8315

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(Railway Board)

13

No.2017/CE-IV/RUB/88 New Delhi, dated 9 .09.2022

The Principal Chief Engineer,/SCR
All Zonal Railways.

Chief Administrative Officer (Con.),
All Zonal Railways

PCE
CAdC
CBE

Sub: Prevention of water logging at subways/RUBs.

Ref: (i) This office letter No. 2017/CE-IV/RUB/88 dated 12.07.2022
(ii) RDSO's letter No. CBE/LUSW dated 05.08.2022
(iii) This office letter No. 2017/CE-IV/RUB/88 dated 16.08.2022
(iv) This office letter No. 2017/CE-IV/RUB/88 dated 22.04.2020
(v) RDSO's letter No. CBE/LUSW dated 01.09.2022

A visit/ inspection of few already completed/ commissioned RUBS/Subways/LHS which are frequently encountered with water -logging problems on geographically distributed areas over various Railways was done to assess the situation with reference to various instructions issued to address drainage issues and suggest remedial measures further to those already taken. It was observed that the existing guideline issued on the matter vide this office letter of even number dated 22.04.2020 are not being fully implemented by the Zonal railways.

2. Further, vide letter dated 16.08.2022 (Ref.iii), RDSO was suggested to supplement the existing guideline issued by vide letter dated 22.04.2020 (Ref. iv) by giving more details, as well as new solutions and guidelines for already constructed RUBs, and new RUBs to be constructed.

3. In view of the above, RDSO have prepared supplement guidelines for further necessary action please.

4. Zonal Railways are instructed to implement site specific measures as suggested in above reports/guidelines and tackle at least two severely affected RUBs in all Zonal Railway on trial basis to proliferate it for other locations on accessing the performance of solutions to the issue of waterlogging.

09.09.2022

DA: As above

(V. P. Singh)
Principal Executive Director/ Bridge

Copy to: CBE, all zonal railways for information and further necessary action please.

File No.RDSO-BnS0ESTR(CB-2)/6/2021-O/o ED/STRUCTURES/RDSO

आर. के. श्रीवास्तव
R. K. Srivastava

कार्यकारी निदेशक/पुल एवं संरचना
Executive Director/B&S

सत्यमेव जयते

भारत सरकार - रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ - 226011
Government of India - Ministry of Railways
Research Designs and Standards Organisation
Lucknow - 226011
Rly. : 032-42120, Phone / Fax : 0522-2450398
Email : edbsrdso@gmail.com

सं.: CBS/LUSW

दिनांक: 01.09.2022

Principal Executive Director/Bridge,
Railway Board,
New Delhi

विषय: Prevention of waterlogging at Subways/RUBs

संदर्भ :
1. PED/Bridge/Rly.Bd. letter No. 2017/CE-IV/RUB/88 dated 12.07.2022
2. This office letter of even no. dated 05.08.2022
3. PED/Bridge/Rly.Bd. letter No. 2017/CE-IV/RUB/88 dated 16.08.2022
4. EDCE/B&S/Rly.Bd. letter No. 2017/CE-IV/RUB/88 dated 22.04.2020

1. Railway Board vide Ref.1 above, directed to visit/ inspect the completed/ commissioned RUBs/Subways/LHS which are frequently encountered with water logging problems on geographically distributed areas over various Railways and assess the situation with reference to various instructions issued to address drainage issues and suggest remedial measures further to those already taken. Hence, two RDSO teams visited some RUB/LHS sites of NWR & NER. Accordingly, a report was prepared and submitted to Railway Board vide Ref.2.

2. Further, Board vide Ref.3 suggested RDSO to supplement the existing guideline issued by Railway Board vide Ref.4 by giving more details, drawing, sketches as well as new solutions and prevention guidelines under two categories:

a. For already constructed RUBs, and

b. New RUBs to be constructed

3. Therefore, a supplement to guidelines has been prepared & submitted for approval and further necessary action please.

संलग्नक: As above

Digitally Signed by Rajesh Kumar Srivastava
Date: 01-09-2022 18:18:07
Reason: Approved

(आर. के. श्रीवास्तव)
कार्यकारी निदेशक/पुल एवं संरचना

DD CE IV

Please put up draft for obtaining approval of PED/Bridge.

07/09/22

File No.RDSO-BnSOESTR(CB-2)/6/2021-0/0 ED/STRUCTURES/RDSO

A Supplement to Guidelines on Waterlogging and drainage problem in RUBS/Subways issued by Railway Board vide letter No. 2017/CE IV/RUB/88 dated 22.04.2020

Railway Board vide letter No. 2017/CE-IV/RUB/88 dated 16.08.2022 has observed that during recent inspections of various RUB/Subways by Railway Board officials & RDSO officials, it was noticed that solutions have not been fully implemented. Though instructions have been issued for various solutions possible, problems are still continuing. Board has further directed that RDSO should supplement the guidelines dated 22.04.2020 by giving more details, drawings, sketches as well as new solutions and preventions guidelines under two categories ie, for already constructed RUBS, and new RUBS to be constructed.

The guidelines issued by Railway Board vide letter No. 2017/CE-IV/RUB/88 dated 22.04.2020 are sufficient to provide solution for water logging in most of the cases. As per guidelines, if various measures such as sealing of joints, provision of cover shed and hump with reverse slope had been provided, then there would not have been much water accumulation in RUBS/Subways and this could have been taken care of by providing drainage plan arrangement as per Table-6 of guidelines and schematic key plan mentioned in these guidelines.

1. Causes of waterlogging and drainage problem in existing RUBS/Subways:

If drainage problem in RUBS/Subways is continuing after providing feasible remedial as per guidelines, then source of ingress of water in RUBs/Subways need to be identified carefully to find the appropriate solution to stop ingress of water in RUB effectively. Some of the possible causes of waterlogging and drainage problem in existing RUBS/Subways are:

1.1 Seepage of water from joints of segments of RCC Box & retaining wall due to joints not completely properly sealed by concrete grouting/Epoxy grouting.

1.2 Seepage of water from leftover shuttering holes and weep holes which were not sealed properly.

1.3 Seepage of water from RCC Retaining wall due to poor quality of concrete. (Honeycombed/porous concrete).

1.4 Ingress/reverse flow of water from recharge pit constructed for rainwater harvesting due to highest water level reaching above road level inside the box during monsoon.

1.5 Ingress of water from openings left in retaining wall.

1.6 Ingress of water due to water logging behind the Retaining wall as earth filling/leveling of surface was not done properly after construction of the wall.

1.7 Improper/low height hump and non-provision of reverse slope at the end of retaining wall.

1.8 Hump is broken and is like speed breaker instead of a properly profiled hump.

1.9 Retaining wall is not properly tied with hump leaving scope for water to enter from these locations even before water level reaches above hump level.

1.10 Cover shed is not provided which was otherwise required as per table-6 of *guidelines*

1.11 Open/close drains along with cross drains are not functioning properly.

1.12 Pumping arrangement is not working properly.

2. Supplementary solutions:

2.1 Existing RUBs/Subways:

SN	Causes of waterlogging and drainage problem	Suggested Solutions
1.	Seepage of water from joints of segments of RCC Box & retaining wall due to joints not completely/ properly sealed by concrete grouting/Epoxy grouting.	*The joints of segments of RCC Box &* retaining wall should be sealed properly. **I. In case of lesser seepage through joints:** (a) Cement grouting with anti shrinkage compound followed by epoxy grouting of all joints of boxes and retaining walls. (b) Removal of wearing coat and grouting of same as I(a) above and redoing of wearing coat. This is to be done when joints in floor not initially grouted. **II. In case of heavy seepage through joints:** (a) Cement grouting with anti shrinkage compound followed by PU grouting (Hydrophobic Polyurethane foaming resin) of all joints of boxes and retaining walls. Being costly, this may be provided in some LHS on trial basis. (b) Removal of wearing coat and grouting of same as II(a) above and redoing of wearing coat. This is to be done when joints in floor not initially grouted. **III. Shotcreting/ Concrete lining in retaining walls and boxes for both the cases as above:** The item of shot-creating is available in

		USSOR-2019 with detail specification. The arrangement of RCC lining is available in Table-6 of Guideline. This has to be done in case of high water table as provided for in the guidelines.
2.	Seepage of water from leftover shuttering holes and weep holes which were not sealed properly.	Leftover shuttering holes and weep holes should be filled up & sealed properly with Cement/Epoxy grouting.
3.	Seepage of water from RCC Retaining wall due to poor quality of concrete. (Honeycombed/porous concrete).	As per site condition, surface of the Retaining wall should be repaired/ grouted properly. Guidance may be taken from RDSO Report No. BS-133 "Guidelines for Repair of Concrete & Masonry Structures".
4.	Ingress/reverse flow of water from recharge pit constructed for rainwater harvesting due to highest water level reaching above road level inside the box during monsoon.	On such location, recharge pit for rainwater harvesting is not required, only water tight sump well of suitable capacity with pumping arrangement is required to pump out the water from it and get it diverted to natural drainage or some low lying area.
5.	Ingress of water from openings left in retaining wall.	Leftover openings should be filled up & sealed properly with Cement/Epoxy grouting.
6.	Ingress of water due to water logging behind the Retaining wall as earth filling/levelling of surface was not done properly after construction of the wall	Low lying surface behind the Retaining wall should be landscaped suitably so that water does not get accumulated (Annexure-I).
7.	In populated surrounding area, if proper drainage system is not provided and household water is diverted towards RUB/Subway.	In populated surrounding area, a proper drainage system should be provided to divert the water to some natural drainage
8.	Improper/low height hump and non-provision of reverse slope at the end of retaining wall. Overflow of water over hump.	As per site condition, raised hump with/without reverse slope may be provided. Retaining wall should continue along the approach slope up to the hump or from where reverse slope starts (Annexure-II).
9.	Hump is broken	Hump to be repaired and should be ensured at least before Monsoon.
10.	Retaining wall is not properly tied with hump/reverse slope.	Retaining wall should be tied with hump/reverse slope either by extending it up to the hump or by shifting hump to retaining wall as per site requirement.

11.	Cover shed is not provided which was otherwise required as per table-6 of guidelines.	Cover shed to be provided as per table-6 of guidelines. Complete covering of gaps with transparent sheets to be provided to prevent rain water ingress from the gap between cover shed and top of the retainer of box along the track.
12.	Open/close drains along with cross drains are not functioning properly.	Open/close drains and cross drains should be cleaned properly.
13.	Pumping arrangement is not working properly or not provided as per table-6 of guidelines.	Provide adequate pumping arrangement as per site requirement. Sensor based pump may be provided in urban areas, if possible.

2.2 New RUBs/Subways to be constructed:

SN	Anticipated causes of waterlogging and drainage problem	Preventive solution
1.	Feasibility w.r.t. highest ground water table.	If highest ground water table is less than 1m from the underside of the bottom slab of the box, construction of RUB should be considered as 'Not Feasible'. If it is necessary to be constructed, in that case, it should be planned and designed specially adopting adequate waterproofing measures and drainage arrangements.
2.	Joints of segments of RCC Box & retaining wall.	The joints of segments of RCC Box & retaining wall should be sealed properly with Cement/Epoxy grouting. Steel sheet strips should be provided over the joints of pre-cast box segments from outer side. This is an additional provision in addition to grouting with cement/epoxy grouting. OR Geo-textile may be wrapped on the entire outer surface of the box to prevent seepage and leaching of earth. OR Concrete canvas may be used over the joints from outer side during the construction of new LHS on trial basis to prevent seepage and leaching of earth. The above provisions will also prevent the flow of cement/epoxy grout to opposite side through joints.
3.	Leftover shuttering holes /lifting holes /openings and weep holes.	In box segments, lifting hooks as per RDSO drawing should be used in place of shuttering holes/lifting holes. Leftover shuttering holes, if any, should be filled up & sealed properly with Cement/Epoxy grouting. Weep holes should not be provided.
4.	Quality of concrete of RCC Retaining walls.	Quality of concrete should be such that honeycombing does not take place.
5.	Waterlogging behind the Retaining walls.	Low lying surface behind the Retaining wall should be landscaped suitably so

		that water does not get accumulated (Annexure-I).
6.	In populated surrounding area, if proper drainage system is not provided and household water is diverted towards RUB/Subway.	In populated surrounding area, a proper drainage system should be provided to divert the water to some natural drainage
7.	Retaining wall and hump.	Retaining wall should be constructed up to the hump.
8.	Cover shed.	Cover shed to be provided as per table-6 of guidelines. Complete covering of gaps with transparent sheets to be provided to prevent rain water ingress from the gap between cover shed and top of the retainer of box along the track.
9.	Pumping arrangement.	Provide adequate pumping arrangement as per site requirement. Sensor based pump may be provided in urban areas, if required.
10.	Lining of RUB	Shot-creating/ Concrete lining in retaining walls and boxes should be provided, if required as per table-6 of guidelines. The item of shot-creating is available in USSOR-2019 with detail specification. The arrangement of RCC lining is available in Table-6 of Guideline. This has to be done in case of high water table as provided for in the guideline.

3. Further suggestions:

3.1 The Guidelines on "Water logging and drainage problem in RUB/Subways" issued by Railway Board vide letter No. 2017/CE-IV/RUB/88 dated 22.04.2020 should be followed in totality.

3.2 Technical feasibility is must before deciding the LHS at planning stage as per Railway Board letter no. 2017/CE-IV/RUB/88 dated 18.02.2021

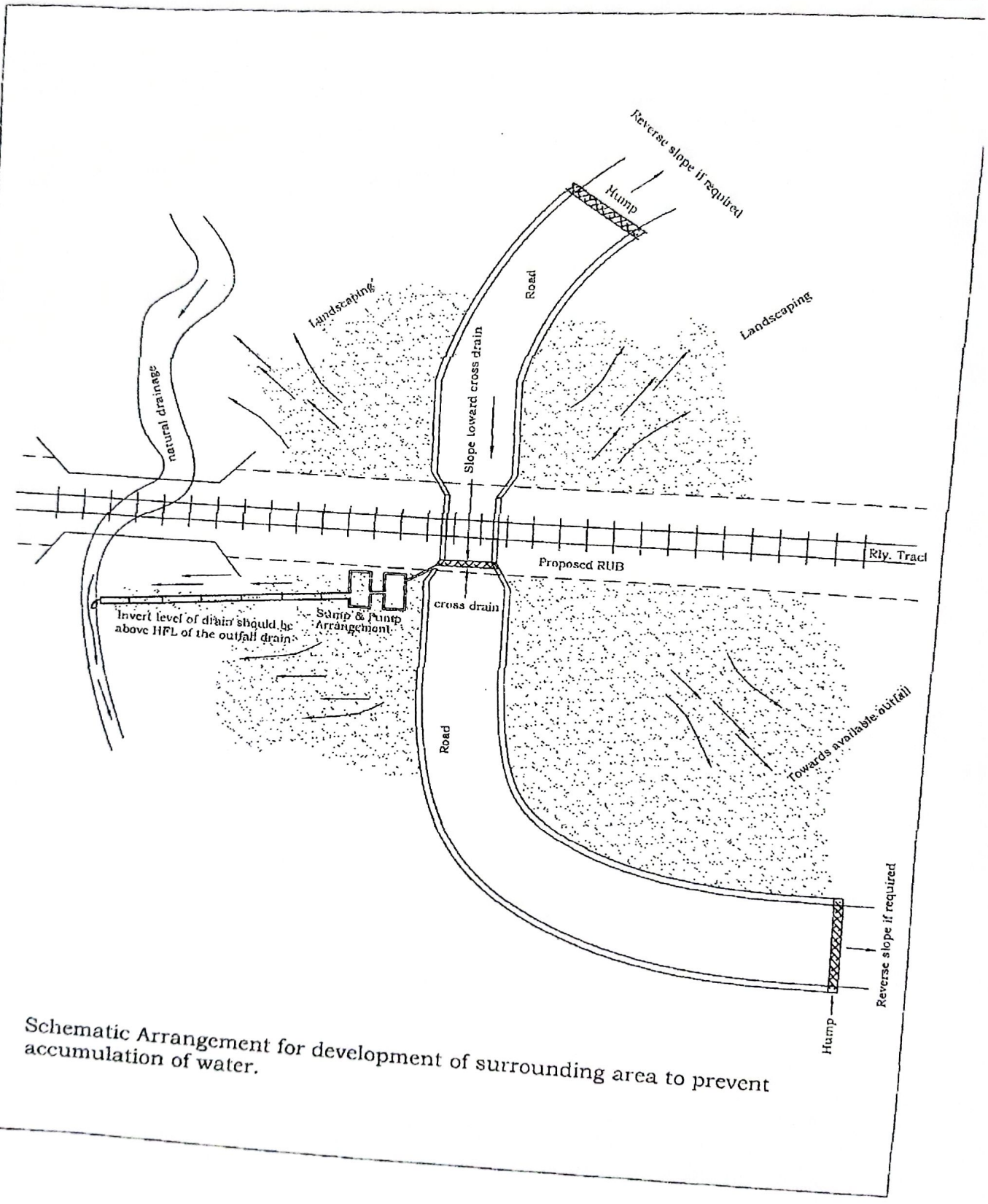
3.3 Segmental construction for RUB/LHS may only be carried out with the approval of CBE considering the instructions given in Railway Board letter no. 2015//CE-III/BR/Structure Code dated 19.01.2022.

3.4 It is observed that the segmented RUBs have been constructed in some of the Gauge conversion Projects. These RUB's should have been planned as a single box ~~and casted in situ at site~~ as line had remained closed for a long time for gauge

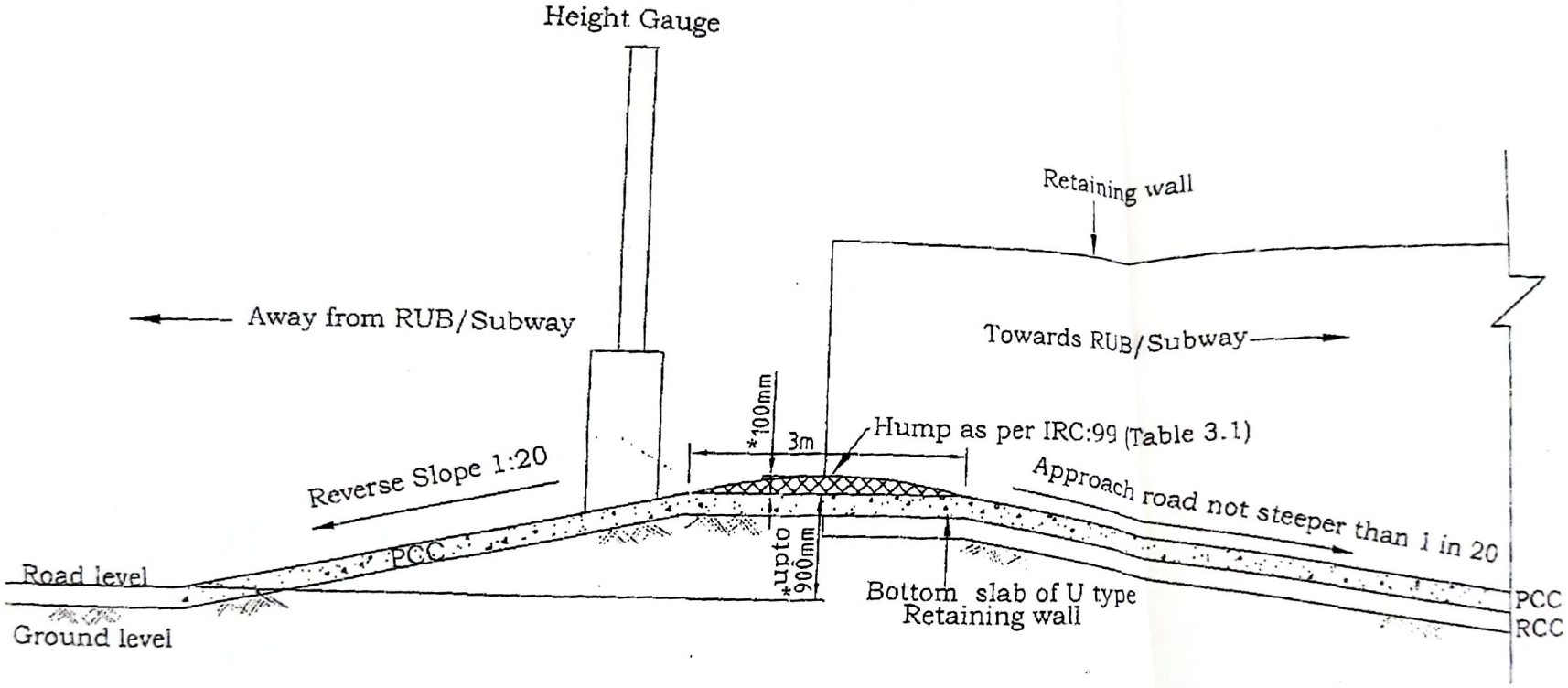
conversion. This would have reduced the joints considerably. Hence in gauge conversion project where line is closed for sufficiently long period, segmental construction of RUB/LHS should not be carried out.

3.5 In case drainage problem is continued. A fresh drainage plan needs to be developed by Railway covering all aspects after studying in details. This should cover the proper drainage system in surrounding area also.

Annexure-I



Schematic Arrangement for development of surrounding area to prevent accumulation of water.



Schematic Arrangement for Reverse slope with Hump

Note:- * The dimension is schematic only. It will vary as per site requirement depending upon the ground level, road level and water logging condition.