei, leh June ni 1 aṭanga 13 thleng Serchhip district-ah 677 mm, June ni 5-ah leiminah mi sawm an thi, Tiperabagh, Serhuan leh Tlabung-ah in tuilianin a chim a, Sairang-ah chhungkua an tang (a zavaia chanchin tlangzarh angin)), July 2019 (Tlabung-ah Khawthlangtuipui tuilianin in 400 vel a chim, a zinga 150 chu khawpui chhungah, leh State-ah mi pathum an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) leh June 2017 (Tlabung-a Khawthlangtuipui tuilian, chhiarna pakhatin sub-division-ah in 350 vel tuiin a chim a ti a, chhiarna dangin in 9 a kim vek leh 60 aia tam a ṭhen a chim a ti, mi 8–10 an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) thil thlengte zinga a tlem berah pahnih hmangin (Clause 11.7.5). Clause 3.15.4 hnathawh ṭhatna tehna-te leh Clause 3.15.6 a awm dan dik endikna report rawh.

Task 5 — Scenario leh hazard map. Clause 11.7.4 scenario-te model rawh: (a) awm mek; (b) hmalam, thunun lo; (c) hmalam, thunun; (d) hmalam, plan nen; leh (e) climate, (a) leh (d)-ah hman. 10%, 1% leh 0.2% AEP tan, awm mek leh hmalam-plan nen, tuilian zau zawng, thuk zawng, chakna (velocity) leh hazard class (H1–H6, Bung 6) hazard map siam rawh (Clause 11.8.4(a)).

Task 6 — Level-of-service chhutna. Scenario (a), (c) leh (d) chu Table 11.2 level of service leh client-in a hman (adopt) level khauh zawk reng reng nen khaikhin rawh (Clause 11.6.1). Tlachhamna tin map-ah dah rawh.

Task 7 — Thlan tur. Clause 11.8.1 indawt dan angin thlan tur (option) siam rawh: khawlna humhalh leh siam ṭhat; modelling-a hmun thlan regional retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw) leh detention; tui luan tirna (conveyance); outfall hna; in leh ram humhimna (property-level protection); structure ni lo hmalakna. Thlan tur tin chu Clause 11.8.2 criteria-in chhut rawh: tuilian hlauhawmna tihtlem (building leh mi tuilian, leh Belhchian 11C hmanga kumtin chhiatna beisei (expected annual damage)); capital leh kum 30 enkawlna senso; ram mamawh; khaw-te leh khawpui ṭhenkhat tui petu tuikhur (tui chhuahna, spring) leh tuikhur aṭanga tui lakna hmun, leh tui lakna hmun chunga an catchment-te, he Kaihhruaina Bu-in paving leh kawng ruahtui luang lei-a luh tir laka a vawn fai (Bung 8 tuikhur dan) chunga nghawng, tlang pang nghetna, shale, colluvium, lei vur emaw leimin bal-a tui luh tir chuan pore pressure a tisang a, SD&SM 2017-in a vaukhan ang leh Hlimen leh Laipuitlang leimin-in a lantir ang khan, phai alluvium leh lui kam zawl (river terrace) test-a recharge, a phalna hmun awmchhun (Clause 4.11, recharge dan), leihnuai tui lak a tlem hle na a (lak zat stage 2011-ah 3.52%, CGWB, leh 2024-ah 3.95%, thu lak chhawn angin), leh ruahtui luangin a thlen tuikhur, lui, luipui, dil leh reservoir-te tui ṭhatna, a ṭhenkhatin ek tui (sewage) an phur (Bung 8, Clause 8.9); luanna hnuailam basin leh tui dawngtu luipui, lui, dil emaw reservoir chunga nghawng; leh tu nge hlawkpui.

Task 8 — Site design tana basin input. Scenario (c)-in level of service a thlen loh chuan, AEP leh sub-catchment zelin basin luan chhuah tir zat (m³/s/ha) rawt rawh (Clause 11.8.3). Tuilian hlauhawm anga notify tur catchment-te, Clause 4.5.4.1 finfiahna nen rawt rawh. Regional facility hmun-te, khawlna tui zat, ram mamawh leh an rawngbawl site-te nen hriatchian rawh, leh ram, sakna leh kum 10 enkawlna tiamin fee-in-lieu unit rate chhut rawh (Clause 4.13.3, 11.8.4(c), (d)).

Task 9 — Capital Improvement Programme. Hna-te chu cheng khata hlauhawmna tihtlem zatin indawt rawh, senso, ṭhen dan (phasing) leh mawhphurtu agency nen (Clause 11.8.4(e)).

Task 10 — Enkawlna leh enfiahna. Fûr hma (pre-monsoon) enkawlna programme buatsaih rawh: leidip laih chhuah (desilting), gate leh pump test, leh tank kalpui dan (Clause 11.8.4(f); Bung 7 leh 10). Enfiahna mamawh sawi chiang rawh: ruah tehna thar, level sensor leh tuilian chhinchhiahna survey point (Clause 11.8.4(g); Clause 10.16.1).

Task 11 — Ram hman dan inzawmna. Clause 11.9.1-in a phut statutory land-use plan tana thil buatsaih rawh: dah hran tur hmun; Bung 7 setback (tui kam aṭanga hmun kalhlen tur) nena 1% AEP hazard map; 1% AEP thil thlengah hazard class H5–H6-a ram; leh tui luan kawng emaw regional khawlna ṭhen ni thei open space awmna.

Task 12 — Inrawnna. BSMP draft chu mipui rawtna atan a tlem berah ni 60 tlangzarh rawh, local body nghawng tinah public meeting nen (Clause 11.10.1). Rawtna leh chhanna log vawng rawh.

Task 13 — BSMP tawp leh tlangzarh. Inrawnna hnuah BSMP siam ṭha rawh. State Stormwater Technical Committee phalna atan package, endikna atana model tiamin, buatsaih rawh (Clause 11.11.1). Data, model, map leh CIP chu Belhchian 11D hnuaiah tlangzarh rawh (Clause 11.10.2).

11A.5 Pek tur (deliverable)

Table 11A.1 — Pek tur

No.	Pek tur	Task	Pek hun (ṭan aṭanga thla)
D1	Inception report, data inventory leh survey plan	1	[ ]
D2	Data report leh data set (Belhchian 11D)	2	[ ]

No.	Pek tur	Task	Pek hun (ṭan aṭanga thla)
D3	Model siam report leh model file	3	[ ]
D4	Calibration leh validation report	4	[ ]
D5	Scenario result, hazard map leh level-of-service chhutna	5, 6	[ ]
D6	Thlan tur report, site design tana basin input nen	7, 8	[ ]
D7	Inrawnna atan BSMP draft, CIP draft nen	9–12	[ ]
D8	BSMP tawp, inrawnna log, phalna package leh open-data chhuah	13	[ ]

11A.6 Neitu leh tlangzarh

He terms hnuaia data, model, map leh report siam zawng zawng hi Lead Authority neih a ni a, Belhchian 11D hnuaiah tlangzarh tur a ni. Consultant chuan tlangzarh dangtu, emaw mi pathum-na-in software version sawi hmanga model tlan nawn dangtu software licence, data licence emaw format reng reng a hman loh tur a ni.

Belhchian 11B — Tier A pawl tana basin list leh ri

Bung 11-a Clause 11.3 leh 11.4 a ṭanpui.

Buatsaih tur. He belhchian hian Tier A pawl tin tan basin list, Clause 11.3.2 hnuaia ri ruat basin ri GIS layer nen, a keng ang. A mamawh: Tier A pawl list (Belhchian 1A), Clause 11.5.1 accuracy nei DEM, tuilian emaw leimin lian reng reng hnuah phai leh leimin awlsam tlang pang chungah thlawh nawn, drain neitu pawl tin drain network (Aizawl Municipal Corporation leh a Local Council-te, Lunglei Municipal Council, PWD, national-highway agency-te, PHED leh SIPMIU, leh khaw drain tan Village Council-te), drain chhung (reach) tin neitu, a thlen lui, leimin hlauhawm map-a a class leh a outfall petu drain register, Master Plan for Aizawl: Vision 2030 Map 8.3-a drain leh catchment rawt (lak chhuah a ni lo [TBC]), IWRD luipui leh flood work-te, datum sawi chunga level, spillway, gate leh tui chhuah tir dan nena Tuirial leh Serlui B reservoir, spill level nena dil-te, tuikhur (tui chhuahna, spring)-te leh tui lakna hmun chunga an catchment-te, lung laihna (quarry), hman mek leh hman tawh loh, leh lei chim chhuk zelna hmun (sinking area), leh Corporation Landslide Hazard Maps (leimin hlauhawmna map) leh MIRSAC atlas-a leimin hlauhawm zone-te (hnar dang ni thei: Survey of India, CWC, CGWB, NIH, MIRSAC, UD&PA master-plan map leh Land Revenue & Settlement Department ram record). Mizoram khawpui reng reng basin map hmuh a ni lo. Belhchian hi tlangzarh a nih hma chu, Aizawl basin-te (Chite lui Tuirial thleng; Ser lui Tlawng thleng), Hlimen–Melthum, Hunthar Veng leh Durtlang hazard area nen, leh Sairang, Bairabi leh Vairengte, Tlabung, Lunglei, Serchhip, Champhai leh Champhai phai, Siaha leh Lawngtlai leh Clause 11.3.3-a hming tarlan Tuirial tui chhuah tirna lui chhung basin-te chu a tlem berah chutah hming tarlante an ni; khawpui leh pawl dangte chuan an BSMP hmasa berah an basin an ruat (Clause 11.3.3); basin tinah Clause 11.3.3 hlauhawmna endikna (hazard screening) a hmasa ber; leh BSMP phalna pek nei lo basin tinah Clause 11.12 ruahmanna rih (interim arrangement) a huam. Belhchian 11C tan, Mizoram-a leimin leh tuilian chhiatna chhutna chu Disaster Management & Rehabilitation Department (DM&R), "chhiatna venna, inbuatsaihna, tihziaawmna, chhanchhuahna, ṭanpuina leh siam ṭhat lehna mawhphurtu" ("is responsible for prevention, preparedness, mitigation, response, relief and rehabilitation") (CAG) leh a chhiar zat chanchinbu-in a report, May ni 24, 2025 aṭanga June ni 3, 2025 thleng tan ang, kutah a awm, Land Revenue & Settlement Department ram record bulah (he Kaihhruaina Bu chhiar dan); calibration thil thleng tan DM&R chhiar zat tawp hmuh a ni lo [TBC].

Table 11B.1 — Clause 11.3.3-a basin hming tarlan (rih)

Tier A pawl emaw area	Basin	Bung 11 aṭanga hriat tur
Aizawl Development Plan Area (Aizawl Municipal Corporation, UD&PA)	Chite lui catchment Tuirial thleng, a lui pengte leh Muthi leh Tuipawl lui nen	Lui chhuk nasa-a outfall zalen (Clause 5.8.5(a) leh (b)); 1D network-ah Chite sewage treatment plant leh Priority II lui chhung; boundary angin tuilian chhinchhiahna survey leh bal leh bawlhhlawh nena 1% AEP level
Aizawl Development Plan Area (a chunga ang)	Ser lui catchment Tlawng thleng, a lui tête leh Khatla, Tuikual, Vaivakawn leh Chanmari thlang lui nen	A chunga ang khan
Aizawl Development Plan Area (a chunga ang)	Heng basin chhunga hazard area: Hlimen–Melthum lung laihna belt, Hunthar Veng leh NH-6 laih, Durtlang leh Bawngkawn–Durtlang kawng	Hlauhawmna endikna hmasa ber; bal kawng map-a dah; basin ruat [TBC]
Sairang	Tlawng-a luang catchment-te	Boundary angin CWC Sairang site (tuilian sang ber a nei lo) leh tuilian chhinchhiahna survey; outfall khar dinhmun chu design dinhmun (Clause 5.8.5(c))
Bairabi leh Vairengte (sub-area MZ-A1)	Khawpui pahnih catchment-te	A tlem berah darkar 72 ruahpui tan tuilian chhinchhiahna survey; luanna hnuailamah Barak-phai dan bula awm
Tlabung (sub-area MZ-D1)	Khawthlangtuipui-a luang catchment-te	Darkar 72 aia tlem lo chhung tuilian sang zawng survey-ah luipui (Clause 5.8.5(d)); calibration finfiahna angin June 2017 leh July 2019
Lunglei (Lunglei Municipal Council, Tier B pawl)	Khawpui catchment-te leh an tui dawngtu lui	Hming leh outfall [TBC]
Serchhip	Mat lam pana luang khawpui catchment-te	Hlauhawmna endikna hmasa ber; tui dawngtu lui [TBC]
Champhai khawpui leh Champhai phai (sub-area MZ-C1)	Tiau lam pana luang catchment-te	Boundary angin tuilian chhinchhiahna survey; Myanmar-ah luanna hnuailam gauge a awm lo
Siaha leh Lawngtlai	Khawpui pahnih catchment-te	District Council-te hmangin chauh, he Kaihhruaina Bu hi an pawm chuan
Tuirial tui chhuah tirna lui chhung	NEEPCO dam hnuaia Tuirial-a luang catchment-te	Boundary angin tui chhuah tir sang ber chhinchhiah, emaw NEEPCO-in a pek hma chu spillway theihna (Clause 5.8.5(e))
Khawpui leh pawl dangte	BSMP hmasa berah ruat tur	Clause 11.3.3

Table 11B.2 — Basin boundary layer attribute-te (layout)

Field	Chi	A chhunga thu
BASIN_ID	Text	Basin hriatchianna
NAME_EN, NAME_LUS	Text	English leh Mizo ṭawnga basin hming
TIER_A	Text	Basin chhunga Tier A pawl pakhat emaw a aia tam
OUTFALL	Text	Tuifinriat, luipui emaw tui awmna lian-a outfall (Clause 11.2)
AREA_KM2	Real	Basin area, km²
LEAD_AUTH	Text	Lead Authority (Clause 11.4.1)
PARTNERS	Text	Ṭanpuitu, a huam chuan IWRD tiamin
LINKS	Text	Basin dang lam pan leh aṭanga tui sawn (Clause 11.3.2)
BSMP_STAT	Text	Awm lo / buatsaih mek / draft tlangzarh / phalna pek

Field	Chi	A chhunga thu
BSMP_DATE	Date	BSMP hman mek phalna pek ni
REVIEW_DUE	Date	Endikna dawt ni (Clause 11.11.2)

Belhchian 11C — Mizoram building chi tana depth–damage curve

Bung 11-a Clause 11.8.2 a ṭanpui.

Buatsaih tur. He belhchian hian Clause 11.8.2 hnuaia kumtin chhiatna beisei (expected annual damage) chhut nan, Mizoram khawpui building chi pawimawh tan, structure leh a chhunga thil tan depth–damage curve a keng ang. A mamawh: building chi ṭhen dan leh building awm zat data (Census in table, property-tax record, Lead Authority GIS), May ni 28, 2024 (Cyclone Remal: Melthum leh Hlimen inkara lung laihna (quarry) hman tawh loh chu zing dar 6 velah a chim a, Aizawl-ah leimin dang a awm bawk; May ni 29 thlengin Aizawl district-ah mi 29 an thi a, mi 7 an bo tih report a ni a, a hnuah quarry-ah mi 15 leh Hlimen-ah mi 5, emaw Aizawl hmun pasarihah mi 34, leh State pumah mi 27–29 tih a ni (a zavaia chanchin tlangzarh angin); May ni 27–28, 2024-a Aizawl ruahtui tlak zat hmuh a ni lo a, May ni 28-a IMD thuchhuaha Mizoram University-a 20 mm chu hun eng chhunga mi nge tih a chiang lo), May ni 24, 2025 aṭanga June ni 3, 2025 thleng (leimin 598, mi panga thi, in 171 chhe leh kawng tihtawp hmun 257, Champhai 209, Serchhip 116, Khawzawl 75, Lunglei 61 leh Aizawl 21, DM&R chhiarna (chanchin tlangzarh angin); ni khatah Serchhip 104.6 mm, Kolasib 98.3 mm leh Aizawl 97.4 mm, chu ni chu chiang lo (chanchin tlangzarh angin); he ruahpui tan IMD series hmuh a ni lo), June 2018 (ni khatah Aizawl-ah 148 mm, June ni 12 a ni maithei, leh June ni 1 aṭanga 13 thleng Serchhip district-ah 677 mm, June ni 5-ah leiminah mi sawm an thi, Tiperabagh, Serhuan leh Tlabung-ah in tuilianin a chim a, Sairang-ah chhungkua an tang (a zavaia chanchin tlangzarh angin)), July 2019 (Tlabung-ah Khawthlangtuipui tuilianin in 400 vel a chim, a zinga 150 chu khawpui chhungah, leh State-ah mi pathum an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) leh June 2017 (Tlabung-a Khawthlangtuipui tuilian, chhiarna pakhatin sub-division-ah in 350 vel tuiin a chim a ti a, chhiarna dangin in 9 a kim vek leh 60 aia tam a ṭhen a chim a ti, mi 8–10 an thi (chanchin tlangzarh angin); ruahtui tlak zat hmuh a ni lo) tuilian aṭanga chhiatna survey leh claim (Land Revenue & Settlement Department leh MSDMA chhiatna chhutna, insurance company), leh thlak nawn man (Public Works Department schedule of rates). A tlangzarh hma chuan, BSMP tin chuan depth–damage inzawmna a hman leh a hnar a sawi tur a ni a, thlan tur tin tan building leh mi tuilian tihtlem zat a report tur a ni (Clause 11.8.2), chu chu curve-ah a innghat lo.

Table 11C.1 — Depth–damage curve (layout, building chi tin tan table pakhat)

Floor level chunga tui thuk zawng (m)	0	0.25	0.5	1.0	1.5	2.0	3.0
Structure chhiatna (thlak nawn man %)	_____	_____	_____	_____	_____	_____	_____
A chhunga thil chhiatna (a chhunga thil hlutna %)	_____	_____	_____	_____	_____	_____	_____
Building chi, hnar leh senso kum	_____						

11C.1 Thlan tur chhutnaa hman dan

Kumtin chhiatna beisei (EAD) hi scenario tin tan model AEP-a chhiatna aṭanga chhut a ni. Kum khatah a lo thlen theih dan (annual exceedance probability) P_1 > P_2 > … -a chhiatna D_1, D_2, … nen, Clause 11.7.2-a 50%, 10%, 1% leh 0.2% AEP result a tlem berah hmangin:

> EAD ≈ Σ ½ × (D_i + D_(i+1)) × (P_i − P_(i+1))

Scenario (c) leh scenario (d) inkar, emaw thlan tur inkara EAD tihtlem zat hi cheng khata hna indawt nana hlauhawmna tihtlem hlawkna hman a ni (Clause 11.8.4(e)). BSMP chuan 0.2% AEP piah lam leh 50% AEP hnuai lam chhiatna engtin nge a chhut tih a sawi tur a ni.

Belhchian 11D — BSMP data leh model tlangzarh standard

Bung 11-a Clause 11.5.1 leh 11.10, leh Bung 10-a Clause 10.17 a ṭanpui.

11D.1 Eng nge tlangzarh, engtikah nge

Table 11D.1 — Tlangzarh tur item-te

Thil	Format	Draft hunah (Clause 11.10.1)	Phalna hunah (Clause 11.10.2)
BSMP report, level-of-service chhutna leh thlan tur nen	Zawn theih PDF	Aw	Aw, a tawp
Tuilian hazard map: zau zawng, thuk zawng, chakna, hazard class, Clause 11.8.4(a)-a AEP leh scenario tin tan	GeoTIFF raster; zau zawng chu GeoPackage polygon angin pawh	Aw	Aw
Capital Improvement Programme	CSV leh PDF	Draft	Aw
Basin luan chhuah tir zat, tuilian hlauhawm catchment rawt, regional facility hmun, fee-in-lieu unit rate	GeoPackage leh CSV	Aw	Aw
Table 11.1 data (ram pianphung, drain, tui awmna, cross-section, luipui, reservoir leh dil level, tui dawngtu lui profile, leimin, bal leh bawlhhlawh hlauhawmna leh outfall structure, ruahtui tlak leh level, tuilian finfiahna, ram hman dan, lei leh leihnuai tui, sewer inzawmna)	GeoTIFF (ram pianphung); GeoPackage (feature); CSV (table leh time series)	Tlangpui	Aw, himna kaihhnawih asset kimchang bak chu
Model file: format ngei, tlan theih, boundary-condition, ruahtui tlak leh control file zawng zawng, software hming leh version, leh run log nen	Format ngei, zip	Aih	Aw
Calibration leh validation report	Zawn theih PDF	Aw	Aw
Rawtna leh chhanna inrawnna log	PDF emaw CSV	—	Aw

11D.2 Format leh reference

- (a) Raster data chu GeoTIFF, cloud-optimised a nih theih chuan, cell size sawi nen a ni tur a ni. Vector data chu GeoPackage a ni tur a ni. Table leh time series chu UTF-8-a CSV, header row leh column hmingah unit nen a ni tur a ni.
- (b) Horizontal leh vertical reference chu Belhchian 10B.1(b) leh (c)-a ang a ni tur a ni. Vertical datum leh tui dawngtu luipui-te CWC level-monitoring site-te Bung 5 river datum (thu hnar hmuh reng rengin a sawi lo), NEEPCO-in metre-a a tlangzarh Tuirial dam reservoir level (datum sawi lo) leh Serlui B level (hmuh a ni lo), leh gauge nei lo lui, luipui leh dil-a tuilian chhinchhiahna survey-te nena an inzawmna chu level keng data set tinah sawi tur a ni.
- (c) Hun chu Indian Standard Time-in, ISO 8601 (yyyy-mm-ddThh:mm+05:30) angin ziah tur a ni. Unit chu SI a ni tur a ni.

- (d) Hazard map file-te chu `<basin>_<scenario>_<AEP>_<variable>.tif` tia hming vuah tur a ni, scenario chu Clause 11.7.4-a a aṭanga e thleng, AEP chu 50, 10, 1 emaw 0p2 tia ziah, leh variable chu depth, velocity, hazard emaw extent a ni; entirnan `chite-lui_d_1_depth.tif`.
- (e) Tui awmna data chuan Belhchian 7A field-te a hmang tur a ni. Facility leh outfall data chuan Belhchian 10B field-te a hmang tur a ni.

11D.3 Metadata

Data set tlangzarh tin hian heng hi a keng tur a ni: thupui; sawifiahna; Lead Authority; hnar leh kalphung; lak ni; accuracy (DEM tan, vertical RMSE teh); horizontal leh vertical reference; scenario leh AEP, a inmil chuan; BSMP version; licence; leh biak theihna.

11D.4 Tlangzarh loh leh mimal data

- (a) Asset pawimawh himna kaihhnawih kimchang chu, a chhan chhinchhiah leh tlangzarhin, tlangzarh loh theih a ni (Clause 10.17.3, 11.10.2). Tuilian hazard map leh model chu tlangzarh tho tur a ni; attribute himna kaihhnawih chauh paih a ni.
- (b) Mimal data chu tlangzarh loh tur a ni (Clause 10.17.3). Khaw mite aṭanga tuilian finfiahna lak khawm chu, a neitu-in a remtih loh chuan, hming emaw biak theihna tel lovin tlangzarh tur a ni.

11D.5 Licence, viewer leh version

- (a) Data leh model tlangzarh chu Government Open Data Licence – India emaw open licence inang hnuaiah chhuah tur a ni (Clause 10.17.4).
- (b) Hazard map, regional facility hmun leh CIP chu public map viewer-ah pawh lantir tur a ni (Clause 11.10.2).
- (c) BSMP phalna pek tin hian version number leh ni a keng tur a ni. Version thlak tawh (superseded) chu, thlak tawh tia chhinchhiahin, hmuh theih reng tur a ni, chu hnuaia design phalna pekte endik theih nan.
- (d) Model package tlangzarh hian mi pathum-na, software version sawi nei, chu result tlangzarh siam chhuak nawn thei turin a siam tur a ni. Designer-te chuan basin chhunga site design tan a boundary condition-te an hmang thei (Clause 11.10, Hrilhfiahna).

Form 11-1 — Kumtin hmalakna report

Bung 11-a Clause 11.11.3 a ṭanpui, Bung 4-a Clause 4.5.6.3 leh 4.13.4 nen.

Draft form — Mizoram Ruahtui Luanna Design Kaihhruaina Bu, Draft v1.0. BSMP phalna pek nei basin tin tan Lead Authority-in fûr hun tin hmain, **March ni 31** hmain a tlangzarh (Clause 11.11.3).

Table 11F.1 — Form 11-1, Section A: Basin leh plan

No.	Field	Ziah luh tur
A1	Basin; Lead Authority; ṭanpuitu	_____
A2	BSMP version leh phalna pek ni	_____
A3	Report kum (April ni 1 aṭanga March ni 31 thleng)	_____
A4	Tlangzarh ni (March ni 31 hmain) leh web address	_____

Table 11F.2 — Form 11-1, Section B: CIP hmasawnna

CIP indawt	Hna	Agency	CIP-a senso (₹)	Kum chhunga sen (₹)	Tun thlenga sen (₹)	Dinhmun	Zawh beisei hun
_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____	_____

Table 11F.3 — Form 11-1, Section C: Fee-in-lieu ledger (Clause 4.5.6.3(c) leh 4.13.4)

Regional facility emaw tank	Site-te tana credit tui zat (m³)	Tui zat pek (m³)	Fee dawn (₹)	Fee sen (₹)	Fee vawn, dawn kum nen
_____	_____	_____	_____	_____	_____
Basin pum: tui zat ba leh pek	_____	_____	_____	_____	_____

Table 11F.4 — Form 11-1, Section D: Enkawlna zawh (Clause 11.8.4(f))

No.	Thil	Ruahman	Zawh	Zawh ni
D1	Drain leh canal leidip laih chhuah (dung, km; tui zat, m³)	_____	_____	_____
D2	Tank leh dil leidip laih chhuah leh siam ṭhatna (tank, zat; khawlna siam ṭhat, m³)	_____	_____	_____
D3	Gate test (gate zat)	_____	_____	_____
D4	Pump station duty test (station zat)	_____	_____	_____
D5	Custodian (enkawltu) nena tank kalpui dan endik (zat)	_____	_____	_____
D6	Enfiahna belh: ruah tehna, level sensor, tuilian chhinchhiahna point (Clause 11.8.4(g))	_____	_____	_____

Table 11F.5 — Form 11-1, Section E: Tuilian leh system hlen tur tehna (level of service) khaikhinna

Thil thleng (ni)	Design thuk zawng nena ruahtui tlak khaikhinna (Clause 10.16.2(a))	Level-of-service element (Table 11.2)	Hmun	A tling em (aw / aih)	Thil thleng report reference (Clause 10.16.2)
_____	_____	_____	_____	_____	_____

Table 11F.6 — Form 11-1, Section F: Endikna ṭanna leh hming ziakna

No.	Field	Ziah luh tur
F1	Kum chhungin basin-ah 1% AEP design thuk zawng khumtu thil thleng (aw / aih). Aw a nih chuan, kum 2 chhunga endikna tur (Clause 11.11.2)	_____
F2	Kum chhunga statutory land-use plan siam ṭhat (aw / aih) (Clause 11.11.2)	_____
F3	Kum 10 endikna dawt hun (ni)	_____
F4	Lead Authority officer: hming, designation, signature, ni	_____

Thumal awmzia (English – Mizo)

He Kaihhruaina Bu-a technical thumal hmante Mizo ṭawnga an awmzia hetah hian a lang. Mizo ṭawngah thumal nghet a awm chuan Mizo thumal hman a ni (ruahtui, tuilian, leimin, lui, dil, tuikhur); Mizo thumal nghet a awm loh chuan English technical thumal chu Latin hawrawpin a awm angin hman a ni a, Bung tin-ah a hman hmasak berna-ah Mizo hrilhfiahna tawi tak bracket chhungah a dah ṭhin (entirnan "detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan)"). Thumal tawi (AEP, CN, IDF, HSG, CWC, IMD, CGWB, UD&PA, PWD, PHED, IWRD, MSDMA, MPCB, NGT, CAG leh a dangte) English angin hman a ni. Mizoram sawrkar Mizo ṭawng thuziakah ang bawkin (Hon'ble Governor's Address, 2025), Department, Council, Authority leh Act hmingte chu English angin ziah a ni. † chhinchhiahna nei thumalte hi Mizoram chauh tan a ni. Hming tarlanna table-ah "Finfiah" tih chu Mizo thuziak tarlan hnar-ah hmuh a nihna; "La finfiah lo" tih chu he Kaihhruaina Bu lehlinna chauh a nihna a ni. He Kaihhruaina Bu hi Draft a ni a, sawrkar emaw pawl emaw reng rengin pawm a ni lo; pawl hming hetah a lan avangin chu pawl chuan he thumal emaw Kaihhruaina Bu emaw a pawm tihna a ni lo. Mizo thumal zawng zawng hi chhut hmain Mizo editor-in a endik tur a ni.

Thumal pawimawh leh Kaihhruaina Bu thumalte

English	Mizo	Hriatchian tur
Stormwater	ruahtui	Ruah sur tui, leilung chunga luang (stormwater). Ek tui (sewage) a ni lo. "Thlipui tui" tih loh.
Stormwater drainage	ruahtui luanna	Ruahtui luan chhuahna kalphung (drainage). Lorrain 1940: *tui luanna*, "a gutter, a ditch, a drain" (p. 525).
Stormwater drain	ruahtui luanna drain	Bung tin-ah a hmasa berah: "drain (tui luanna)".
Drain	drain (tui luanna)	English "drain" hi chhunzawm a ni (English edition ang bawkin). A hmasa berah "drain (tui luanna; Pachuau: tui luankawr)". Sewer nen a dang.
Roadside drain / side drain	kawng sir drain	Lorrain 1940: *kawng*, road (p. 237); *sîr*, side (p. 419).
Cross drain	kawng kal tlang drain (cross drain)	
Lined drain / unlined drain	drain lined (cement emaw lungin chhuah) / drain lined lo	"Lined side drain" — Governor's Address 2025 hmanna ang.
Kutcha / pucca drain	kutcha drain / pucca drain	English angin; "kutcha" = leia laih mai, "pucca" = lung emaw cement-a siam.
Drainage (the system, the work)	tui luanna / tui luanna system	
Drainage area / catchment	ruahtui luan khawmna hmun (catchment)	Bung tin-ah a hmasa berah "catchment (ruahtui luan khawmna hmun)".
Dry-weather flow (DWF)	ruah sur lohna hun tui luang (DWF)	Ek tui leh in chhunga tui bal (sullage) a ni ber.
Design manual / Manual (this Manual)	Kaihhruaina Bu / he Kaihhruaina Bu	Bu dang (CPHEEO *Manual on Storm Water Drainage Systems*) chu English hmingin.
Guidelines (NDMA, CPHEEO, URDPFI)	inkaihhruaina (guidelines)	He Kaihhruaina Bu tan hman loh.
Design / designed / designer	design / design-a siam / design siamtu (designer)	"Design" hi Mizo ṭawngah hman nghet a ni ("Blast Design", Governor's Address 2025).

English	Mizo	Hriatchian tur
Clause / Clauses	Clause	He Kaihhruaina Bu Clause chauh. Act section chu "section" (s.), rule chu "rule" (r.), Regulation chu "reg.", Constitution Article chu "Article", Schedule chu "Schedule".
Commentary	Hrilhfiahna	Paragraph bul-ah `**Hrilhfiahna.**` (ASCII full stop).
Note	Hriat tur	`**Hriat tur.**`, "Hriat tur:"; Hrilhfiahna hman loh.
Chapter	Bung	`## Bung N — …`
Annex / Annexes to Chapter N	Belhchian / Bung N belhchian	`## Bung N belhchian — …`; heading-ah `### Belhchian 4C — …`. He Kaihhruaina Bu belhchian chauh.
Annexure (of a notification, order or report) / Appendix (of a cited report)	Annexure / Appendix	English angin; Belhchian hman loh.
Supplement	Belhchhah	Mizoram tan Belhchhah a awm lo.
Form	Form	`### Form 4–1 — …`
Figure / Table	Milem / Table	`*Milem 4.1 — …*`, `![Milem 4.1 — …](figures/…)`, `**Table 4.2 — …**`
Title (column of the lists of tables and figures)	Thupui	
References	Thu hnar	`### Thu hnar`, `### Thu hnar (bung)`
Sources (`*Sources: …*`)	Thu lakna	`*Thu lakna: …*` (thu hnar hming English angin)
Draft v1.0 / draft	Draft v1.0 / draft	
About this draft	He draft chungchang	
To be prepared	Buatsaih tur	`> **Buatsaih tur.**`, `*Buatsaih tur*`
Illustrative — not design values	Entirna chauh — design value a ni lo	
[TBC]	[TBC]	Thlak loh.
Preserve · Retain · Detain · Convey · Maintain	Humhalh · Khawl · Dah rih · Luan tir · Enkawl	Cover leh Bung 1.
Retention	retention (ruahtui khawl reng, hman nan emaw lei-a luh tir nan emaw)	Mizoram-ah ruahtui khawl khawm (rainwater storage tank) a ni ber. "Ruahtui khawl khawm" — AIR Aizawl, March 2026.
Detention	detention (ruahtui dah rihna, a luan chhuah zat tihhniam nan)	
Detention pond	detention pond (ruahtui dah rihna dil siam)	Dil emaw tuikhur emaw tih ngai lo.
Required retention volume (RRV)	khawl tur tui zat (RRV)	
Storage / volume	khawlna / tui zat (volume)	Lorrain 1940: *khâwl*, "to store up" (p. 256).
Rainwater harvesting (RWH) / rainwater storage tank	ruahtui khawl khawm (RWH) / ruahtui khawlna tank	AMCBR reg. 33 "rain water harvesting facility".
Runoff	ruahtui luang (runoff)	Lorrain 1940: *tui-hâwk*, "rainwater either running or standing" (p. 524).

English	Mizo	Hriatchian tur
Flow / peak flow / peak discharge	tui luang / tui luang zat sang ber (peak flow)	
Discharge (rate of flow) / to discharge into	tui luang zat (m³/s) / … ah luang lut tir	
Release rate	luan chhuah tir zat (release rate)	
Permissible site discharge (PSD)	site aṭanga luan chhuah phal zat (PSD)	
Site / plot	site / ram (plot)	
Pre-development / post-development	hmasawnna hma lam (pre-development) / hmasawnna hnu lam (post-development)	
Development / redevelopment	hmasawnna hna (development) / siam ṭhatna (redevelopment)	
Impervious area / pervious surface	tui luh theih lohna hmun (impervious) / tui luh theihna hmun (pervious)	
Land disturbance	lei tihbuai (land disturbance)	
Fill / cut	lei vur (fill) / lei laih (cut)	
Rainfall / rain	ruahtui tlak / ruah	"Ruahtui tlak dan mumal lo" — Governor's Address 2025.
Rainfall depth / intensity	ruahtui tlak zat (mm) / ruahtui tlak chakna (mm/h, intensity)	
Intensity–duration–frequency (IDF)	IDF (ruahtui tlak chakna, a rei zawng leh a lo thlen ṭhin dan inzawmna)	
Annual exceedance probability (AEP)	AEP (kum khatah a lo thlen theih dan)	"1% AEP (kum 100)".
Return period	return period (kum engzat zelah nge a lo thlen ṭhin)	"kum 100 return period".
Rain gauge / self-recording rain gauge (SRRG) / automatic rain gauge (ARG) / automatic weather station (AWS)	ruah tehna (rain gauge) / SRRG / ARG / AWS	
Storm / storm event	ruahpui (storm)	Lorrain 1940: *ruah pui*, "heavy rain" (p. 392). Thlipui (cyclone) a ni lo; cyclone chu "cyclone" (Cyclone Remal).
Design rainfall / design storm	design ruahtui tlak / design ruahpui	
Hyetograph / hydrograph	hyetograph (hun hrang hranga ruahtui tlak zat) / hydrograph (hun hrang hranga tui luang zat)	
Critical duration / temporal pattern	duration pawimawh ber (critical duration) / ruahtui tlak dan (temporal pattern)	
Areal reduction factor (ARF) / climate factor (CF)	ARF / climate factor (CF)	
Sub-daily ratios	ni khat aia tawi ratio (sub-daily ratio)	

English	Mizo	Hriatchian tur
Subzone (CWC) / Flood Estimation Report (FER) / plate	subzone / FER / plate	English angin (CWC hmanna).
Rainfall zones (MZ-Z1 to MZ-Z4) / hydrologic sub-areas (MZ-A … MZ-D1) †	ruahtui zone (MZ-Z1–MZ-Z4) / hydrologic sub-area (MZ-A … MZ-D1)	Code thlak loh.
Reanalysis / gridded data	reanalysis / grid data (NIH-DHAARA)	
Monsoon / monsoon season (this Manual: 1 April to 31 October) †	fûr / fûr hun (he Kaihhruaina Bu-ah: April ni 1 aṭanga October ni 31)	Lorrain 1940: *fûr*, "the rainy season, the rains, the south-west monsoon" (p. 139); "Fur ruahtui" — AIR Aizawl, June 2025. IMD south-west monsoon chu "south-west monsoon" English angin.
Pre-monsoon / post-monsoon	fûr hma (pre-monsoon) / fûr hnu (post-monsoon)	
Onset / withdrawal (of the monsoon)	lo thlen (onset) / kir leh (withdrawal)	
Cloudburst / flash flood	cloudburst (ruahpui thut tlak nasa) / tuilian thut (flash flood)	
Heavy rainfall warning / red alert	ruahpui hriattirna (warning) / red alert	
Antecedent moisture condition (AMC)	AMC (ruahpui hma lei hnawnna dinhmun)	AMC hi he Kaihhruaina Bu-ah hei hi chauh a ni; Aizawl Municipal Corporation chu kimchangin ziah tur.
Curve number (CN) / hydrologic soil group (HSG)	CN / HSG	
Time of concentration (Tc)	Tc (catchment hla ber aṭanga tui lo thlen hun)	
Runoff coefficient (C) / Rational Method	runoff coefficient (C) / Rational Method	
Unit hydrograph / synthetic unit hydrograph (SUH)	unit hydrograph / SUH	
Routing / level-pool routing	routing / level-pool routing	
Continuous simulation	continuous simulation (kum tam tak ruahtui hmanga model)	
Calibration / validation	calibration / validation	
Model (hydrologic, hydraulic)	model	
Hydrology / hydrologic / hydraulic	hydrology / hydrologic / hydraulic	
Catchment / sub-catchment / basin	catchment / sub-catchment / basin	Bung tin-ah a hmasa berah hrilhfiah tur.
Flood-sensitive catchment	tuilian hlauhawm catchment (flood-sensitive)	
Upstream / downstream	luanna chunglam (upstream) / luanna hnuailam (downstream)	
Downstream analysis / point of comparison	luanna hnuailam zirchianna / khaikhinna hmun (point of comparison)	

English	Mizo	Hriatchian tur
Tailwater / headwater	tailwater (outfall hnuailama tui sang zawng) / headwater	
Tide / tidal (coastal terms; not applicable in Mizoram)	tide / tidal (tuifinriat thlen theih loh, Mizoram-ah a awm lo)	
River stage	lui tui sang zawng (stage)	
River-locked / drain-locked outfall; lock; lock window	lui khar (river lock) / drain khar (drain lock) / khar hun (lock window)	Khar = lock; rack leh culvert blockage chu "tihtawp" (blockage), khar hman loh.
Outfall-closed check	outfall khar endikna	
Outfall	outfall (drain tui luan chhuahna)	
Gated / pumped / gravity outfall	gate nei outfall / pump hmang outfall / amah ngei a luang chhuak outfall (gravity)	
Outlet / inlet	outlet (luan chhuahna) / inlet (luan lutna)	
Flap gate / non-return valve	flap gate / non-return valve	
Minor system / major system	tui luanna system tenau (minor) / tui luanna system lian (major)	"Minor irrigation" = "tui lak siam hna tenau" — Governor's Address 2025.
Spread (street) / gutter / kerb	kawng chunga tui zau zawng (spread) / gutter / kerb	
Kerb inlet / grate inlet	kerb inlet / grate inlet	
Blockage / clogging factor	tihtawp (blockage) / clogging factor	
Hydraulic grade line (HGL)	HGL	
Manhole / access chamber	manhole / access chamber	
Culvert / pipe / box drain	culvert / pipe / box drain	"culvert" — Governor's Address 2025.
Open drain / covered drain	drain khuh lo / drain khuh	
Freeboard	freeboard (tui sang ber chunga zau dah)	
Silt / sediment / silt trap	leidip (silt) / bal (sediment) / leidip dawnna (silt trap)	
Debris / slide debris / garbage	bal (debris) / leimin bal (slide debris) / bawlhhlawh (garbage)	
Sediment bulking	leidip avanga tui pun (bulking)	
Trash rack / screen / debris rack	trash rack / screen / debris rack (bal dangna)	
Orifice / weir / riser / spillway	orifice / weir / riser / spillway	
Multi-stage outlet	multi-stage outlet	
Crest / invert / soffit	crest / invert (tui luanna hniam ber) / soffit	
Head / head loss	head / head loss	

English	Mizo	Hriatchian tur
Inlet control / outlet control	inlet control / outlet control	
Energy dissipator / stilling basin / riprap / apron / drop structure	energy dissipator (tui chakna tihnemna) / stilling basin / riprap / apron / drop structure	
Headwall / wingwall / chute	headwall / wingwall / chute	
Uniform / critical / supercritical flow; Froude number	uniform / critical / supercritical flow; Froude number	
Backwater / surcharge / flotation	backwater / surcharge / flotation	Surcharge = surcharge (series ang).
Embankment / bund / breach	embankment (dai) / bund / breach (a chhiat)	
Dam / check dam	dam (tui khuahna) / check dam	Lorrain 1940: *tui khuahna*, "a dam, a bund, anything which dams up water" (p. 524). Annex 7E Table 7E.4 chu English angin.
Reservoir / full reservoir level (FRL) / minimum draw-down level (MDDL) / maximum water level (MWL)	reservoir (tui khuah) / FRL / MDDL / MWL	Tuirial leh Serlui B reservoir.
Full tank level (FTL)	FTL	
Drawdown / drawdown time	drawdown / tui hniam hun (drawdown time)	
Pump / sump / wet well / standby pump	pump / sump / wet well / standby pump	
Tank (in the shared chapters)	dil (tank)	Bung dangte-a "tank" chu dil (Clause 7.2).
Lake / pond	dil / dil tê	Lorrain 1940: *dîl*, "a lake, a pond, a tank, a pool" (p. 114). Running text-ah circumflex dah loh: "dil".
Waterbody	tui awmna (waterbody)	
Top of bank / bank	kam chhip (top of bank) / kam	Lorrain 1940: *kam*, "the bank (of a river, lake …)" (p. 226).
Crest of the bank slope †	kam pang chhip (crest of the bank slope)	Lui laih thuk-ah Zone 1 tehna.
Floodway / flood fringe / floodplain	floodway / flood fringe / floodplain (tuilian luanna phai)	
Compensatory storage / flood cushion	compensatory storage / flood cushion	
1% AEP flood extent / flood level / flood line	1% AEP tuilian zau zawng / tuilian sang zawng / tuilian ri (flood line)	
Setback / buffer	setback (tui kam aṭanga hmun kalhlen tur) / buffer	
Zone 1 / Zone 2	Zone 1 / Zone 2	Thlak loh.
Hydraulic corridor / corridor	corridor	Corridor = corridor (series ang).
Drainage reserve / easement / right of way (ROW)	drainage reserve / easement / ROW	
Reach (of a river, drain or channel)	lui chhung (reach)	"Encroached reaches" = "luah hneh lui chhungte". Clause tih hman loh.

English	Mizo	Hriatchian tur
Section (of a channel or conduit)	cross-section (ṭhenkhawm)	Act section nen a dang.
Water quality volume (WQv) / first flush	WQv / first flush (ruah tlak hmasa ber tui bal)	
Treatment train / best management practice (BMP)	treatment train / BMP	
Bioretention / rain garden / swale / filter strip	bioretention / rain garden / swale / filter strip	
Swale (terrace swale) †	swale (terrace swale)	SD&SM reg. 27.
Terrace †	terrace (tlang panga hmun zawl siam)	SD&SM reg. 27.
Interceptor drain †	interceptor drain (cut chung lama ruahtui dangtu drain)	
Down-drain †	down-drain (tlang pang zawh chhuk drain)	
Permeable pavement / infiltration trench / soakaway / soak pit	permeable pavement / infiltration trench / soakaway / soak pit	
Constructed wetland / gross pollutant trap (GPT)	constructed wetland / GPT	
Infiltration / recharge	infiltration (lei-a tui luh) / recharge (leihnuai tui tihpun)	
Groundwater / water table	leihnuai tui (groundwater) / leihnuai tui sang zawng (water table)	
Spring	tuikhur / tuihna	Annex 7E.
Aquifer / observation well	aquifer / observation well	
Sewage / sewer / sewerage / sullage / septic tank	ek tui (sewage) / sewer / sewerage / in chhunga tui bal (sullage) / septic tank	Ruahtui hi ek tui a ni lo.
Sewage treatment plant (STP)	STP	Chite STP.
Interceptor (dry-weather flow)	DWF interceptor	
Illicit discharge	dan lova tui bal luan lut tir (illicit discharge)	
Erosion and sediment control (ESC) / silt fence / construction exit	ESC / silt fence / construction exit	
Fee-in-lieu / regional facility	fee-in-lieu / regional facility	
Basin Stormwater Master Plan (BSMP)	Basin Ruahtui Luanna Master Plan (BSMP)	
Digital elevation model (DEM) / LiDAR / GIS layer	DEM / LiDAR / GIS layer	
Approving Authority (the Authority) / competent authority / Lead Authority	Approving Authority (phalna petu Authority) / competent authority / Lead Authority	English angin, a hmasa berah hrilhfiahna nen.

English	Mizo	Hriatchian tur
Applicant / owner / developer / architect	dilna thehluhtu (applicant) / neitu (owner) / developer / architect	"dil" (dîl, to apply) hi lake "dil" nen a inang; context-in a hrilhfiah.
Urban local body (ULB) / local body	ULB / local body	
State Stormwater Technical Committee	State Stormwater Technical Committee	English angin.
Master plan / zoning / land use	master plan / zoning / ram hman dan (land use)	
Open space	open space	
Variance / waiver	variance / waiver	
Operation and maintenance (O&M) / O&M plan	kalpui leh enkawl (O&M) / O&M plan	"Enkawl" — AIR Aizawl, March 2026.
As-built / completion certificate / occupancy certificate	as-built / completion certificate / occupancy certificate	
Tier A / Tier B	Tier A / Tier B	
Submittal / hold point / drainage report	thehluh tur (submittal) / hold point / drainage report	
Compliance / enforcement / stop-work order	dan zawm (compliance) / dan zawm tirna (enforcement) / stop-work order	
Shall / shall not	… tur a ni / … loh tur a ni	Thupek (mandatory). Hrilhfiahna leh Clause-ah inang.
Should	… a ṭha	Thurawn (recommendation). "Tur a ni" hman loh.
May	… thei / … phal a ni	
Must	… ngei ngei tur a ni	
Adopt / adoption (formal, by a government or authority)	pawm / pawmna	"Pawm a ni lo" = has not been adopted. Technical adopt (value, method) chu "hmang" (use) emaw "la" (take).
Has not been adopted, notified or endorsed by X	X-in pawm a ni lo, notify a ni lo, thlawp a ni hek lo	
No legal force / in force / not in force	dan anga thuneihna a nei lo / hman mek (in force) / hman a ni lo (not in force)	
Notify / notification	notify / notification (hriattirna)	Gazette-a tarlan.
Endorse / endorsement	thlawp / thlawpna	Lorrain 1940: *thlawp*, "to support … to second or support (a proposal)" (p. 480).
Approve / approval	phalna pe / phalna	Building permit chu "building permit" English angin.
Sanction	sanction	Sum sanction.
Accept / acceptance	lo pawm / lo pawmna	Pawm (adopt) nen hrang taka hman tur: "lo pawm" chu thehluh lo pawm chauh.
Consent / concurrence	remtihna / inremna	
No-objection certificate (NOC)	NOC	
Act / Rules / Regulation / Bill / Ordinance	Act / Rules / Regulation / Bill / Ordinance	Hming English angin, italics chhungah thu hnar-ah.

English	Mizo	Hriatchian tur
Bye-laws	bye-laws	Model building bye-laws.
Amendment / as amended	amendment / siam ṭhat angin (as amended)	
Gazette / Extraordinary	Gazette / Extraordinary	
Order / direction / circular	order / thupek (direction) / circular	
Court / tribunal	court / tribunal	Gauhati High Court (Aizawl Bench), NGT, Supreme Court.
As reported	(chanchin tlangzarh angin)	Series thumal (as reported).
As cited / not read / title only	(thu hnar ang) / (chhiar a ni lo) / (hming chauh)	
Was not found	hmuh a ni lo	
Sources differ	thu hnarte a inang lo	
Landslide / landslip	leimin	Lorrain 1940: *lei min*, "a landslip, a landslide" (p. 292); AIR leh chanchinbu-ah "leimin" (closed).
Landslide hazard zone (Low, Moderate, High, Very High) †	leimin hlauhawm zone (Low, Moderate, High, Very High)	Zone hming English angin, map ang.
Landslide Hazard Maps †	Landslide Hazard Maps (leimin hlauhawmna map)	Corporation map.
Flood	tuilian	Lorrain 1940: *tui lian*, "to be in flood as a river" (p. 525); AIR, Governor's Address ("Tui lian tuarte"). Closed "tuilian" ziah tur.
Slope / cut slope / retaining wall / weep hole	tlang pang (slope) / lei laih pang (cut slope) / retaining wall / weep hole	"retaining wall" — Governor's Address 2025.
Ridge / ridge town †	tlang chhip / tlang chhip khawpui	Lorrain 1940: *tlâng-dung*, "a range of hills" (p. 511).
Valley floor / river terrace †	phai (valley floor) / lui kam zawl (river terrace)	
Colluvium / shale / siltstone / sandstone / Surma group	colluvium / shale / siltstone / sandstone / Surma group	
Geotechnical certificate	geotechnical certificate	
Quarry	lung laihna (quarry)	
Riverine reserve †	riverine reserve	EF&CC; hming English angin.
River Conservation Zone †	River Conservation Zone	Notify a ni lo.
Sixth Schedule †	Sixth Schedule	"Non-Sixth Schedule Area" — Governor's Address 2025.
Union Territory	Union Territory	
Basement	basement	Series ang.
Cess-pool	cess-pool	
Highest flood level (HFL)	HFL (gauge-a tuilian sang ber)	Design level a ni lo.
Months	January, February, March, April, May, June, July, August, September, October, November, December	Mizo thuziakah English thla hming hman a ni. Ni: "May ni 28, 2024" (Governor's Address 2025: "September ni 19, 2024").

English	Mizo	Hriatchian tur
Step (Step 1) / method	Step (Step 1) / kalphung	Kalphung hi method tan chauh (Bung 3 thupui).
Lakh / crore	nuai / vbc	"cheng nuai khat" (Governor's Address 2025); "cheng vbc 10" (AIR, March 2026).
To be confirmed in design	design-ah finfiah tur	Belhchian leh milem zawng zawngah ("design-ah nemnghet tur" hman loh).
Schematic; (schematic, not to scale)	schematic; (schematic, scale ang a ni lo)	Caption leh milem-ah inang ("entirna milem" hman loh). "Schematic section" = schematic cross-section.
Dotted / dashed / solid (line, in a figure key)	dotted / dashed / solid	English angin (technical thumal).
Rockslide	lungpui tlak (rockslide)	Laipuitlang lungpui tlak, 2013. "Lung min" hman loh.
Seepage / seepage ground	tui chiar (seepage) / tui chiar hmun	"Seepage collar" chu English angin.
Two-thirds / a third / a quarter	ṭhena thum ṭhena hnih / ṭhena thum ṭhena khat / ṭhena li ṭhena khat	
Flood marks	tuilian chhinchhiahna (flood marks)	"Tuilian hnuhma" hman loh.
Champhai flats †	Champhai phai	Sub-area MZ-C1 hming.
Works in default	works in default (neitu-in a tih loh hna thawh theihna)	
Marsh	hmun hnawng (marsh)	
NEER reading / NEER arithmetic / this Manual's reading	(NEER chhiar dan) / (NEER chhutna) / (he Kaihhruaina Bu chhiar dan)	
None has done so (adoption)	Pakhatin mah a pawm lo.	"La" hman loh.
Yes / No / Not applicable / N/A (forms)	Aw / Aih / a huam lo / NA	"Ni / ni lo" leh "a kaihhnawih lo" hman loh. "Met (yes / no)" = "A tling em (aw / aih)".
Form columns: Entry / Item / Total / Date / Signature / Role / Requirement / Result / Content / Source	Ziah luh tur / Thil / A vaiin / Ni / Hmingziak / Mawhphurhna / Mamawh / A chhuah / A chhunga thu / Hnar	GIS field chi "Date" chu English angin.
(layout) in table titles	(layout)	English angin ("ruangam" hman loh).
Benchmark test problem	benchmark test problem (software enchhinna atana chhut tur)	"Problem 3C-1" English angin.
Receiving drain / receiving water	drain dawngtu / tui dawngtu	
Seasonal high (ground)water table	hun bik-a leihnuai tui sang ber	
Habitable floor	mi chenna chhuat	
Depth	thuk zawng	"Thukzawng" hman loh.
Crown (of a road)	crown (kawng laili sang ber)	
Removable cover / ponding / overflow path	cover sawn theih / tui tlin / tui liam kawng	
Sealed joint	tui put chhuak thei lo joint (sealed joint)	
Desilting	leidip laih chhuah (desilting)	

English	Mizo	Hriatchian tur
Point of interest	ngaihtuah hmun (point of interest)	
Certifying professional	certify-tu professional	
Reporting year	report kum	
Road closed / school shut / lockable gate	kal theih loh / school chawlh tir a ni / lock theih kawngka	"Khar" hi outfall khar (lock) tan chauh.

Bung thupuite

No.	English	Mizo
1	Policy, Applicability and Adoption	Policy, A Huam Chin leh Pawmna
2	Design Rainfall and Design Storms	Design Ruahtui Tlak leh Design Ruahpui
3	Hydrologic Methods	Hydrology Kalphungte
4	Site Runoff Control: Retention and Detention	Site Ruahtui Luang Thunun: Retention leh Detention
5	Downstream and Tailwater Analysis	Luanna Hnuailam leh Tailwater Zirchianna
6	Minor and Major Drainage Systems	Tui Luanna System Tenau leh Lian
7	Waterbodies, Dils (Lakes and Ponds) and Setbacks	Tui Awmnate, Dil (Dil Lian leh Dil Tê) leh Setback
8	Water Quality and Recharge	Tui Ṭhatna leh Recharge
9	Hydraulic Design of Structures	Structure-te Hydraulic Design
10	Submittals, Review, Operation & Maintenance and Enforcement	Thehluh tur, Endikna, Kalpui leh Enkawl, leh Dan Zawm Tirna
11	Basin and City Stormwater Master Plans	Basin leh Khawpui Ruahtui Luanna Master Plan

Form thupuite

Form	English	Mizo
1-1	Applicability Determination	A Huam leh Huam Loh Thutlukna
1-2	Variance / Waiver Request	Variance / Waiver Dilna
2-1	Design Rainfall Sheet	Design Ruahtui Tlak Sheet
3-1	Hydrologic Calculation Summary	Hydrology Chhutna Tlangpui
3-2	Pre- vs Post-Development Comparison	Hmasawnna Hma leh Hnu Khaikhinna
4-1	Site Runoff Control Report	Site Ruahtui Luang Thunun Report
4-2	Tier B Site Sheet	Tier B Site Sheet
4-3	Fixed-coefficient Route Sheet	Fixed-coefficient Route Sheet
5-1	Downstream and Tailwater Report	Luanna Hnuailam leh Tailwater Report
5-2	Simplified Downstream Statement (small sites)	Luanna Hnuailam Thusawi Tawi (site tê tan)
6-1	Conveyance Design Report checklist	Tui Luan Tirna Design Report checklist

Form	English	Mizo
7-1	Waterbody Sheet	Tui Awmna Sheet
7-2	Tank Storage Credit Sheet	Dil Khawlna Credit Sheet
7-3	Compensatory Storage Calculation (by elevation band)	Compensatory Storage Chhutna (sanzawng band zelin)
8-1	Water Quality Sheet	Tui Ṭhatna Sheet
8-2	Infiltration Test Record	Infiltration Test Record
9-1	Hydraulic Structures Report checklist	Hydraulic Structure Report checklist
10-1	Drainage Report Checklist	Drainage Report Checklist
10-2	Compliance Calculator Summary	Compliance Calculator Tlangpui
10-3	Professional Design Certificate	Professional Design Certificate
10-4	Hold-Point Inspection Record	Hold-Point Endikna Record
10-5	As-built Certificate	As-built Certificate
10-6	Maintenance Declaration	Enkawlna Puanchhuahna (Maintenance Declaration)
10-7	Annual Maintenance Declaration and Inspection Report	Kumtin Enkawlna Puanchhuahna leh Endikna Report
10-8	Asset Handover Certificate	Asset Hlanna Certificate
11-1	Annual implementation report	Kumtin hmalakna report

Mizo thumal Kaihhruaina Bu-a hmante (Belhchian 7E) †

English edition-a an hrilhfiah ang leh an ziah dan angin. Running text-ah thumal chu ziah a ni a, Bung tin-ah a hmasa berah a awmzia bracket chhungah (English edition hrilhfiahna ang).

Thumal	Awmzia	Hriatchian tur
dil	dil lian emaw dil tê, a pianphung emaw laih (lake, pond, tank)	Plural: "dilte" emaw thumal dang ("dil tam tak"); English "dils" hman loh (Annex 7E Table 7E.4 chu English angin lehlin). Small = "tê" (circumflex nen), plural = "-te" (circumflex nei lo); Lorrain 1940: *-te*, "denoting plurality" (p. 439). Hming: Palak Dil, Tam Dil. Verb "dil" (to apply) nen a inang.
dil tê	dil tê, tank tê	
tuikhur	tuikhur, tui chhuahna (spring, water point)	Lorrain 1940: *tui-khur*, "a waterhole, a well, a water supply; a spring …" (p. 524). Dah rihna (storage) atan hman ngai lo.
hna; tuihna	lui hnar, tuihna (source of a stream; spring)	Lorrain 1940: *tui-hna*, "the source of a spring or stream" (p. 524); AIR 2026 "tuihnate humhalh".
lui	lui (stream, river)	Chite lui, Ser lui. English edition-in "lui" chu hill stream, "river" chu lui lian. Mizo-ah: lui (lui tê leh lui lian) leh luipui (river); hming: Tlawng lui.
lui-pui	luipui (river)	Modern spelling closed.
tui luankawr	tui luankawr (drain, ditch)	Pachuau 1997. Lorrain 1940-ah *tui luanna* (p. 525).
tui-hawr	tuihawr (gutter, ditch)	Lorrain 1940: *tui-hâwr*, "a groove" (p. 524) chauh; English edition-a L&S 1898 hrilhfiahna chu thlak loh.
kawm	kawm (eaves drip trench)	

Thumal	Awmzia	Hriatchian tur
tui lian	tuilian (flood)	Modern closed "tuilian".
tui lét	tui lét (flood, hman hlui)	Annex 7E chauh.
lei min	leimin (landslide)	Modern closed "leimin".
kor	kor (ravine)	Lorrain 1940-ah *kawr*, "a small valley, a ravine" (p. 240) a awm; English edition-in "kawr" a hmang lo, Mizo edition pawhin a hmang lo (thlak loh).
tui-khuah	tui khuah (dam)	Lorrain 1940: *tui khuah*, "the damming up of water … a tank or reservoir surrounded by a bund"; *tui khuahna*, "a dam, a bund" (p. 524). Annex 7E Table 7E.4 status chu English angin lehlin.
minpui, tuikawng, kawr (gully)	—	English edition-in a hmang lo; Mizo edition pawhin hman loh.

Sawrkar, pawl leh hnathawktute

Mizoram sawrkar Mizo ṭawng thuziakah Department, Council, Authority leh Commission hmingte chu English angin ziah a ni (Hon'ble Governor's Address, Budget Session of Mizoram Legislative Assembly, 2025, mizoramassembly.in; Akashvani Aizawl Mizo news bulletins, 2025–2026, newsonair.gov.in). He Kaihhruaina Bu pawhin chutiang chuan a ziah. Mizo case marker chu hyphen nen a belh: "UD&PA-in", "District Council-ah", "Corporation-a".

English	Mizo text-ah	Status (hnar)
Government of Mizoram	Mizoram sawrkar	Finfiah: Governor's Address 2025 ("Mizoram sawrkar"). "sorkar" ziah dan pawh AIR-ah a awm; he Kaihhruaina Bu-ah "sawrkar".
Government of India / the Union	sawrkar laipui	Finfiah: Governor's Address 2025 ("Sawrkar laipui"); AIR ("sawrkar laipui").
State Government / the State	State sawrkar / State (Mizoram)	Finfiah: Governor's Address 2025 ("kan State-a").
Governor	Governor	Finfiah: Governor's Address 2025.
Council of Ministers / Chief Minister	Council of Ministers / Chief Minister	Finfiah: Assembly proceedings, February 2025 ("Council of"); AIR ("Chief Minister Pu Lalduhoma").
Mizoram Legislative Assembly	Mizoram Legislative Assembly	Finfiah: Governor's Address 2025.
Department / departments	Department / Department hrang hrang	Finfiah: Governor's Address 2025.
Urban Development and Poverty Alleviation Department (UD&PA)	Urban Development & Poverty Alleviation Department (UD&PA)	Finfiah: Governor's Address 2025 (heading).
Aizawl Municipal Corporation / the Corporation	Aizawl Municipal Corporation / Corporation	Finfiah: Governor's Address 2025; AIR. Mizo chanchin-ah "AMC" a ni ṭhin a, he Kaihhruaina Bu-ah kimchangin ziah tur.
Board of Councillors / Ward Committee / Local Council	Board of Councillors / Ward Committee / Local Council	Local Council: finfiah (Governor's Address 2025). Board of Councillors leh Ward Committee: la finfiah lo.
Lunglei Municipal Council (LMC)	Lunglei Municipal Council (LMC)	"Lunglei Municipal Area": finfiah (Governor's Address 2025).
Aizawl Development Authority (ADA, erstwhile)	Aizawl Development Authority (ADA, hman hlui)	La finfiah lo.

English	Mizo text-ah	Status (hnar)
Landslide Policy Committee for Aizawl City	Landslide Policy Committee for Aizawl City	La finfiah lo.
Aizawl Smart City Ltd	Aizawl Smart City Ltd	La finfiah lo.
Lai / Mara / Chakma Autonomous District Council (LADC, MADC, CADC)	Lai / Mara / Chakma Autonomous District Council (LADC, MADC, CADC)	Finfiah: Governor's Address 2025 ("Lai Autonomous District Council", "Chakma Autonomous District Council", "LADC leh MADC").
District Council / the three District Councils	District Council / District Council pathumte	Finfiah: Governor's Address 2025 ("Mizorama District Council pathumte").
Village Council / Village Council President	Village Council / Village Council President	Village Council: finfiah (Governor's Address 2025). President: la finfiah lo.
Mizoram State Water Resources Council (MISWARC)	Mizoram State Water Resources Council (MISWARC)	La finfiah lo.
Water Resources Development and Management Authority (WARDMA)	Water Resources Development and Management Authority (WARDMA)	La finfiah lo.
District / Village / Local Water Resources Committee (DWRC, VWRC, LWRC)	District / Village / Local Water Resources Committee (DWRC, VWRC, LWRC)	La finfiah lo; "Lunglei District Water & Sanitation Mission" (AIR) chu pawl dang a ni.
River Rejuvenation Committee / Mizoram River Protection Authority	River Rejuvenation Committee / Mizoram River Protection Authority	La finfiah lo; Authority hi din a nih hmuh a ni lo.
Public Works Department (PWD)	Public Works Department (PWD) / Mizoram PWD	Finfiah: Governor's Address 2025 ("Public Works", "Mizoram PWD").
Public Health Engineering Department (PHED)	Public Health Engineering Department (PHED)	Finfiah: Governor's Address 2025 ("Public Health Engineering"); AIR ("PHE Dept").
Irrigation and Water Resources Department (IWRD)	Irrigation & Water Resources Department (IWRD)	Finfiah: Governor's Address 2025 ("Irrigation & Water Resources").
State Investment Programme Management and Implementation Unit (SIPMIU)	SIPMIU	La finfiah lo.
Disaster Management and Rehabilitation Department (DM&R)	Disaster Management & Rehabilitation Department (DM&R)	Finfiah: Governor's Address 2025 (heading).
Mizoram State Disaster Management Authority (MSDMA) / District Disaster Management Authority	MSDMA / District Disaster Management Authority	La finfiah lo (AIR-ah Assam "State Disaster Management Authority" chauh).
Mizoram Pollution Control Board (MPCB)	Mizoram Pollution Control Board (MPCB)	La finfiah lo.
Environment, Forest and Climate Change Department (EF&CC)	Environment, Forests & Climate Change Department (EF&CC)	Finfiah: Governor's Address 2025.
Land Revenue and Settlement Department	Land Revenue & Settlement Department	Finfiah: Governor's Address 2025.
Directorate of Geology and Mineral Resources (DG&MR)	Directorate of Geology and Mineral Resources (DG&MR)	La finfiah lo.
Mizoram Remote Sensing Application Centre (MIRSAC)	MIRSAC	Finfiah: Governor's Address 2025 ("MIRSAC nen").

English	Mizo text-ah	Status (hnar)
Directorate of Science and Technology (DST)	Directorate of Science and Technology (DST)	La finfiah lo.
Young Mizo Association (YMA)	Young Mizo Association (YMA)	La finfiah lo (pawl hming English a ni).
Deputy Commissioner / sub-division	Deputy Commissioner (DC) / sub-division	DC: finfiah (AIR, June 2025, "DC hian"); "Sub-Divisional Hospital": finfiah (Governor's Address 2025).
Mizoram State Election Commission	Mizoram State Election Commission	Finfiah: Governor's Address 2025.
Gauhati High Court (Aizawl Bench) / National Green Tribunal (NGT) / Supreme Court	Gauhati High Court (Aizawl Bench) / NGT / Supreme Court	English angin.
Mizoram University (MZU)	Mizoram University (MZU)	Finfiah: Governor's Address 2025.
Central Water Commission (CWC), IMD, CGWB, CPCB, CAG, NIH, NEEPCO, NHIDCL, NDMA, MoEF&CC, MoHUA	English angin	Sawrkar laipui pawlte.
IMD Meteorological Centre Aizawl	IMD Meteorological Centre Aizawl	

Act, Regulation leh thuziak dangte

Act leh Regulation hmingte chu English angin ziah a ni (Mizoram sawrkar Mizo thuziakah ang bawkin: "'The Mizoram State University Bill, 2025'", Governor's Address 2025), italics chhungah thu hnar-ah. Mizo version hming official a awm chuan bracket chhungah belh theih; hetah hian pakhat mah hmuh a ni lo.

English	Mizo text-ah	Status
Aizawl Municipal Corporation Building Regulations, 2012 (AMCBR)	AMCBR (Aizawl Municipal Corporation Building Regulations, 2012)	Mizo version hming hmuh a ni lo.
Aizawl Municipal Corporation (Site Development and Slope Modification) Regulations, 2017 (SD&SM)	SD&SM	Mizo version hming hmuh a ni lo.
Mizoram Municipalities Act, 2007	Mizoram Municipalities Act, 2007	Mizo version hming hmuh a ni lo.
Mizoram Municipalities (Ward Committee and Local Council) Rules, 2010	Mizoram Municipalities (Ward Committee and Local Council) Rules, 2010	English edition-in "printed in both languages" a ti; Mizo hming la finfiah lo.
Mizoram (Village Councils) Act, 2025	Mizoram (Village Councils) Act, 2025	Mizo version hming hmuh a ni lo.
Mizoram Water Resources (Management and Regulation) Act, 2024	Mizoram Water Resources (Management and Regulation) Act, 2024	Mizo version hming hmuh a ni lo.
Mizoram (Protection of Rivers) Ordinance, 2023 / Bill, 2023	Mizoram (Protection of Rivers) Ordinance, 2023 / Bill, 2023	Enact a nih finfiah a ni lo (English angin).
Mizoram Official Language Act, 1974	Mizoram Official Language Act, 1974	Mizo hi official language.
Mizo District (Forest) Act, 1955	Mizo District (Forest) Act, 1955	
Mizoram Urban and Regional Development Act, 1990	Mizoram Urban and Regional Development Act, 1990	Hming chauh.
Master Plan for Aizawl: Vision 2030	Master Plan for Aizawl: Vision 2030	Phalna notification hmuh a ni lo.
Roadmap to Stability (2014)	*Roadmap to Stability* (2014)	

English	Mizo text-ah	Status
Model Building Bye-Laws 2016 (MBBL 2016)	MBBL 2016 (sawrkar laipui model bye-laws; Mizoram dan a ni lo)	
Constitution of India, Sixth Schedule; 74th Amendment	Constitution of India, Sixth Schedule; 74th Amendment	
Mizoram Gazette (Extraordinary)	Mizoram Gazette (Extraordinary)	

Hmun, lui leh dilte

Mizoram hmun, lui leh dil hmingte hi Mizo hming an ni a, English edition ziah dan angin ziah a ni (Aizawl, Lunglei, Champhai, Serchhip, Kolasib, Mamit, Lawngtlai, Siaha, Khawzawl, Hnahthial, Saitual, Tlabung, Sairang, Bairabi, Vairengte, Chawngte, Kamalanagar, Thenzawl, Durtlang, Bawngkawn, Hlimen, South Hlimen, Melthum, Laipuitlang, Zemabawk, Lengpui, Tiperabagh, Serhuan). Hming dang (variants) English edition-in a tarlan ang chuan bracket chhungah vawng tur.

English	Mizo text-ah	Hriatchian tur
Tlawng (Dhaleswari of CWC)	Tlawng lui (Dhaleswari)	"Tlawng lui" — AIR, June 2025.
Tuirial (Sonai; CWC "Turial")	Tuirial lui (Sonai)	CWC site hming "Turial" English angin.
Khawthlangtuipui (Karnaphuli)	Khawthlangtuipui (Karnaphuli)	Governor's Address 2025-ah "Khawthlangpui" tih a awm (English phrase chhungah); he Kaihhruaina Bu-ah English edition ang.
Chhimtuipui (Kaladan; CWC "Kolodyne"; FER "Kalden")	Chhimtuipui (Kaladan)	
Tuipui (Champhai district)	Tuipui	Chhimtuipui nen a dang.
Tiau	Tiau lui	
Serlui / Serlui B reservoir	Serlui / Serlui B reservoir	
Chite lui / Ser lui / Tuikual / Lawibual	Chite lui / Ser lui / Tuikual lui / Lawibual lui	"Chite luia" — Governor's Address 2025.
Palak Dil (Pala Wetland) / Tam Dil	Palak Dil (Pala Wetland) / Tam Dil	Ramsar site no. 2484.
Siaha (Saiha) / Lawngtlai (IMD "Lwangtlai")	Siaha (Saiha) / Lawngtlai	"Siaha" — Governor's Address 2025.
NH-6 (old NH-54)	NH-6 (NH-54 hlui)	
Barak / Barak valley	Barak / Barak phai	
Bangladesh / Myanmar	Bangladesh / Myanmar	