



**MADHYA PRADESH MANUAL OF RAILWAY
AFFECTING TANKS AND OTHER PUBLIC WORKS**

**State Committee of Engineers for
Railway Affecting Tanks and other Public Works
Madhya Pradesh**

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CONTENTS

	Chapter Name	Particular	Page No.
1	Chapter-I	General	1
2	Chapter -II	Criteria for and types of Railway Affecting Works	34
3	Chapter -III	Inspection and repairs	37
	Annexure-I (A)	Statement showing the Designation and addresses of the Senior Divisional of Central, South Central, South Eastern and Western Railways to be associated in concerned districts of Madhya Pradesh with Railway affecting tanks/works.	39
	Annexure-I (B)	Statement showing the Designation and addresses of the Executive Engineer of M.P. Water Resources Department to be associated in concerned districts of the Madhya Pradesh with Railway affecting tanks/works.	44
	Appendix-I	Statement of Financial and Miscellaneous Powers exercised by Officers of the W.D. in Respect of Matters other than Establishment	49
	Appendix-I(A)	Proforma For Particulars of The Railway Affecting Tanks/Barrages/Weirs/Regulators	57
	Appendix-I(B)	Proforma For Particulars of Railway Affecting Road Bridges (Including Causeways, Culverts Etc.)	63
	Appendix-I(C)	Proforma for Particulars of Railway Affecting Canal Crossing With/Without Head Works & Approach Banks	68
	Appendix-I(D)	Proforma for Particulars of Railway Affecting Canal Running Parallel or Oblique	72
	Appendix-I(E)	Proforma for Particulars of Railway Affecting Road Embankments in the Vicinity of Railway Line	77
	Appendix-I(F)	Proforma for Particulars Of Railway Affecting Marginal Bunds	81
	Appendix-I(G)	Proforma for Particulars of Railway Affecting River Protection Works and Training Works	85
	Appendix-I(H)	Proforma for Particulars of Railway Affecting temporary Channels (Cut From The Bed of Streams and Tail Ends of Tributaries)	89
	Appendix-I(I)	Proforma for Particulars of Railway Affecting Works(Like Long Solid Walls, Barriers, Townships, New Drainage Schemes Etc.)	93

Appendix-II(A)	Proforma for the Annual Inspection of Railway Affecting Barrages, Weirs and Regulators	97
Appendix-II(B)	Proforma for the Annual Inspection of Railway Affecting Road Bridges (Including Culverts, Causeways Etc.)	100
Appendix-II(C)	Proforma for the Annual Inspection of Railway Affecting Canal Crossing With/Without Head Works & Approach	103
Appendix-II(D)	Proforma for the Annual Inspection of Railway Affecting Canal Running Parallel Or Oblique/Temporary Channel	106
Appendix-II(E)	Proforma for the Annual Inspection of Railway Affecting Road Embankments in the Vicinity of Railway Line	109
Appendix-II(F)	Proforma for the Annual Inspection of Railway Affecting Marginal Bunds.	111
Appendix-II(G)	Proforma for the Annual Inspection of Railway Affecting River Protection Works and Training Works.	114
Appendix-III	Letter from Govt. of India, Ministry of Railways regarding Appointment of Committee of Engineers of P.W.D. Water Resources and Railway etc., for Railway Affecting and other Works.	117
Appendix-IV	Copy of Resolution	120
Appendix-V	Extract from Indian Railway & Works Manual	122
Appendix-VI	Extract from Indian Railways Permanent Way Manual-1986	124
Appendix-VII	Extract from Indian Railways Bill-1989 Chapter-IV	127
Appendix-VIII	Indian Railways Permanent Way Manual Advance Correction Slip	128
Appendix-IX	List of Indian Standard Code for Reference	129

INTRODUCTION

A large number of works which are classified as Railway Affecting are being executed in addition to carrying out improvements and repairs. Deforestation of large areas and other development activities affect the flood pattern posing danger to the safety of the Railway line in the vicinity and thereby affecting the travelling public and national assets.

Recognizing aforesaid potential danger to the Railway line, this Manual has been prepared to deal with the identification and classification of Railway Affecting Works, their standards of construction, maintenance, inspection and prompt intimation to the Railways of any anticipatory damage affecting adversely to the safety of the Railways. The Manual is applicable to all existing and future works in the State. The power to be exercised for construction and maintenance of works shall be governed by existing books of financial powers Govt. of MP (Presently 1995). The technical provisions in general are kept as per state technical circulars but prevalent Indian standard code shall prevail in case of any contradiction.

The Engineer in Chief, Water Resources Department, Government of Madhya Pradesh is the Chairman of the state committee of Engineers and the Coordinating Authority and will be responsible for close liaison with all the concerned organizations within the State and Railways for the purpose of this manual.

This Manual is prepared to guide the Engineers of the Water Resources Department as well as the Railways for sharing information, interaction and timely action, to protect the precious public transport, property and life.

PREAMBLE

1. The Railway Affecting Works such as Irrigation and Water Supply Tanks or Reservoirs, Canals in embankment, marginal bunds and road embankments with inadequate waterway for drainage situated in the vicinity of Railway line and other works which might alter or impede the natural course or discharge of waterways may be owned and controlled by a multiplicity of agencies e.g. Public Works, Water Resources, Revenue and Forest Department of State Governments, Quasi Government and local bodies, private parties and individuals, etc. The failure, improper design, malfunction, improper maintenance or operation or lack of inspection of such works could lead to serious breaches and failure in the railway embankments and bridges, which can result in catastrophic accidents to trains and loss of precious human life, serious and prolonged disruption on railway traffic and also heavy losses to railway and other property. No statutory obligations have so far been placed on the owners of Railway Affecting Works, which expose the Railway and the travelling public to great risk.
2. As a follow-up of the discussions between Union Minister of Railways and the Chief Ministers of the States on 5th June, 1957, a “State Committee of Engineers” consisting of senior Officers from Railways, Public Works, Water Resources, Revenue, Forest, Local Self Departments of the State concerned, has been setup in each State. The functions of this committee has been laid down in Para 4 of the Ministry of Railway letter No. 57/W-II/20, dated 22/23-6-57(Appendix-III). This committee has been charged with the responsibilities of maintaining up-to-date lists of the Railways Affecting Works and bringing about coordination between the Railways and State authorities in respect of policies and programs and for proper up keep of such works whether belonging to the State or Private Agencies.
3. Recognizing the danger posed by the Railway Affecting Works, Khosla Committee of Engineers, which was set up Government of India vide Ministry of Railways Resolution No. E-57001/3(RBI), dated 4th March, 1957 (Appendix-IV) to go into the design of bridges and other concerned matters-recommended, inter-alia as follows:-

- a. The State committee of Engineers would prepare the list of all Railway Affecting Works, notify & arrange for submission of annual reports of Inspection on the condition & issues of warnings of apprehended danger to the Railway Affecting Tanks/ works to the Railway authorities in time.
- b. The State Government should be entrusted with the responsibility for checking up and ensuring the maintenance of all Railway Affecting Works, their watch and issue of warnings.
- c. The State Revenue Department should have the authority to take action against unauthorized excavation of channels from beds of active rivers.
- d. It should be obligatory for the party constructing a work which is likely to become Railway Affecting to obtain prior approval of the Railway concerned
- e. In order that the directions in respect of maintenance and construction of Railway Affecting Works be comprehensive and unified for all States, a Manual of Instructions should be prepared on an all India basis and the essential requirements of safety, as set forth in this Manual, incorporated in a central statute either as an amendment to the Indian Railway Act or as a separate Act.

The above recommendations were accepted by the Government. Pursuant to the recommendations (e) of the Khosla Committee of Engineers, a draft Manual of Instructions for Railway Affecting Works was compiled by the Research, Design and Standards Organization, Ministry of Railways for uniform adoption by all the States and Railways on all India basis. Suggestions for improvements in the contents of the manual were to be sent to the Director General (Research), Research, design and Standards Organization, Ministry of Railways Government of India, Manik Nagar, Lucknow, through State Committee of Engineers.

4. In the 38th meeting of State Committee of Engineers held on 23-06-1988, the Committee directed that a sub-Committee may be constituted to go through the revised draft Manual of instructions received from Railway Board and submit comments for discussion in the next meeting. The Sub-Committee of the following officers was constituted vide Engineer-in-Chief, Water Resources Department, Madhya Pradesh, Memo No. 3212607, dated 22-07-1988.

- a. Chief Engineer, BODHI, Bhopal -Chairman
- b. Chief Engineer, Chambal Betwa Basin, Bhopal - Member

- c. Dy. Chief Engineer(B&F) Central Railway, Mumbai -Member
- d. Director (Canals) BODHI, Bhopal - Member& Convener

The Sub-Committee met on 22nd October 1988, 18th January 1989, 4th and 5th May 1989 and 9th November 1989. The revised draft Manual of Instructions received from Railway Board was considered as the basis for the review in Sub-Committee. After detailed and exhaustive deliberations the draft of Madhya Pradesh Manual of Instruction for Railway Affecting Works has been finalized for consideration of State Committee of Engineers. Consequently the manual was published in the year 2003. In last few meeting it was suggested by various members to update the manual. This work is mostly updating of the original Manual, which also includes modern trends in the technology.

The 55th meeting of the State Committee of Engineers for Railway Affecting works was held on 28/06/2012 at Bhopal.

CHAPTER-I

GENERAL

1.1. Scope

This Manual deals with rules, procedures and general practice to be followed for the construction, inspection, maintenance and operation of Railway Affecting Works for Uniform adoption all over in Madhya Pradesh. These may be considered obligatory.

1.2. Definition of Railway Affecting Works

Railway Affecting Works are those, the construction, defective design, failure, improper or poor maintenance or operation of which may cause serious damages/ breaches or flooding of Railway line or bridge. Examples of such works are:-

- i. Irrigation and water supply tanks or reservoirs;
- ii. Canals in embankment and river bunds;
- iii. Temporary channels cut for Irrigation or other purpose from bed of active rivers; and
- iv. Other works or operations which might alter or impede the natural course of flood flow or cause an increase in the volume of such flow. These may be new Irrigation Project, new township, new forest belts, large scale deforestation etc.

1.3. Authority to declare work as Railway Affecting

A work can be declared as Railway Affecting, by an Officer not below the rank of Executive Engineer of State Water Resources, Public Works, Public Health Department or officer equivalent rank of concerned Department or concerned Division/ Executive Engineer of Railway. In the event of any dispute, the matter will be referred to the State Committee of Engineers for decision.

1.4. List of Railway Affecting Works

List of Railway Affecting works shall be maintained by Chief Engineer of State Water Resources, Public Works, Public Health Department and by an Officer of equivalent rank nominated by the State Government for the works belonging to Revenue Department, Quasi Government, local bodies, private bodies, and

individuals etc. These will be revised by them from time to time and updated at least once in a year before monsoon. The nominated officer and Chief Engineers of the State Government will send copies of the amendments to the list by 15th May every year to the State Committee of Engineers, Railway Chief Engineer, Railway Divisional Engineers, Executive Engineers of State Government and other owing bodies. The Officer nominated by the Engineer-in-Chief Water Resources Department, will notify the consolidated list on behalf of State Committee of Engineers.

The list of such works shall be prepared in Performa prescribed at appendices I (A) to I (I) and maintained by the respective Departments.

1.5. New Railway Affecting Works

Construction of new tank/ work or remodeling of the existing tank or work, which is likely to be Railway Affecting should be informed beforehand by the concerned Chief Engineer of the State to the Chairman of the State Committee of Engineers and concerned Railway Chief Engineer.

1.6. Inspection and maintenance/ repairs of Railway Affecting Works

The concerned State Government Authorities Quasi-Government/ local bodies, private bodies and individuals as the case may be, will arrange to carryout necessary inspection and complete the repairs on priority before next monsoon.

1.7. Action in case of apprehended danger

In the case of any apprehended danger or actual damage to the Railway work, which might affect the safety of the railway lines, immediate action should be taken by the SDO of concerned Department or nominated officer of the other Department e.g. Revenue Department, Quasi-Government/ local bodies, private bodies and individuals etc. to advice Station Master, Divisional Engineer/ Executive Engineer and the Chief Engineer of the railway concerned by telephone and telegram so as to enable the Railway officials to take immediate precautionary and other measures to ensure the safety of trains and to avoid accidents. For the purpose, officer concerned should always keep the address and telephone numbers of the railway officials concerned, available with them.

1.8. Timely repairs not undertaken

In case the repairs of works, which are found in unsound condition, are not completed in time for certain compelling circumstances, the Sub Divisional Officer in-charge of work will report to his Executive Engineer, who shall send a separate list of such cases to the parties as well as Divisional Engineer of the Railway. For works owned by the Revenue Department, Quasi Government/ local bodies, private bodies and individuals etc. a report to this effect will be made by the authority in-charge to the nominated officer (as per Para 1.4) who will in turn report to the concerned Roadway Divisional Engineer. Arrangement will also be made by the State Government in consultation Divisional Engineer of the Railway to inform immediately the nearest accessible Railway Station Master and the concerned Assistant Engineer of the Railway in the event of threatened/ actual mishap.

1.9. Declaring a section vulnerable

The Divisional Engineer of the Railway Concerned shall declare as vulnerable the sections of the railway, which are likely to be affected by non-completion of the urgently required repairs and strengthening etc., and shall make suitable arrangements like patrolling of the sections during monsoon and also take other necessary precautions to ensure the safety of the railway line. The Railway official should also take action in this regard as detailed in the Para 726 and 727 of Indian Railways permanent way manual published in 1986, (The extract of which is at Appendix VI)

Statement showing the designation and address, of Senior Divisional Engineer of Central, South Central, South Eastern and Western Railways and Executive Engineer of M.P. Water Resources Department to be associated in concerned districts of Madhya Pradesh with Railway Affecting Tanks/ Works are at Annexure- I (A) and (B) respectively.

1.10. Role of State Committee of Engineers

State Committee Engineers have an important role to play in the matter of Railway Affecting Works. Their function have been set forth in Railway Board letter No. 57/W-II/CMT/20, dated 22/23-06-1957 (Copy at Appendix- III).

1.11. Guidelines for Design, Construction and Maintenance of Railway Affecting Work are as below:-

1.11.1. Guidelines for Design and Construction of New Railway Affecting Work:-

In all cases the relevant IS code will supersede all provisions made in the manual. The IS codes pertaining to this are listed in Annexure IX.

1. Catchment area of the Tank must be correctly assessed and probable maximum flood discharge shall be computed and approved by the competent authority.
2. The surplus channels should not run parallel, or close to the railway embankment.
3. Regarding the top width, side slopes and free board of tanks bunds standards that are approved by competent authority should be followed.

1.11.2. Guidelines for Maintenance and Improvement of Existing Railway Affecting Tanks:-

1. The Existing tanks with earlier standards may be brought to the approved standards, wherever feasible in a phased manner.
2. The tanks which have not been provided with the adequate surplus arrangements should be provided with surplus weirs of flush escape etc. The surplus works should be designed for the probable maximum flood discharge as approved by the competent authority.
3. Existing surplus works found inadequate to cope up with the observed maximum discharges must be strengthened to suit the requirements.

1.11.3. Design of Railway Affecting Works:-

For designing of Railway Affecting Works, the design circulars issued by the competent authority may be followed and that should be got approved by competent authority with intimation to the relevant Railway Authority. But in brief

some information of design circulars which are important for the design and maintenance of Dams are summarized below:-

Type Design of earthen dam- The tentative dam profiles should be in no way be taken as type designs. Each section will have to be analysed by slip circle method based on properties of soils to be used. Approval is to be given only, when the stability analysis shows adequate safety factor. The relevant technical circular/ IS Codes may be referred.

Main details of the tentative sections as summarized below :

General Guidelines for Embankment Sections (IS- 12169- 1987)

Sl. No.	Description	Height up to 5 m		Height Above 5 m and up to 10 m		Height Above 10 m up to 15 m	
		Upstream	Downstream	Upstream	Downstream	Upstream	Downstream
i)	Type of Sections	Homogeneous Section/ Modified Homogeneous Section		Zoned Section/ Modified Homogeneous Section/ Homogeneous Section		Zoned Section/ Modified Homogeneous Section/ Homogeneous Section	
ii)	Slopes	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream
	a) Coarse grained soil (GW, GP, SW, SP)	Not Suitable		Not suitable		Not suitable for core Suitable for casing Zone	
	b) Coarse grained soil (GC, GM, SC, SM)	(H) (V) 2:1	(H) (V) 2:1	(H) (V) 2:1	(H) (V) 2:1	Section to be decided based upon the stability analysis in accordance with IS : 7894-1975	
	c) Fine grained soil (CL, ML, CI, MI)	(H) (V) 2:1	(H) (V) 2:1	(H) (V) 2.5 : 1	(H) (V) 2.5 : 1	--do--	
	d) Fine grained soil (CH, MH)	(H) (V) 2:1	(H) (V) 2:1	(H) (V) 3.75 : 1	(H) (V) 2.5 : 1	--do--	
iii)	Hearting Zone	Not Required		May be provided		Necessary	
	a) Top Width			3m		3m	
	b) Top Level			0.5m above MWL		0.5m above MWL	
iv)	Rock Toe Height	Not necessary up to 3 m. Above 3 m height, 1 m height of Rock Toe may be provided		Necessary H/5, where H is the height of embankment		Necessary H/5, where H is the height of embankment	
v)	Berms	Not necessary		Not necessary		The Berm may be provided as per design. The minimum berm width shall be 3 m. The berm may be provided also on the downstream slope for facilities during maintenance.	

The intention is that the above sections could be tentatively used for purpose of preparing projects estimates. Their final adoption will be subject to:-

- i. Their having adequate safety factor in the slip circle analysis, and
- ii. Approval by the competent authority. Adoption of these tentative profiles will also make uniformity.

“CREST WIDTH OF EARTH/ ROCK-FILL DAMS”

The crest width of an earth/ Rock-fill dam depends on:-

- (a) Nature of embankment materials and maximum available percolation distance through the embankment at normal reservoir level:
- (b) Height and importance of structure:
- (c) Possible road-way requirements, and
- (d) Practicability of construction

These requirements are in general adequately covered if crest width based on the following formula is adopted:-

$$W = 0.2 H + 3 \text{ m.}$$

Where W = Width of crest in metres, and

H = the height of Dam in metres above lowest elevation in the stream bed.

Based generally of the above approach and in addition giving adequate consideration to economy, following crest widths, based on the maximum height of the Dam, should be adopted for earth/ rock-fill dams.

S. Height of Dam No. (Metres)		Minimum top width of Dam (Metres)	Remarks
1	0 – 10 a) In the length of 0 3.5 to 6 m height b) In the length of 6		

Note: - Top width mentioned in Col. 2 is to be adopted uniformly throughout the length of the dam. Surface drainage of crest should be provided by slopping the crest in a grade of 1 in 50 to drain towards upstream.

IS 10635 - 1993 Use for free board requirement in embankment dams – Guidelines.

1. General - Selection of the correct design free board in one of the critical determination made to ensure adequate security to downstream areas against possible hazards resulting from failure of dam. The objective of free board is to provide assurance against overtopping due to inflows, wind setup, wave run up, landslides, seismic activity, extreme settlement of the embankment, malfunction of water release structures in the operation and maintenance of the dam appurtenant structure and hydrological uncertainties. Of these, the first three factors are by far the most important ones which are normally considered for determining the free board requirement.

2. Terminology:- For the purpose of this circular the following terminology shall apply

2.1. Design Wave Height(Ho) - It is that wave height for which the structure is designed to with stand, so that it does not undergo more than the accepted

probability of damage, should the same wave height be exceeded. It is a suitable multiple of significant wave height depending on the degree of risk to be accepted.

Fetch (F) - It is the maximum straight line distance over open water on which the wind blows.

2.1.1. Effective Fetch (Fe) – It is weighted average fetch of water spread, covered by 45 ° angle on either side of trial fetch, assuming the wind to be completely non-effective beyond the area.

2.2. Free Board– It is the vertical distance between the crest of embankment (excluding camber) and the still reservoir water surface.

2.2.1. Normal Free Board- It is free board above the Full Reservoir Level (FRL).

2.2.2. Minimum Free Board- It is free board above the Maximum Water Level (MWL).

2.3. Maximum Wave Height (Hmax) - It is average wave height of the highest one percent of waves in a representative spectrum.

2.4. Significant Wave Height (Hs) - It is the average wave height of the highest one third of waves present in each sampling interval.

2.5. Wave Length (Ls) - It is a length in m, from crest to crest for significant wave.

2.6. Wave Period (Ts) - It is the average interval, in seconds between successive crest or trough of significant waves.

2.7. Wave Run-up (R) - It is the difference (vertical height) between maximum elevation attained by wave run-up a slope and the water elevation on the slope excluding wave action.

2.8. Wind Set-up (S) – When wind blows over water surface it exerts a horizontal force on the water surface driving it in the direction of the wind. This effect results in piling up of the water on one shore of the lake or reservoir. The

magnitude of rise above the still reservoir water surface called wind set-up or wind tide.

3. Factors Governing Freeboard Estimate

The following factors govern the requirement of freeboard.

- a) Wave characteristic particularly wave height & wave length.
- b) Slope of the dam & roughness of the pitching.
- c) Height of wind set-up above the still water level adopted as freeboard reference elevation, and
- d) Earthquake seiches.

The first three factors are dependent on wave generation by the wind on the water surface. The wave generation is a complex phenomenon. Therefore freeboard for a dam may be obtained by empirical formulae which are based on research studies of specific cases.

Table-1
District wise extreme wind velocity for M.P.

(50 years return period observed from the map of extreme wind speed over India prepared by I.M.D. Pune)

S. No. (1)	District (2)	Wind Velocity on land (U) in km/hrs (3)
1.	Bhopal, Dhar, Dewas, Hoshangabad, Indore, 140 Jhabua, Khandwa, Khargone, Mandsaur, Rajgarh, Ratlam, Shajapur, Sehore, Ujjain.	
2.	Betul, Raisen, Vidisha	145
3.	Mandla, Seoni	150
4.	Balaghat, Chhindwara,	155
5.	Shivpuri	160
6.	Bhind, Chhattarpur, Datia, Damoh, Gwalior, 170 Guna, Jabalpur, Morena, Narsinghpur, Panna, Sagar, Tikamgarh	
7.	Shahdol	175
8.	Rewa, Satna, Sidhi	180

Note:- Above values of extreme wind velocity on land are to be used from IS 875-1964 completed. Afterwards, revised wind velocity as per IS code be adopted.

CORE IN EARTH DAM

The core is defined as a zone of impervious earth within a zoned earth dam and provides impermeable barrier within the body of the dam.

Location of Core:

Core may be located either centrally or inclined upstream. The location will depend mainly on the availability of materials, topography of site foundation condition, diversion considerations etc. The main advantage of central core is that it provides higher pressure at the contact between the core and the foundation reducing the possibility of leakage and piping and provides opportunity for additional grouting of the foundation or contact zone through the core if need arises. Similarly any cracks in the core can be more conveniently plugged by grouting through vertical holes in central core. On the other hand inclined core reduces the pore pressures in the downstream part of the dam and thereby increases its safety. But due to upstream core the stability of upstream slope of dam reduces especially for sudden draw down condition. It also permits construction of downstream casing ahead of the core. The section with inclined core allows the use of relatively large volume of random material on the downstream.

In view of above factors no hard and fast rule can be fixed for location of the core. However, following broad guide lines may be followed.

- i. The core may be located centrally for dams up to the 15 m height (small dam).
- ii. For dams above 15 m in height (large dam) the locations of core may be decided on basis of individual site conditions. The central core being preferred unless otherwise warranted on account of necessity of using huge quantities of random soil on the downstream zone or due to limitation of availability of core material.

CORE THICKNESS

The following practical considerations govern the thickness of core: -

- a) Availability of suitable impervious material.
- b) Resistance to piping.
- c) Permissible seepage through the dam, and
- d) Availability of other materials for casing, filter etc.

It is desirable that C.O.T. is fully covered by hearting core. The core thickness can be reduced if plastic clays are used, because they have greater resistance to piping, erosion and are impervious. If the soils used in the hearting core are silty type then larger thickness is desirable.

In general, the slopes of central core are kept as 1:1 on both upstream and downstream sides. However, these may be steepened up to 1/2:1 on both sides, if limitation of availability of impervious soil so warrants.

The top level of the core should be fixed at 0.5m and 1.0m above the maximum water level in respect of small and large embankment dam respectively and the top width of core should be 3 metres minimum.

Suitability of core material:

Impervious soils are generally suitable for core. Permeability of material should be generally 10^{-5} cm/sec or lower.

Appendix A of IS: 8826-1978 gives recommendations regarding suitability of soil for construction of core for earth dams which is given at Table-III. These are general requirements. In addition following points should also be kept in mind:-

- i. Soils having high compressibility and liquid limit are not suitable, as they are prone to swelling and formation of cracks. The swelling soils should not be used for the top portion of core to avoid cracking. The depth to which the

non-swelling soil should be used for top portion can be worked out by carrying out swelling pressure tests.

- ii. Soil of P.I. 15 clay content, +30% and having liquid limit between 30 to 50% should generally be used. To avoid swelling tendencies, plasticity index should not exceed 30.
- iii. Extremely high densities and low moistures should be avoided in order to provide some flexibility.
- iv. Soils having organic contents are also not suitable.

Degree of Compaction:

This will be based on the dry density achieved which may satisfy the following criteria.

TABLE-II

CRITERIA FOR CONTROL OF COMPACT DAM EMBANKMENT

Type of Material	Percentage of + No. 4 fraction by weight of total material	Percentage based on minus No. 4 fraction		
		Minimum acceptable density	Desirable average density	Moisture limits (we – wf) -2 to +2
Cohesive soils 0-25 Controlled by 26-50	Where “we-wf” is the difference between optimum water content and fill water content in percent of dry weight of soil, is fill dry density divided by proctor maximum dry density, in percent. Cohesive soils containing more than 50% gravel sizes should be tested for permeability of the total material if used as water barrier.	D=95	D=98	
		D=92.5	D=95	
		D=90	D=93	

N.B. 1 in rare case, when a layer with necessary moisture content gives lower density than specified in the above table even after rolling with more No. of passes or re-rolling such a layer may be approved at the discretion of the Engineer –in-Charge provided

- a) The placement dry density is not less than 90 percent of the standard proctor Dry Density and 95 percent of Design Dry Density and
- b) Number of such samples having proctor Dry Density less than 95 percent O.D.D. should not be exceed 2 percent of the total number of samples.

Preventive Measures: -

The following preventive measures if adopted during construction will help to check the occurrence of cracks in embankment:-

- i. For the hearting cores soils of P.I. 15 should be used, Soils should be compacted at O.M.C. or on the plus side of O.M.C.
- ii. The soil should be compacted to optimum dry density i.e. (O.D.D) so as to reduce the subsequent settlement of embankment. For this purpose appropriate quality control is necessary. The soil should be selected appropriately and well tested before use in bank work.
- iii. Well graded filters should be provided on the downstream side of core so that even if cracking occurs the harmful effects would be avoided.
- iv. Low density deposits in the foundation may be removed if feasible economically.
- v. Vertical surface in abutment should be excavated to form moderate slope not less than 1 in 4 to 1 in 5. A wider impervious zone and thicker transitions are also provided sometimes at the abutment contacts to increase the length of path of seepage and to protect against erosion.

TABLE-III**Relative suitability of soil for use in Embankments**

IS 8826-1978 & IS 12169-1987

Relative Suitability (1)	Homogeneous Dykes (2)	Zoned Earth Dam		Impervious Blankets (5)
		Impervious core (3)	Pervious casing (4)	
Very Suitable GC		GC	SW, GW GM	GC CL, CI CH, SM, SC, GC
Suitable	CL, CI	CL, CI		-
Fairly Suitable SP, SM, CH		GM, GC, SM, SP, SC, CH	-	-
Poor	-	ML, MI, MH		-

Provision of Berms**Definition:**

A Berm is a level surface indentation in the slope of a dam, which can serve a number of purposes.

Requirement of Berm:

Generally dams having a height up to 10m may not require a berm. For dams beyond 10m height, the stability consideration may suggest provision of berms at suitable locations, or flattening of slopes. Theoretically, stability of slopes can be best improved by varying the slopes, but the berm serves multiple purposes as under:-

- i. It increases slope stability by increasing 10m width.
- ii. It reduces the surface erosion in case of downstream slope by breaking the continuity of the slopes.
- iii. It provides level surface convenient to be used as road for construction and maintenance operations.
- iv. It prevents under mining of the lower edge of the rip-rap in case of upstream slope

In view of above it is considered necessary to provide berms at suitable locations for dams higher than 10m.

Width and locations of Berms

The width and locations of berms would be governed by considerations of stability. However the following minimum requirements may be kept in view:-

- I. A minimum berm width of 3.0 m is desirable but a width of 6.0 m should generally be provided for convenience of maintenance and construction and also for access road in downstream slope.
- II. A 6.0 m wide berm about 1.5 m below M.D.D.L. on the upstream slope should invariably be provided. This also prevents undermining of the lower edge of rip-rap at the time of low reservoir water when the water cascades down.
- III. Generally, a berm at a vertical interval of about 12 m should invariably be provided for case of construction and maintenance.
- IV. Erosion of soil on downstream slope may result in choking and subsequent malfunctioning of toe filter. This can be avoided by providing a berm at the top elevation of the toe filter.

Transverse Slopes:

The berm should have a reverse slope of 1 in 50 m towards the longitudinal collecting drain.

SHRINKAGE/ SETTLEMENT ALLOWNCES IN EARTH/ ROCKFILL DAM

1.0 In supersession of the prevailing practices and instructions, the provision of shrinkage/ settlement allowances, to account for both embankment compression and foundation settlement may be made as under: -

1.1 Extent of shrinkage/ settlement allowance:

- i. 1% of the height of the dam for un-yielding (rock) foundations.
- ii. 2% of the height of the dam for dams founded on compressible (soil) foundations.

- iii. The above shrinkage allowance would be for cases where material is placed in layers and compaction is done to maximum dry density at O.M.C. as per specifications.

1.2 Methodology of providing shrinkage allowance:

- i. The shrinkage allowance to be provided should be calculated for various heights wherever there is a berm or change of slope in the dam section and for the top of dam. The points of berm width or change of slope and top width of dam should be raised vertically by the amount of shrinkage allowance to be provided for the embankment height at the relevant point. The points so obtained shall be joined, starting from the original base width
- ii. The stability analysis may be done for the section obtained after adding shrinkage allowance.

Protection of upstream slopes for Reservoir Embankment

1. General: -

Embankment slope need to be protected against wave action, rain wash, wind action and velocity of flow. Protection against this erosion can be provided in many ways such as cement concrete surface, flexible bricks/ stone pitching & rip-rap on the upstream slope.

2. Terminology: -

For the purpose of this circular, the following definitions shall apply.

2.1 Pitching: -

The term pitching refer to the roughly squared masonry or precast blocks or embedded stones laid in regular fashion with dry or filled joint, on the upstream slope of an embankment dam or on a reservoir shore to provide protection to the embankment materials against erosion due to wave action etc, and also to give a pleasing finished appearance.

2.2 Rip-Rap: -

It is the protection to the embankment material against erosion due to wave action, etc provided by placing a protection layer of rock fragments

manufactured material. Rip-Rap may be placed on slope either by hand or it may be simply dumped.

2.3 Hand placed Rip-Rap: -

It consists of natural stones quarried laid flat or laid with projections boulder or specially manufactured material like cement concrete blocks and soil-cement blocks carefully placed by hand in a more or less definite pattern with a minimum amount of voids. It's top surface reasonably uniform and free of loose stones or alternately panel wise concrete or precast concrete interlocking type blocks.

2.4 Dumped Rip-Rap: -

It consists of boulders or blasted rock reasonably free from quarry fines and dumped in place by mechanical means.

2.5 Wave Action:-

It consists essentially of the dynamic impact effect of the waves as they impinge on the slope and suction forces set up on the embankment face as the waves ride up and down.

2.6 Waves Height (hw):-

The height of wave is reckoned as measured from the trough to the crest of the wave.

2.7 Wave run up:-

It is the difference (Vertical height) between maximum elevation attained by wave run-up on a slope and the water elevation on the slope excluding wave action.

2.8 Quarry spalls: -

The stone chips obtained out of quarrying and shaping the stones to the size.

3. Function and Choice :

3.1 The main function of rip-rap/pitching is to protect upstream slope of reservoir embankment against erosion due to wave action, rain wash, wind action and velocity of flow.

3.2 The choice of type of rip-rap/pitching is governed mainly from the consideration of requirement of finished appearance of the structure, availability of suitable materials within reasonable distance & availability of

manual versus mechanical modes of working, time constraints & cost of placement.

4. Extent of Rip-Rap :

- 4.1 Rip-Rap should be provided from, an elevation 1.5 or half of maximum wave height at minimum draws down level (MDDL) whichever is more, below MDDL to the top of the dam. However, at sites, where there is possibility of flow parallel to the embankment below the lowest water level and exigencies of drawing below MDDL, rip-rap may be extended further below the MDDL as required.
- 4.2 Rip-Rap/pitching should as far as possible be terminated at lower end in a berm provided in the embankment. (Fig.-1).
- 4.3 Where the berm is not provided on account of any specific reason, the rip-rap/pitching should be terminated duly keyed to a support (Fig.-2).
- 4.3.1 Toe support arrangement for rip-rap/pitching extending to ground level is shown in Fig.-3. The arrangement for rip-rap terminating at rock surface is shown in Fig.-4.
- 4.3.2 Arrangement of header stones in hand placed rip-rap/pitching is shown in Fig.-5.

5. Filter :

- 5.1 Provisions of filter under rip-rap prevent the waves generated in the reservoir, from eroding and washing out the underlying embankment material. Since the rip-rap is generally poorly graded due to predominance of one size material the provision of adequate filter of fine and coarse material, is also essential.
- 5.1.1 The thickness and number of layers of filter are mainly governed by considerations of intensity of wave action, gradation of rip-rap, gradation of embankment material and case of construction.
- 5.1.2 Thickness of each of the two layers shall not be less than 150mm under hand placed rip-rap pitching and 200 mm under dumped rip-rap.
- 5.1.3 In case of small dams, (Dam height less than 15 m and the wave height up to 0.50m), where filter material is not available in required quantity and quality at economical leads, filter may be replaced with layer of

quarry spalls having thickness equal to half the thickness of rip-rap/pitching but not less than 150mm.

5.1.4. Filter Gradation Criteria:

5.1.4.1 Gradation requirement for the coarse filter material with respect to

rip-rap material should conform to the criteria that D85 size of the coarse filter material shall not be less than 1/10 of D15 size of the rip-rap material.

5.1.4.2 The gradation requirement for the fine filter with respect to embankment material should conform to the criteria that D15 size of the fine filter material shall not exceed 5 times the D85 size of the retained embankment material.

5.1.4.3 In case embankment material, satisfy the filter gradation criteria explained above, with respect to coarse filter, the fine filter, the fine filter could be omitted and rip-rap can be directly laid over 200mm gravel or coarse filter layer.

5.2 Filter material for the rip-rap shall consist of gravel/metal/crushed rock or sand of medium to coarse sizes. They shall satisfy the required gradation criteria. Filters with large percentage of fines are not desirable.

6. Hand placed Rip-Rap :

6.1 Thickness of Rip-Rap

6.1.1 The minimum thickness of hand placed rip-rap/pitching measured normal to embankment slope shall be as shown in table-1 below. It shall in no case be less than 300mm.

6.1.2 The maximum wave height, needed in computation of thickness of pitching may be computed as per the design series T.C. No. 22 issued by Bodhi, on computation of free board for embankment dam.

TABLE 1
MINIMUM THICKNESS OF HAND PLACED PITCHING/RIP-RAP
IS 8237-1985

Max. wave height Minimum in m.	thickness of rip-rap mm. pitching in mm	Minimum thickness of filter layer in	
		Finer*	Coarser
0 to 1.5	300	150	150
1.5 to 3.0	450	150	150
Over 3.00	600	150	150
*Refer clause 5.1.4.3			

7. Dumped Rip-Rap :

7.1 Thickness:

7.1.1 The minimum thickness of dumped rock rip-rap and average rock size shall be shown in Table 2 below.

TABLE-2:
MINIMUM THICKNESS OF DUMPED RIP-RAP

Max. wave Minimum Av. Minimum height m.	Rock size Rip- Rap (D50 mm)	thickness (mm.)	Minimum Thickness of filter layer in mm.	
			Finer*	Coarser
0 to 1.5	300	600	200	200
1.5 to 3.0	400	750	200	200
above 3.00	700	1000	200	200
*Refer clause 5.1.4.3				

7.1.2 The most important criteria in the Table-2 above, is the minimum average rock size (D50) of rip-rap. For example, for waves of 2m height, the rip-rap should be composed of rocks, half of which by weight are equal to or larger than more or less equi-dimensional rock with average diameters of 400mm. The rock used for rip-rap shall be well graded for a maximum rock size roughly equal to 1.5 times the averages size to 50mm.

7.1.3 The full thickness of dumped rip-rap shall be dumped in one layer.

8. Where stone of adequate size or requisite specifications are not available, cement concrete blocks of adequate size can be used as shown in Fig.-6.

9. The tolerance on the nominal thickness of rip-rap enforced on the performed profile shall be 10 percent.

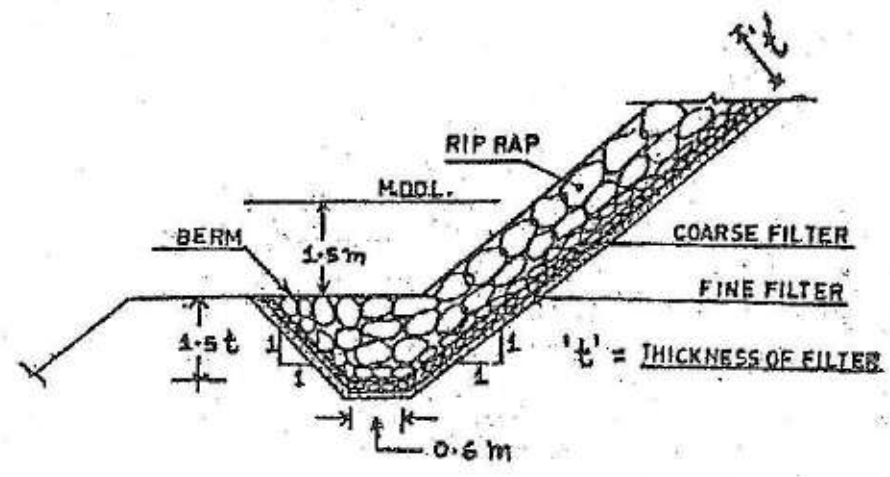


FIG.1 RIP RAP / PITCHING WITH BERM BELOW MDDL.

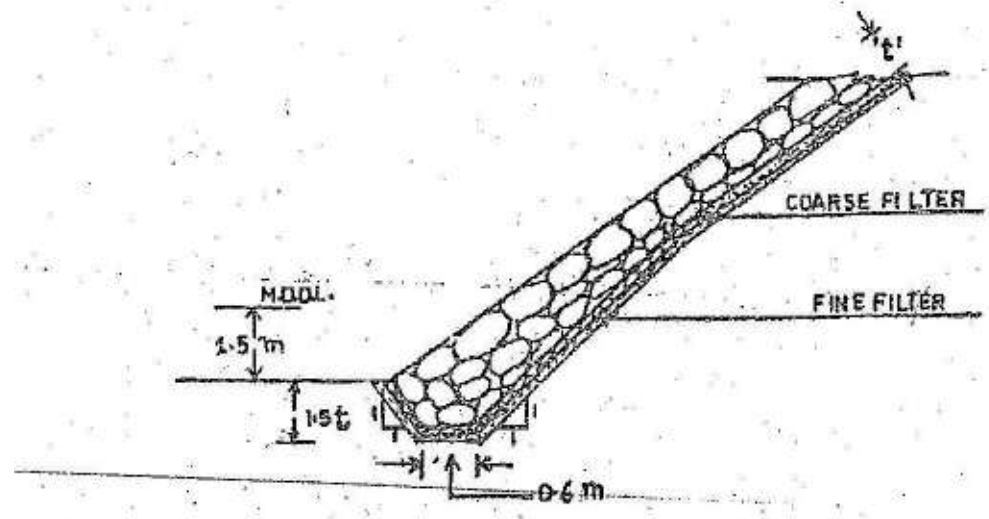


FIG.2 RIPRAP / PITCHING WITH NO BERM BELOW MDDL.

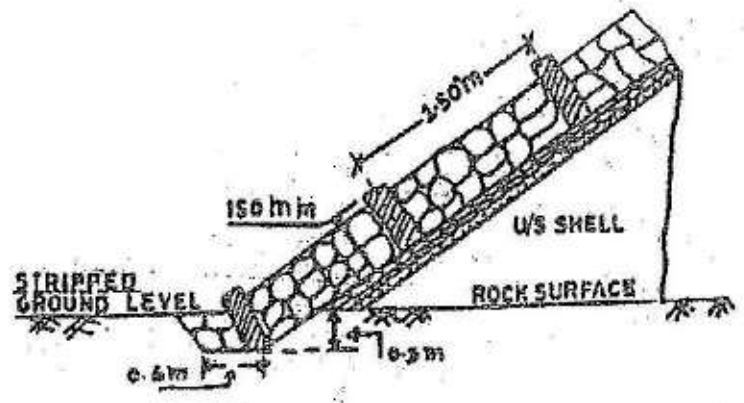


FIG.3 RIPRAP / PITCHING TERMINATING AT ROCK SURFACE

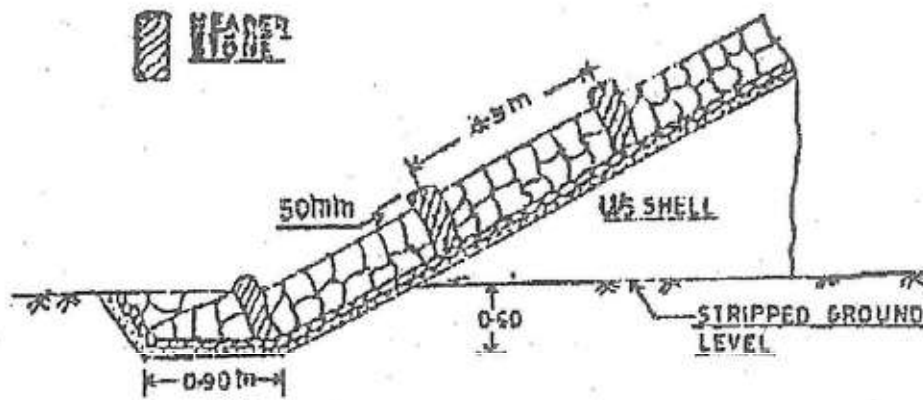


FIG. 4: RIPRAP/PITCHING AT STRIPPED GROUND LEVEL

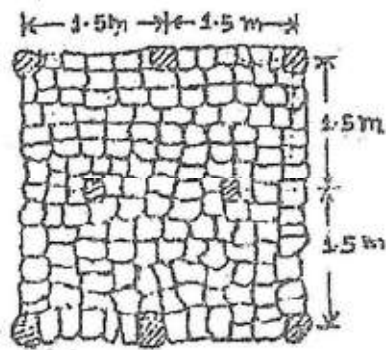


FIG. 5 ARRANGEMENT OF HEADER STONES IN RIPRAP/PITCHING

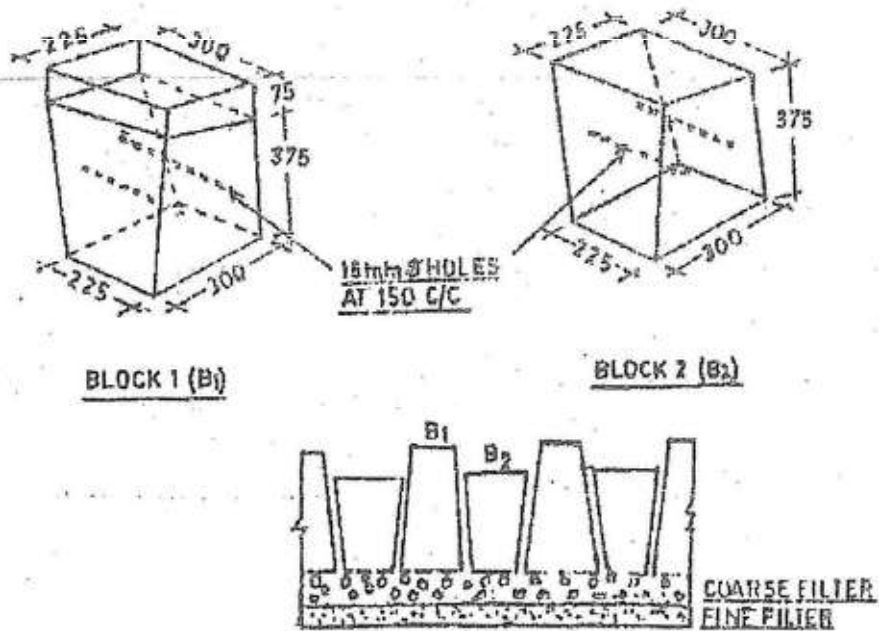


FIG. 6 TYPICAL DETAILS OF CONCRETE BLOCKS

DOWNSTREAM SLOPE PROTECTION OF RESERVOIR EMBANKMENT

1. The downstream slope of a reservoir embankment is required to be protected against erosion due to rain. Depending upon the intensity of rainfall and vulnerability of the soil to erosion due to rain, the treatment has to be different.
2. Turfing shall be provided and maintained on the entire downstream face where average annual rainfall is less than 200 cms (80").

Where turfing cannot grow or where the average annual rainfall exceeds 200cms, the downstream slope embankment shall be provided with 300 mm thick hand placed rip-rap without filter layers.

3. The erosive effect of rains will increase with the height of the embankment and hence in order to break continuity and reduce the erosion effect, a berm and longitudinal drain shall be provided for the embankment heights exceeding 15m. However, where the average annual rainfall exceeds 200cm, and/or the embankment soils are prone to erosion, the berms may be provided for embankment heights between 10 to 15m also.
4. In addition to above, where dam height exceeds 15m a system of open paved drains (chutes) along the surface starting only after the first berm and longitudinal collecting drains at the junction of berm and slope shall be provided to drain the rain water. When parapet wall is provided on the crest of dam, the above system of paved drain will start right from the top of the dam. The paved drains should generally be spaced 90m center to center. The drains may be suitably reduced based on climatic conditions. The drains may be formed by pitching or with pre-cast concrete.

A 150mm dia. pipe laid in a slope of 1 in 50 across the berm width shall be provided for discharging the water collected in the longitudinal drain to the aforesaid open paved drains/chutes.

When parapet wall is provided on the crest of dam, the top of the dam in addition to the camber may be provided with a longitudinal slope of 1 in 1000 from a ridge point between the two surface drain points i.e. 45mm from the drain. Longitudinal collecting drains at the junction of berm and slope shall also be

provided with a longitudinal slope of 1 in 1000 from a ridge point between the two drain points i.e. 45m from the drain.

The surface drain (Chute) immediately below the culvert pipe be covered with a inverted drain section or pier of pipe may be laid along the chute in about ½ m reach. The lower most chutes should drain into the main collection drain beyond the rock toe.

The above arrangement may also be followed for dams of lower height where special circumstances so worry.

5. Prevention of erosion by Tail Water: - Hand placed rip-rap (pitching) 30 cm thick over properly laid filter layer shall be provided above the rock toe up to 1m above the highest tail water level.

Hydrology:-

1. Maximum flood discharge shall be computed and approved by the competent authority :

To ensure adequate safety and reliability structures should be designed to pass design flood, Central Water Commission recommends following design flood for different categories :-

S.No.	Structure	Capacity (Mcum)	Hydraulic head(m)	Design flood
1	Small Dam	0.5 to 10	7.5 to 12	100 year
2	Medium Dam	10 to 60	12 to 30	SPF
3	Large Dam	Greater than Greater 60	30	than PMF

SPF: The Standard Project Flood is usually taken to be flood that would result from the most severe combination of meteorological and hydrological conditions considered reasonably possible in the region in question.

PMF: The Probable Maximum Flood is usually defined as the largest flood that would result from the most severe combination of critical metrological and hydrological conditions considered reasonably possible in the region of interest.

The design flood for the railway affecting tanks should be assessed on the basis of prevailing CWC guide lines applicable to the region.

CRITERIA FOR DESIGN FLOOD TO BE FOLLOWED FOR RAILWAY AFFECTING TANKS

Hydrology:

For the safe design of a hydraulic structures such as dam, weirs, barrages etc. the rational estimate of design flood is very essential. However, the requirements of safety of structures under flood conditions should not lend to over design and consequent increase in costs. For Railway Affecting tanks, the same criteria are to be followed which is applicable for other tanks also, Bureau of Indian Standard and Central Water Commission have issued guidelines applicable for design flood estimation.

- (i) Spillway of dams are to be designed as per guide lines of IS: 11223
- (ii) As per IS: 6966(1989): Criteria for hydraulic design of barrages and weirs: For purpose of design of items other than free board, a design flood of 50 year frequency may normally suffice. In such cases where risks and hazards are involved, a review of this criteria based on site conditions may be necessary. For designing the free board a minimum of 500 year frequency flood or the Standard Project Flood may be desirable.
- (iii) As per C.W.C. criteria for pickup weirs, according to Importance and level conditions and catchment area, a flood of 50 to 100 years should be adopted.

Further, keeping in view the need to avoid a catastrophe, downstream hazard potential should be assessed and check the safety of the structure for probable maximum flood be checked.

Central Water Commission has published flood estimation reports for seven hydro meteorological zones covering entire Madhya Pradesh. Based on the methodology given in these reports, unit hydrographs for the specific site be developed and by applying storm of required frequency, design flood be estimated.

GUIDELINES FOR DESIGN OF WASTE WEIR

1. Weir or spillway of dams and similar other structures for releasing the surplus water or flood which cannot be stored without creating possibility of damage to the main structure or appurtenant works or diverting the water to some other channel. These take the excess water from the reservoir and convey the same safely, back to the river or to some adjoining natural channel.

2. Types of spillways

2.1 Flow of water:

A typical flow diagram of water weir or spillway flows would include an approach channel to lead the water to the weir or control structure from weir. The water will be led to an energy dissipater over a discharge channel and then dropped to tail channel to a natural drain.

2.2 Functional Classification:

Depending upon the function, there are two types of spillways.

- (i) Service Spillway
- (ii) Emergency Spillway

Service spillway is designed to pass to design flood, which is likely to occur frequently. In major dams, emergency spillway is provided for additional safety. In case of emergency like non operation of gates of service spillway, the necessity for by-passing the service spillway, because of its failure or to take care of un-contemplated excessive floods. Fuse plug or branching section fall in the category of emergency spillways.

2.3 Classification based on features:

The spillways can also be classified according to their most prominent feature, as under.

- 1 Free Over fall (Straight Drop)
- 2 Ogee (Overflow)
- 3 Chute (Open Channel or trough)

Free Over fall (Straight Drop) Spillway:

This is the common type of spillway used for small drops. Most of the old weirs are examples of this type. A free Over fall or straight drop spillway is one in which the flow drops freely from crest. The downstream face is nearly vertical, flows either free discharging (With sharp crested control weir) or supported along the top of the broad crested weir. Occasionally the crest may be in the form of cantilevered or hanging lip. In these types, underside of the nappe is ventilated sufficiently or sketched below to prevent pulsating, fluctuating jet.

Aeration of the Nappe:

When the upper and lower nappe surfaces are subjected to full atmospheric pressure, the over falling nappe is considered as aerated.

However, insufficient aeration below the nappe, occurs in overflow spillways and weirs. This means a reduction of pressure beneath the nappe due to the removal of air by the overflowing jet. On the basis of experimental studies on spillway with gates 'Hick ox' developed an equation given the quantity of air required for aeration.

Quantity of air required in cum/ sec per metre length of Weir

$$\text{Length of Weir} = 3.135865(0.0774)^{3.64} P^{1.14}$$

Where, H = Measured head in metres over the crest.

P = Reduction of pressure in metres of water to be maintained beneath the nappe.

This type of weir is effective over wide range of tail water depths usually adopted for spillways of low earth dams. Ordinarily, the use of this structure for hydraulic drops from head pool to tail water in excess of 6 m should not be considered.

Ogee (Overflow) Spillways:-

The Ogee spillways has a control weir which has a profile made to conform closely to the low nappe of a vertical sheet of water falling from a sharp crested weir so that discharging capacity is high.

The profile of the ogee is further continued tangentially along the slope to support the sheet on the face of the overflow. A reverse curve at the bottom of the slope turns the flow into the apron of stilling basin or into the spillway discharge

channel. This is most commonly used for larger falls (Say more than 6 m) because of its high discharge efficiency.

A spillway whose discharge is conveyed from the reservoir to downstream river bed through an open channel (or through), planed either along a dam abutment or through a saddle is called chute, open channel or through type spillway. This type of spillway has been used with earth dam more often than any other type. It can be adapted to any foundation. It is particularly suited for layouts where the material from the excavation of the channel can be utilized in the construction of dam embankment.

Data for Design of Masonry Dam/ Spillways Obligatory data:

(i) Topography:-

- a. Project Report
- b. Index plan: Scale 1:50,000 showing project location, layout, borrow area, stone queries, existing roads etc.
- c. Block control plan of proposed spillway location from upstream 200 m to downstream 500 m or up to point of confluence with river in case of saddle spill way or flank spillway.

(ii) Hydrology:

- a. Catchment area of the project
- b. No of project upstream of proposed project and their details viz.
 - (i) Catchment Area.
 - (ii) Maximum outflow capacity of the spillway.
- c. Flood hydro-graphs and rainfall data available to the maximum extent.
- d. Storage capacity curve.
- e. Discharge rating curve approved by Chief Engineer in case of minor and medium project.
- f. Tall rating curve.
- g. Maximum observed flood and year of observation and the level attained.

(iii) Geological Data:

- i. L-Section of the dam location with bore holes at 30 metres c/c and 2 bores at upstream and 5 bores at downstream of proposed weir at 30 m c/c logging of bores should be done with the help of Geologist. Nature of over burden

should be stated by visual inspection and watching from the bore. Levels of sub soil water table in each bore should also be recorded. Water intake tests should be carried out in these bores.

- ii. Grid plan of Bores and other details at above point No. 1.

(iv) Other survey Data:

1. Flood carrying capacity of river downstream along with cross section of the river about 100 m to 250 m c/c up to a distance of 5.0 km from dam site or if the spillway is located at the flank cross-section of the river up to the distance of 5.0 km beyond the confluence of river and tail water channel.

(v) (a) Data on strength of rock core.

- (b) Data on strength of mortar (Compression and tension) of different mix proportion.

4.0 Principles of Hydraulic design of Ogee type spillways:

4.1 Shape of Crest:

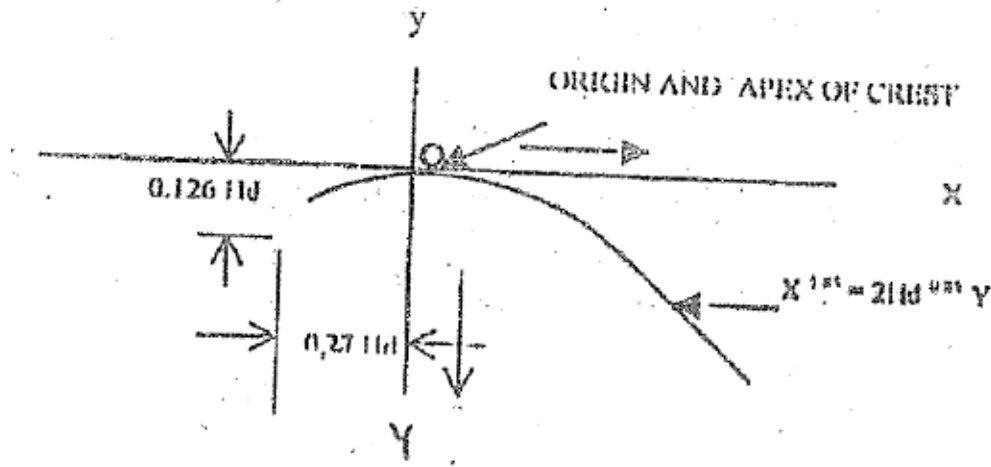
There are many types of spillway profiles adopted for the crest viz- Poondi Profiles, U.S. Army Corps of Engineers. W.E.S. Profiles, Craquire Profile, Scimeni Profile, Smetana's Profile, C.V. Davic Profile. However the profile given IS:6934-1973 to be adopted for over flow spillways. It confirms closely to the profile of the lower nappe of a ventilated sheet of water falling from a sharp crested weir. The equations for upstream and downstream quadrants for the profile and adopted by IS: 6934-1978 for hydraulic design of high Ogee overflow spillway are as under: -

- (i) For upstream quadrants

$$Y = 0.724(X + 0.270 Hd)^{1.85} + 0.126 Hd - 0.4315 Hd^{0.375} (X + 0.270 Hd)^{0.625} \\ Hd^{0.85}$$

- (ii) For downstream quadrants

$$X^{1.85} = 2 Hd^{0.85} Y$$



Where X, Y = Cartesian coordinates positive in the direction of flow head.

Hd = Design head

4.2 Discharge Over Crest

The discharge over the crest can be found out by the following formula: -

$$Q = CLH^{3/2}$$

Where Q = Discharge

C = A variable coefficient of discharge

L = Effective length of spillway crest and

H = Total head over the crest, including the head due to the velocity of approach co-efficient of discharge over broad crested weir.

The value of co-efficient of discharge over a broad crested weir depends on many factors, viz. the rounding of the upstream corner, the length and the slopes of the weir crest and the height of the weir. If the crest of the weir (approximately rectangular in cross section) is sufficiently wide, to prevent the nappe from springing free at upstream corner, the weir is classified as broad weir. If the head exceeds 1.5 to 2.0 times the crest width the jet may jump clear of the crest, in

which case the action is essentially that of a sharp crested weir. For head more than 2 times the crest width the coefficient as found out by different experiment is constant and is equal to 1.45 C. The effect of roughness of the crest must, however, be taken into account of find out true coefficient of discharge. If the upstream corner is rounded the discharge coefficient is increased. If it is not rounded and if slope of the crest is such that it is equal to loss of head due to friction, flows occur at critical depth and the discharge is given by;

$$Q = 1.705 LH^{3/2}$$

It may be noted that $C = 1.705$ is maximum value of the coefficient that is obtainable for a broad weir under any condition.

CHAPTER – II

CRITERIA FOR TYPES OF RAILWAY AFFECTING WORKS

2.General:

2.1 General

Criteria for identifying the works as “Railway Affecting” can at best be outlined under broad principles for the guidance of the Engineers. Every case has to be decided on merits taking into account some other factor e.g. local conditions such as location of Railway Affecting works whether upstream or downstream of the railway line, slope of the ground, extent of discharge in the event of failure of work, capacity of railway line to absorb the shock etc. Such criteria cannot be laid down for every conceivable shape of Railway Affecting Works. However, a few common types of Railway Affecting Work are described in the following paragraphs.

2.2 Tanks, Barrages and Weirs:

The following types of tanks, barrages and weirs may be deemed to be rail affecting.

- i. Tanks, Barrages or Weirs within 0.5 km upstream of railway line irrespective of their capacity and having a full tank/ reservoir level higher than the formation level of the Railway line.
- ii. Tank, Barrages or Weirs within 10 km upstream of the Railway line having capacity of 0.05 Mcum and more.
- iii. Tank, Barrages or Weirs between 10 - 15 km upstream of the Railway line having capacity of 0.15 M. Cum and more.
- iv. Dam, Barrages or Weirs between 15 - 30 km upstream of the Railway line having capacity of 15 M. Cum and more.
- v. A Tank, Barrages or Weirs on downstream of the Railway line where it touches the toe of railway embankment and formation level is less than 1m. from MWL.
- vi. Tank, Barrages or Weirs through which Railway line passes having MWL above danger level of the railway bridge and the Railway line.
- vii. Tank, Barrages or Weirs on upstream of railway line past history of breaches affecting working of the railways and not re-modeled to cope with known surplus discharge.
- viii. A Tank, Barrages or Weirs or a series of Tank, Barrages or Weirs in the

catchment of the stream crossing the Railway line, where the catchment area of the stream at the crossing point is 250 sq. km or more and the combined catchment area of the Tank, Barrages and weir is not less than 5% of the total catchment area of the stream at the crossing point.

Canals and Drainage Channels

- 2.3 Following may be considered as Railway Affecting Works.
- i. All canal crossing Railway lines, having discharge of more than 1.5 cumecs and having F.S.D. 0.3 M and more above the ground level.
 - ii. Channels on upstream of the railway line running parallel or oblique including the drainage channels having F.S.L. being 0.3 M or more above the ground level.
 - iii. Discharge between 7 to 15 cumecs and within range of 0.5 km from railway line.
 - iv. Discharge between 15 to 30 cumecs and within range of 1.0 km from railway line.
 - v. Discharge more than 30 cumecs and within range of 1.5 km from railway line.

Road Embankments:

- 2.4 Road Embankments higher than 3 m with bridges, culverts and retaining wall within 1.0 km on either side of railway line may be considered as Railway Affecting Works.

Bunds:

- 2.5 The following may be considered as Railway Affecting Works, if located within 5.0 km of the railway line.
- i. Marginal bunds on upstream or downstream side on one/ both banks of the river crossing the railway line.
 - ii. Protection bunds or works for diverting flow from one channel to another or for prevention of flow through a defunct channel, crossing the railway line on the upstream of the bund or works so constructed.

Protection Works on Rivers:

- 2.6 Protection works on rivers like groynes, repelling/deflecting spurs, and retired bunds are constructed either by State Government or Railways or

jointly by State Government and Railways, for regulating and controlling the flow. Failure of such work can endanger not only the bridge across the river but also the railway embankments at other places. These may be considered as Railway Affecting Works if located within 5 km upstream of railway line.

Temporary Canals taken from Rivers and other works

2.7 Sometimes channels are dug out from dry or nearly dry beds of stream or from active rivers to tap and divert the water for irrigation or other purposes. During heavy rains a large quantity of water may find its way along these channels and flood the adjoining areas, especially near the tail ends of these channels. In such case, if the general slope of the ground is falling towards the railway line, it may cause the danger to the railway line in the same way as a canal bursting its bank in the vicinity of the railway line would. These may be considered as Railway Affecting Works, if located within 5 km upstream of railway line.

CHAPTER-III
INSPECTIONS AND REPAIRS

Inspecting Authority:

3.1 The Railway Affecting Works falling within the jurisdiction of concerned Assistant Engineers of the State Government Department will be inspected by them. For inspection of works owned by the Revenue Department, Quasi Government, Local bodies, Private bodies and individuals etc., the inspection will be done by the Assistant Engineer of Rural Engineering Services in whose area such work located.

3.2 The concerned Assistant Engineer or the other nominated officers by State Government shall inspect every Railway Affecting Work in his jurisdiction soon after the monsoon and submit his report to his Executive Engineer (or equivalent nominated Officer of State Government) and Divisional Engineer (Railway) in duplicate by the end of December every year. This report be accompanied by certificate of soundness for the work in good condition and approximate estimates for repairs for those works not considered in sound condition. The Executive Engineer (or equivalent nominated Officer of State Government) and Divisional Engineer (Railway) concerned may bring some important points to the notice of their Chief Engineers if necessary.

3.3 Proforma for the inspection of Railway Affecting Works are indicated at Appendices- II (A) through II (G). Alternatively a certificate as prescribed in Appendices- II (A) through II (G) will be sufficient for Water Resources and Public Works Departments, where such inspections are carried out and recorded periodically in accordance with codal provisions. Divisional Engineers of Railway will carefully scrutinize the report received from the concerned inspecting Officer of State Government and take note of the works not considered in sound condition. He will then ask his Assistant Engineer to jointly inspect such works with the concerned inspecting officer of the State Government and submit his report to the Divisional Engineer. The Divisional Engineer will correspond and request the State authority to concerned, to carryout and complete necessary repairs well before the next monsoon.

3.4 The parties concerned should regularly inspect and maintain Railway Affecting Works in accordance with the procedure and schedule laid down in this chapter for this purpose, so as to ensure that the works remain in fit and sound condition. Any repairs or strengthening needed should be carried out with utmost expedition before the onset of the monsoon. The Railway's representative should have access and be given facility to inspect the works, their maintenance and operation. Any request from railway administration in connection with strengthening, repairs, maintenance or operation of such works to ensure the safety of Railway lines should also be attained with promptitude so that Central Government is not forced to any action vide clause 20 in chapter- 4 of Indian Railways Bill 1989 (at Appendix-VII). Detailed instruction for operations of such works should be laid down by the Executive Engineer of the concerned State Government or designated officer for works of Revenue Department, Quasi Government/ Local Bodies, Private Bodies and Individuals etc. This instruction should be followed by the parties concerned.

3.5 For works existing before construction of railway line the strengthening required, where felt necessary by the Railways, shall be carried out at the cost of Railways.

ANNEXURE- I(A)

Statement showing the Designation and Addresses of the Senior Divisional Officers of central, South Central, South Eastern and Western Railways to be associated in concerned districts of Madhya Pradesh with Railway Affecting Tanks/works.

CUG list of HQ Officers as on 05.02.13

Sr.no	Name S/Shri	Designation	CUG. No
1	D. D. Dewangan	PCE	9752415200
2	R. K. Meena	CTE	9752415201
3	B. K. Gupta	CE/TP	9752415207
4	R. N. Sunkar	CBE	9752415202
5	Kaushal Kishore	CE/G	9752415203
6	P. K. Singh	CE/C-I	9752415350
7	A.K. Dadarya	CE/C-II	9752415204
8	O. P. Tanwar	CPDE	9752415206
9	G.L. Goel	SAG	9752415349
10	Rajesh Agarwal	SAG	
11	D.C. Gupta	Dy.CE/TP	9752415213
12	R.S. Rajput	Dy.CE/C/Wks	9752415214
13	A.K. Khare	Dy.CE/Tr-I	9752415348
14	Pranav Kumar	Dy.CE/TMC	9752415215
15	G.P. Mishra	Dy.CE/Br.L	9752415211
16	J.N. Verma	Dy.CE/G	9752415208
17	S.K. Roy	Dy.CE/HQ	9752415216
18	K.K. Pali	Dy.CE/Tr-II	9752415209
19	G.N. Pandey	Dy.CE/P&D	9752415212
20	A.K. Tiwari	Secy to PCE	9752415222
21	Ravindar Sharma	SEN/Tr-II/HQ	9752415228
22	Shatrughan Singh	SEN/TMC/HQ	9752415298
23	S. B. Sharma	SEN/Wks/HQ	9752415233
24	B. K. Paliwal	SEN/TP-II/HQ	9752415224
25	V. K. Chaturvedi	SEN/G/HQ	9752415226
26	Sudhir Parihar	SEN/Br.D/HQ	9752415210
27	Alok Shrivastava	XEN/Br.D/HQ	9752415227
28	Ramdas	SEN/TP-I/HQ	9752415229
29	Rajesh Tripathi	SEN/Tr-I/HQ	9752415225
30	K. A. Qureshi	AEN/LM/HQ	9752415241
31	K. P. Rasaniya	AXEN/C-II/HQ	9752415377
32	J. S. Dahiya	AEN/Br.D/HQ	9752415248
33	M. C. Mehra	AXEN/G/HQ	9752415237
34	P. K. Gupta	AEN/Control/HQ	9752415255
35	S. K. Khare	AXEN/C-I/HQ	9752415351

CUG list of Jabalpur Division Officers as on 03.01.13

Sr.no	Name S/Shri	Designation	CUG. No	Telephone no.Rly(015)
1	Rajesh Agrawal	Sr.Divisional Engineer/Co	9752418200	55300-301
2	Sanjeev Kumar	Sr. Divisional Engineer /W/Jabalpur	9752418202	55304-305
3	S.K. Shukla	Sr Divisional Engineer /N/ Jabalpur	9752418201	55308-309
4	Deepak Muke	Divisional Engineer /HQ/ Jabalpur	9752415223	55376
5	D. R. Bharti	Divisional Engineer /E/ Jabalpur	9752418204	55306-307
6	A. H. Ansari	Divisional Engineer /S/ Jabalpur	9752418203	55310
7	H. C. L. Rawat	Sr. Asstt. Divisional Engineer / Satna	9752418217	65220-221
8	Jai Prakash	Asstt. Divisional Engineer /Sagar	9752418213	67202
9	Ramendra Pandey	Asstt. Divisional Engineer /S/ Jabalpur	9752418210	55318-319
10	B. D. Ahirwar	Asstt. Divisional Engineer /Narsingpur/jabalpur	9752418212	62210
11	P. K. Shrivstava	Asstt. Divisional Engineer /Beohari	9752418216	8592100
12	S. P. Singh	Asstt. Divisional Engineer /HQ/ Jabalpur	9752418205	55314
13	Rajesh Patel	Asstt. Divisional Engineer /West/Katni	9752418215	64359
14	Het Singh	Asstt. Divisional Engineer /East/ Katni	9752418214	64369
15	Sanjay Dubey	Asstt. Divisional Engineer /M/ Katni	9752418206	64239

CUG list of Bhopal Division Officers as on 03.01.13

Sr.no	Name S/Shri	Designation	CUG. No	Telephone no.(015)
1	Manish Gupta	Sr. Divisional Engineer Co/ Bhopal	9752416200	5300-301
2	Rishi Gangwar	Sr. Divisional Engineer /N/ Bhopal	9752416201	5302-03
3	Sandeep Jain	Divisional Engineer /S/Bhopal	9752416202	5304-05
4	Gaurav Mishra	Asstt. Divisional Engineer /Harda	9752416210	4800-01
5	Sushil Kumar	Asstt. Divisional Engineer /Guna	9752416208	2300
6	Kailash Meena	Asstt. Divisional Engineer /Bina	9752416209	3360
7	R. M. Kaushik	Asstt. Divisional Engineer /Shajapur	9752416211	
8	S. K. Pardesi	Asstt. Divisional Engineer /Shivpuri	9752416206	(016)0074- 232
9	C. K. Thomas	Asstt. Divisional Engineer /Itarsi	9752416205	4450
10	A. K. Sharma	Asstt. Divisional Engineer /Bhopal	9752416207	(016)6310
11	Ramakant Panday	Divisional Engineer /W/ Bhopal	9752416203	

CUG list of Kota Division Officers as on 03.01.13

Sr.no	Name S/Shri	Designation	CUG. No	Telephone no.(017)
1	L. P. Singh	Sr. Divisional Engineer /Co/Kota	9001017200	44400-01
2	Vijay Pandey	Sr. Divisional Engineer /N/ Kota	9001017202	44406-07
3	S. K. Yadav	Divisional Engineer /S/ Kota	9001017201	44404-05
4	Suresh Singh	Divisional Engineer /East/ Kota	9001017205	44408-09
5	S. K. Khullar	Asstt. Divisional Engineer /Gnagapur City	9001017215	43220-21
6	Rahul Jaipuriyar	Asstt. Divisional Engineer /Bharatpur	9001017214	47220-21
7	Mahendra Singh	Asstt. Divisional Engineer /Sawaimadhopur	9001017216	42220-21
8	Neeraj Shrivastava	Asstt. Divisional Engineer /Shamgarh	9179094472	41220-21
9	Bhuneshwar Tripathi	Asstt. Divisional Engineer /Ramganjmandi	9001017206	44416

The list of Railway officials to be contacted during any emergencies is as under:

Section Engineer/p.way		Section	Route km		ADEN with phone no	DEN
Jurisdiction	Phone no		from	to		
KHANDWA	09730471247 KNW-	PAU	568.00	638.00	Sri Chandra Mohan ADEN/AKOLA Sr. DEN/NED (09730471255) (09730471202)	Sri Rajanish Saroj

Name	Designation	Phone No.
Sri Rajkumar Wankhede	Sr.DEN/Co-ord/NED	09730471200 02462223630
Chief Controller	Nanded	02462261729
Engineering Control	Nanded	02462223416
Headquarters:		
Sri S k Shrivastav	Chief Engineer/WS & Floods	09701370206
Sri Pradeep kumar	Dy. Chief Engineer/LC & Floods	09701370212
Sri L N Gowri Shankar	Asst. Executive Engineer/Floods	09701370233
Engineering Control- Fax	Headquarts, Secunderabad	040-27824143

ANNEXURE-1 (B)

Statement showing the Designation and Addresses of the Executive Engineer of M.P. Water Resources Department to be associated in concerned districts of the Madhya Pradesh with Railway affecting tanks/works.

S.No.	District	Details of Executive Engineers with addresses and telephone Nos.		Telephone Nos.	
		Designation Address		Office	Residence
(1)	(2)	(3)	(4)	(5)	(6)
1.	Anuppur	Executive Engineer	Water Resources Dn. Annuppur	07659-222355	
2.	Ashoknagar	-do-	Water Resources Division, Ashoknagar	07543-220607	
3.	Alirajpur	-do-	Water Resources Division, Alirajpur	07394-233631	233519
4.	Balaghat	-do-	Wainganga Division Balaghat	07632-241340	247922
		-do-	Survey Divn. Balaghat	07632-240738	241268
		-do-	Banjar Project Divn. Baihar	07636-256328	
		-do-	Rajiv Sagar Project Divn. No.3 Katangi.	07630-250147	250159
		-do-	Rajiv Sagar Project Divn. No.2 Kudwa	07630-278475	278448
5.	Betul	-do-	Water Resource Division, Betul	07141-238350	238346
		-do-	Water Resource Division, Multai	07147-224318	224439
6.	Bhopal	-do-	Water Resource Division, Bhopal	0755-2553096	2750566
7.	Bhind	-do-	Water Resource Division, Bhind	07534-245702	245945
8.	Badwani	-do-	Water Resource Division, Badwani	07290-222006	222085
9.	Burhanpur	-do-	Water Resource Division, Burhanpur	07325-241323	241125
10.	Chhindwara	-do-	Water Resource Division, Chhindwara	07162-248586	242821
		-do-	Water Resource Division, ...	07162-222202	222208

S.No.	District	Details of Executive Engineers with addresses and telephone Nos.		Telephone Nos.	
		Designation Address		Office	Residence
(1)	(2)	(3)	(4)	(5)	(6)
11.	Chhatarpur	-do-	Water Resource Division, Nowgong	07685-256341	256156
		-do-	Bariyarpur LBC Divn. Rajnagar Distt. Chhatarpur	07682-248340	
12.	Dewas	-do-	Water Resources Division, Dewas	07272-250517	252259
13.	Datia	-do-	Rajghat Distributary Divn. No.9, Datia	07522-235672	233233
14.	Dhar	-do-	Water Resources Division, Dhar	07292-222539	222299
		-do-	Water Resources Division, Manawar	07294-232254	232232
15.	Dindori	-do-	Water Resources Division, Dindori	07644-234652	234043
16.	Damoh	-do-	Water Resources Division, Damoh	07812-222779	222760
17.	Guna	-do-	Water Resources Division, Guna	07542-256415	251062
		-do-	Water Resources Division, Raghogarh	07544-2622234	
18.	Gwalior	-do-	Water Resources Division, Gwalior	0751-2345996	
		-do-	Dam Safety Divn. Gwalior	0751-2340188	
		-do-	Water Resources Division, Dabra	07524-222787	
19.	Hoshangabad	-do-	Tawa Project, Divn. Itarsi.	07572-266134	266087
		-do-	Tawa Canal Division, Seoni, Malwa	07570-220669	
		-do-	Tawa RBC Divn. Sohagpur	07575-278229	278230
		-do-	Handiya LBC Division, Timarni	07573-230041	230042
20.	Harda	-do-	Water Resources Division, Harda	07577-222065	222174

21.	Indore	-do-	Water Resources Division, Indore	0731-2490177	
22.	Jabalpur	-do-	Hiran Water Resources Division, Jabalpur	0761-2602441	2320329
23.	Jhabua	-do-	Water Resources Division, Jhabua	07392-244225	243375
		-do-	Mahi Project Division Petlawad	07391-266080	266081
24.	Katni	-do-	Water Resources Division, Katni	07622-235269	
25.	Khargone	-do-	Water Resources Division, Khargone	07282-241220	231295
26.	Khandwa	-do-	Water Resources Division, Khandwa	0733-2223112	2223268
27.	Mandsaur	-do-	Water Resources Division, Mandsaur	07422-242268	
		-do-	Gandisagar dam Division, Gandhisagar	07427-237114	237113
28.	Morena	-do-	Water Resources Division, Morena	07532-234352	
29.	Mandla	-do-	Water Resources Division, Mandla	07642-252220	252233
		-do-	Water Resources Division, Niwas	07641-231230	231231
30.	Narsinghpur	-do-	Water Resources Division, Narsinghpur	07792-230342	230265
		-do-	Linght Machinery Divn. Narsinghpur	07792-230328	230265
31.	Neemuch	-do-	Water Resources Division, Neemuch	07423-232411	257005
32.	Panna	-do-	Water Resources Division, Panna	07732-252075	252041
33.	Rewa	-do-	Water Resources Division, Rewa	07662-256071	
		-do-	Keoti Canal, Dn. Rewa	07662-256726	251845
		-do-	Upper Purwa canal Dn. Rewa	07662-256710	250605

		-do-	Bansagar Distributary Divn. Rewa	07662-254504	226588
34.	Ratlam	-do-	Water Resources Division, Ratlam	07412-270440	267125
35.	Raisen	-do-	Water Resources Division, Raisen	07482-222068	222342
36.	Rajgarh	-do-	Water Resources Division, Rajgarh	07372-255182	255183
		-do-	Water Resources Division, Narsingarh	07375-245608	
37.	Satna	-do-	Water Resources Division, Satna	07672-222378	
		-do-	Purwa canal Dn. Satna	07672-250596	
38.	Shahdol	-do-	Water Resources Division No.2, Shahdol	07652-240314	245894
		-do-	Masonry Dam Divn. No. 3, Deolond	07650-268521	268610
39.	Sidhi	-do-	Water Resources Division No. 1, Sidhi	07822-252329	252514
		-do-	Mahan Canal Divn. Sidhi	07822-252534	
		-do-	Lower Sihawal canal Dn. Churhat	07802-272329	
40.	Singrauli	-do-	Water Resources Dn. No 2 Singrauli	07805-234653	
41.	Shivpuri	-do-	Water Resources Division, Shivpuri	07492-221354	221265
42.	Sheopur	-do-	Water Resources Division, Sheopur	07530-252703	222533
43.	Sagar	-do-	Water Resources Division No.1, Sagar	07582-223809	272288
		-do-	Water Resources Division No.2, Sagar	07582-240097	
44.	Sehore	-do-	Water Resources Division, Sehore	07562-224033	224260
45.	Shajapur	-do-	Water Resources Division Shajanur	07364-228733	229744

46.	Seoni	-do-	Water Resources Division No.1, Seoni	07692-220559	220521
		-do-	Tilwara L.B.C. Divn. Keolari	07694-235229	235298
47.	Tikamgarh	-do-	Water Resources Division, Tikamgarh	07683-245304	
		-do-	Survey Division Tikamgarh	07683-240134	
48.	Umariya	-do-	Water Resources Division, Umariya	07653-222226	223556
49.	Ujjain	-do-	Water Resources Division, Ujjain	0734-2516548	2519846
50.	Vidisha	-do-	Water Resources Division, Vidisha	07592-233548	233547
		-do-	Water Resources Division, Ganjbasoda	07594-220403	220415
		-do-	Samrat Ashok Sagar Dam Division, Vidisha	07592-250469	

Appendix I
Statement of Financial and Miscellaneous Powers exercised by
Officers of the W.D. in Respect of Matters other than Establishment
(Appendix-2.30 of the M.P.Works Departmental Manual)

Powers of Authority

E.E. **S.D.O.**
(6) **(7) (8)**
Rs. Rs.
50,000

Note: - 1. Extension and improvements that can be for seen must be considered together for a whole project at one time and the limits prescribed must not be applied to individual works forming part of a proposal.
2. Survey estimates shall not be split up into Sub-estimates to avoid obtaining approval of competent authority.

Item No.	Particulars	E in C	C.E.	S.E.
(1)	(2)	(3)	(4)	(5)
1	To accord administrative approval for survey and investigation of works/projects.		Rs. 10.00 lakhs	Rs. 5.00 lakh
2	To accord administrative approval for the investigation of Preliminary feasibility proposals for the improvement of existing works irrespective of what the cost of the work is likely to be.		Rs. 25,000	Rs. 5000
3	To accord administrative approval to estimates for works of modification, addition and alteration relating		Rs. 50,000	Rs. 10,000 [49]

Item No.	Particulars	Powers of Authority				E.E. (6)	S.D.O. (7) (8)
		E in C (3)	C.E. (4)	S.E. (5)			
	to Govt. buildings used as W.D. office, store, godown, rest house, inspection bungalow.						
4	To accord administrative approval to estimates for addition and alterations to residential buildings of W.D. intended for the occupation of the officials of the W.D.		Up to a limit of 50,000				Class of building should not change due to addition and alteration.
5	To accord administrative approval to special repair work.		Rs. 5.0 lakhs	Rs. 50,000	Rs. 5000		
	Sanction to estimates						
6	To accord technical sanction to estimates for new works, including survey and investigation of projects, suspense estimates such as running and maintenance of tools and plants, earth-moving equipments, transport vehicles etc.		Full powers	Rs. 1.00 crore	Rs. 20.00 lakhs	Rs. If the amount of 5,000 the estimate exceeds the amount for which administrative approval is given by more than 20% revised administrative approval must be obtained before the estimate is sanctioned.	

Item No.	Particulars	Powers of Authority				S.D.O. (7) (8)
		E in C	C.E.	S.E.	E.E.	
(1)	(2)	(3)	(4)	(5)	(6)	
7	To sanction the execution of deposit (contributonal) work by W.D. The limits represent the cost of the work exclusive of the percentage charges.		Rs. 2.5 lakhs	Rs. 1.0 lakh	Rs. 25,000	
8	To accord technical sanction to estimates for ordinary repairs to buildings, roads, irrigation and PHE works.				Full powers within his budget allotment	
9	To accord technical sanction to estimates for special repairs to buildings, roads, irrigation and PHE works.		Full powers	10.00 lakhs	Up to Rs. 1.0 lakh	
10	To classify expenditure on minor additions and alterations to non-residential buildings/external services as petty works expenditure and to debit it to "repairs".			Rs. 5,000		

Item No.	Particulars	Powers of Authority				E.E. (6)	S.D.O. (7) (8)
		E in C (3)	C.E. (4)	S.E. (5)			
11	To classify expenditure on minor additions and alterations to residential buildings as petty works expenditure and to debit it to "repairs".			Up to Rs. 1000 in any one builds in any one year provided that funds are available from the annual repairs grant.			
12	To debit to "repairs" the cost of petty and miscellaneous items of work in respect of a road work.		Rs. 1.25 lakh in any one case	Rs. 50,000 in	Rs. 12,000 in any one case		
13	To sanction estimates for (ordinary) tools and plant including mathematical instruments.		Full powers	Rs. 25.00 lakhs in a year	Rs. 25,000 in a year		For powers Concerning machines See Appendix 5.07
14	To sanction estimates for repairs to (ordinary) tools and plant including mathematical instruments.			Full power within the budget provision for his circle.	Rs. 25,000 in a year		Rs. 500 For powers in a Concerning year machines See Appendix 5.07

Item No.	Particulars	Powers of Authority				S.D.O. (7) (8)
		E in C (3)	C.E. (4)	S.E. (5)	E.E. (6)	
15	To sanction estimates for repairs to tools and plants used for water supply and sanitation schemes.		.	Full power within the budget provision for his circle.	Rs. 10,000 in a year	
16	To sanction estimates for Office furniture for newly created offices.		Full powers as per scale/amount fixed for his office	Full powers as per scale/amount fixed for his office	Full powers as per scale/amount fixed for his and S.D.O's offices	Nil Scale of furniture/amount shall be fixed by the Government.
17	To sanction estimates for "losses on stock" under the minor head "Civil" works.			Rs. 25,000	Rs. 2500	
	Excess over Estimate					
18	To pass excesses over estimate, after Full powers obtaining the revised administrative approval where necessary.		Full powers. 10% in	(1) Upto the case of estimates originally sanctioned by the C.E. provided the amount of this excess does not	(1) Upto 10% in the case of estimates originally sanctioned by the S.E. provided the amount of this	

Item No.	Particulars	Powers of Authority				S.D.O. (7) (8)
		E in C (3)	C.E. (4)	S.E. (5)	E.E. (6)	
				exceed his powers of technical sanction.	excess does not exceed his powers of technical sanction.	
19	Power to split up sanctioned estt. For purpose of calling tenders, awards of contracts to issue work orders, piece work, etc.		Full powers for estimates sanctioned by him.	Full powers for estimates sanctioned by him.	Full powers for estimates sanctioned by him.	
20	To accept tenders for works.	Up to Rs. 1.5 crore	Up to Rs. 1.0 crore	Up to Rs. 40 lakhs	Up to Rs. 20 lakhs	
21	To sanction the payment of lump sum for any item of work		Full powers	Up to Rs. 5,000	Rs. 1000	

Note: 1. No lump sum payment may be made for any item which is susceptible for measurement notwithstanding that such Provision exists in the sanctioned estimate.

Item No.	Particulars	Powers of Authority				S.D.O. (7) (8)
		E in C (3)	C.E. (4)	S.E. (5)	E.E. (6)	
						(2) The S.E. or the E.E. or the S.D.O. would not submit to the higher authority a tender which is within his power of acceptance but which contains one or more lump sum items the payment of which requires the sanction of a higher authority. In such cases the S.E. or the E.E. may accept the tender but separate sanction of the competent authority should be obtained for payment of the lump sum items.
22	To accept contracts for playing ferries and tolls on bridges			Full powers	Up to Rs. 75,000	
23	Power to award works on piece work agreement for the works taken up departmentally.			Rs. 2.5 lakhs	Rs. 50,000	Note: 1. Unregistered contractors may be allowed to execute the works up to Rs. 5,000 under this system.

Item No.	Particulars	Powers of Authority				E.E. (6)	S.D.O. (7) (8)
		E in C (3)	C.E. (4)	S.E. (5)			
(1)	(2)	(3)	(4)	(5)	(6)	(7) (8)	

2. Estimates sanctioned by the C.E. may be split up by the S.E. with the approval of the former, and the E.E. may split up the estimate sanctioned by the S.E. with the approval of letter.

APPENDIX-1 (A)

(Para.....)

**PROFORMA FOR PARTICULARS OF THE RAILWAY AFFECTING
TANKS/BARRAGES/WEIRS/REGULATORS**

StateRailway
.....

Notes :-

- (i) Levels refer to GTS/RAIL level at Bridge.
- (ii) Columns to be filled in by Railways shown @
- (iii) Dimensions to be in metres.

1.0 Name of the work :

1.1 Reasons for considering it Railway affecting :

1.2 Serial No./(Distt.)/Department/No. :

1.3 Ownership :

1.4 State Government :

1.4.1 Authority for maintenance :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.4.2 Authority for communicating warnings :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

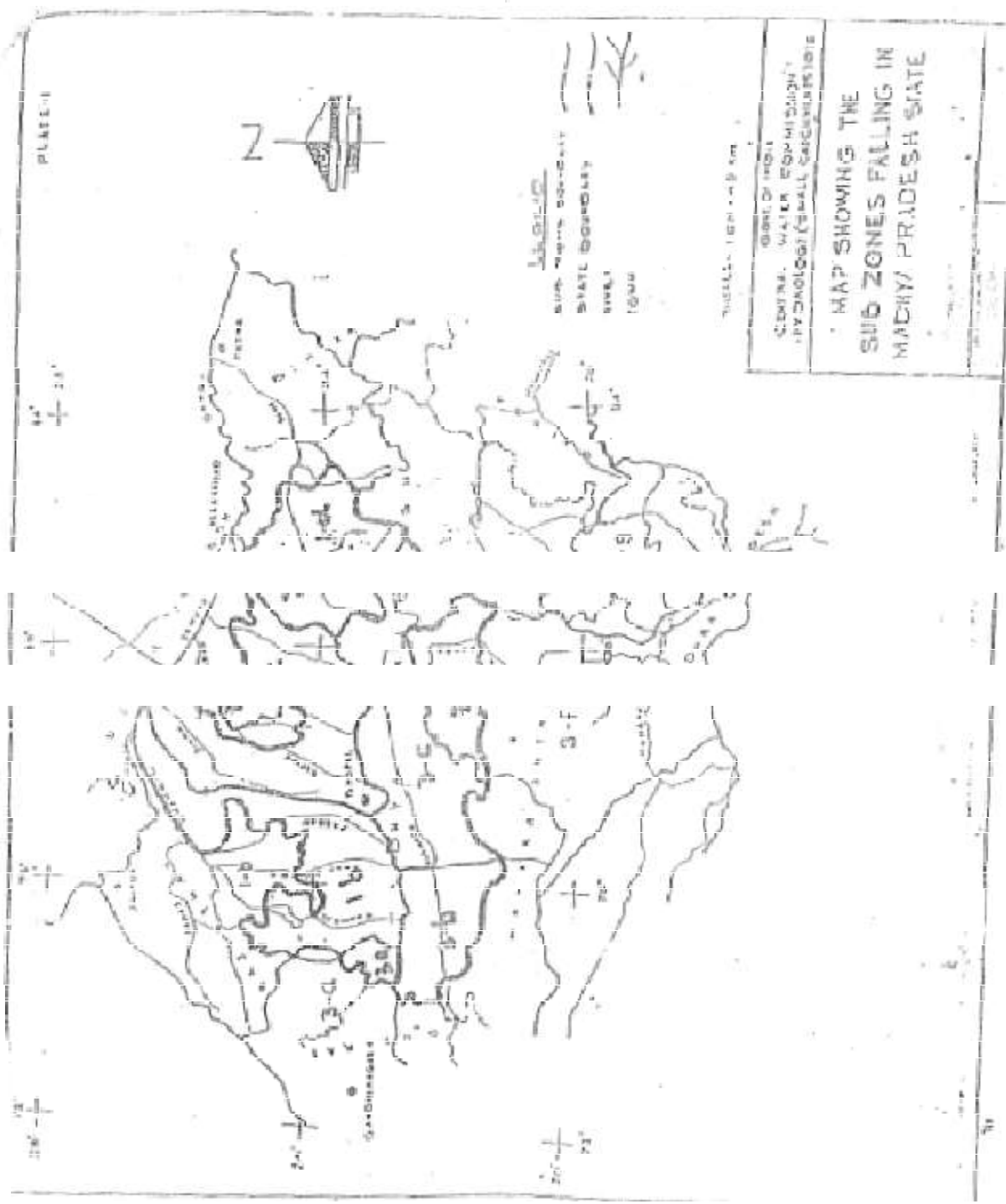
- (d) Telegraphic Address :
- 1.5 Railways @
- 1.5.1 Authority for Joint Inspection :
- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :
- 1.5.2 Authority for receiving warnings :
- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :
- 2.0 Details of Tank/Barrage/Weir/Regulator :
- 2.1 Location :
- 2.1.1 Longitude :
- 2.1.2 Latitude :
- 2.1.3 Topo Map No. :
- 2.1.4 Nearest Village :
- 2.1.4.1 Distance in Kms from nearest village :
- 2.1.5 Nearest Railway Station
- 2.1.5.1 Distance in Kms from nearest Railway Station :

(Indicate Left/Right with reference to the
Increasing kilometreage of Railway track) :

- 2.2 (a) Distance from Railway track :
- (i) At its nearest place :
- (ii) Corresponding Railway Kilometreage :
- (iii) At its farthest place :
- (iv) Corresponding Railway Kilometreage :
- 2.2 (b) Physical features of Tank/Barrage/Weir/Regulator :
- 2.2.1 Catchment Area in Sq. Kms. :
- 2.2.2 Gross capacity in M.Cum. :
- 2.2.3 Full Tank level :
- 2.2.4 Maximum water level :
- 2.2.5 Level of Top of Dam/Barrage/Weir/Regulator :
- 2.2.6 Maximum height of Dam/Barrage/Weir/Regulator:
- 2.2.7 Top width of dam/Barrage/Weir/Regulator :
- 2.2.8 Side slopes :
- (a) Up stream side :
- (b) Downstream side :
- 2.2.9 (A) Length of Dam/Barrage/Weir/Regulator :
- (a) Earthen :
- (b) Masonry :
- 2.2.9 (B) Width
- 2.2.9 (C) Depth/Height :
- 2.2.9 (D) Bed level
- 2.2.10 Surplussing weir :

- (a) Type : Gated/ungated :
 - (b) Length :
 - (c) Design Discharge of surplussing weir :
(cumecs)
- 2.2.11 Level of Pen-stock outlets at different levels :
- 2.2.12 Design discharge at each set of pen-stock :
- Working at a time.
- 2.2.13 Crest levels of different spillways & waste :
weir or sluice gates.
- 2.2.14 Design discharge of each spillway :
- 2.2.15 Total combined discharge of both pen stock :
and spill at different levels working at one time
- 2.2.16 Any reduction in discharge in item :
- 2.2.12 Between the work and the bridge due to :
canals taking off etc.
- 2.2.17 Direction of flow of water in case of breach/ :
Failure.
- 2.2.18 Minimum designed free Board :
- 3.0 (a) Nos. of Railway bridges likely to be affected :
- 3.0 (b) Details of affected Railway bridge @
- 3.1 Section :
- 3.2 Railway bridge No. :
- 3.2.1 Kilometreage :

- 3.3. Span & Type :
- 3.4 Rail level :
- 3.5 Bottom of girder/slab or springing of Arch :
- 3.6 HFL with year :
- 3.7.1 Average Bed Level :
- 3.7.2 Danger level :
- 3.8 Total water way in Sq.m :
- 3.9 Foundation
- (i) Type (Open/Pile/Well) :
- (ii) Depth of foundation :
- (iii) Nature of Strata with depth :
- 3.10 Maximum height of embankment :
- 3.11 Flooring/Protection work :
- 3.12 Remarks with special reference to past History :
- 4.0 Details of affected Railway line @
- 4.1 Section
- 4.2 Length at Railway line (in Railway Kilometreage) :
- Vulnerable for damage in Kilometres-from-Kms
- To Km. in the event of damage to the Tank/
Barrage/Weir/Regulator.
- 4.3 Between Stations :
- 4.4 Maximum Height of embankment :



APPENDIX-1 (B)

(Para.....)

**PROFORMA FOR PARTICULARS OF RAILWAY AFFECTING
ROAD BRIDGES (INCLUDING CAUSEWAYS, CULVERTS ETC.)**

StateRailway
.....

Notes :-

- (i) Levels refer to GTS/RAIL level at Bridge.
- (ii) Columns to be filled in by Railways shown @
- (iii) Dimensions to be in metres.

- 1.0 Name of road/bridge/river :
- 1.1 Reasons for considering it Railway affecting :
- 1.2 Serial No./(Distt.)/Department No. :
- 1.3 Bridge No./Road Kms. :
- 1.4 Ownership :
- 1.5 State Government :
 - 1.5.1 Authority for maintenance :
 - (a) Designation :
 - (b) Postal Address with Pin Code No. :
 - (c) Telephone No. :
 - (d) Telegraphic Address :
 - 1.5.2 Authority for communicating warnings :
 - (a) Designation :
 - (b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.6 Railways @

1.6.1 Authority for Joint Inspection :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.6.2 Authority for receiving warnings :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

2.0 Details of road bridges :

2.1 Location :

2.1.1 Longitude :

2.1.2 Latitude :

2.1.3 Topo Map No. :

2.1.4 Nearest Village :

2.1.4.1 Distance in Kms from nearest village :

2.1.5 Nearest Railway Station

2.1.5.1 Distance in Kms from nearest Railway Station :

(Indicate Left/Right with reference to the

Increasing kilometres of Railway track)

2.2	Physical features of Road Bridges	:
2.2.1	Class of Bridge (I.R.C.AA/A/B) loading	:
2.2.2	Number X span and Type	:
2.2.3	Length between abutments	:
2.2.4	Type of bearing	:
2.2.5	Width of roadway between the kerbs	:
2.2.6	Top level of road	:
2.2.7	Bottom of girder/slab or springing of arch	:
2.2.8	Lowest Bed Level	:
2.2.9	Total water way in sq.m .	:
2.2.10	Foundation	
	(i) Type (Open/Pile/Well)	:
	(ii) Depth of foundations	:
	(iii) Nature of strata with depth	:
2.2.11	Materials in	
	(i) Superstructure	:
	(ii) Sub-structure	:
2.2.12	Protective works on approaches	:
	(Pitching, hand rails or guard stones)	
2.2.13	Distance from Railway track	:
	(indicate left/right with reference to Increasing kilometreage of Railway track)	

2.3	Hydraulic features of Road Bridge	:
2.3.1	Catchment area in sq. kms.	:
2.3.2	Maximum flood level observed (with year)	:
2.3.3	Maximum scour observed (Extent, location and year).	:
2.3.4	Description of protection works in river (Guide bunds, Aprons etc.)	:
2.3.5	General remarks on behavior of river	:
3.0	Details of affected Railway bridge @	:
3.1	Section	:
3.2	Railway bridge no.	:
3.2.1	Kilometreage	:
3.3.	Span & Type	:
3.4	Rail level	:
3.5	Bottom of girder/slab or springing of arch	:
3.6	HFL with year	:
3.7	Lowest Bed Level	:
3.8	Foundation	:
3.8.1	Type (Open/Pile/Well)	:
3.8.2	Depth of foundation	:
3.8.3	Nature of Strata with depth	:
3.9	Maximum height of embankment	:
3.10	Remarks with special reference to past History	:

- 4.0 Details of affected Railway line @
- 4.1 Section
- 4.2 Kilometres fromto
- 4.3 Between Stations :
- 4.4 Maximum Height of embankment :

APPENDIX-1 (C)

(Para.....)

PROFORMA FOR PARTICULARS OF RAILWAY AFFECTING CANAL CROSSING WITH/WITHOUT HEAD WORKS & APPROACH BANKS

StateRailway

Notes :-

- (i). Levels refer to GTS/RAIL level at Bridge.
- (ii) Columns to be filled in by Railways shown @
- (iii) Dimensions to be in metres.

1.0 Name of canal crossing :

1.1 Reasons for considering it Railway affecting :

1.2 Serial No.(Distt.)/Department/No. :

1.3 Ownership :

1.4 State Government :

1.5.1 Authority for maintenance :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.4.2 Authority for communicating warnings :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.5 Railways @

1.5.1 Authority for Joint Inspection :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.5.2 Authority for receiving warnings :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

2.0 Details of canal crossing :

2.1 Location :

2.1.1 Longitude :

2.1.2 Latitude :

2.1.3 Topo Map No. :

2.1.4 Nearest Village :

2.1.4.1 Distance in Kms from nearest village :

2.1.5 Nearest Railway Station

2.1.5.1 Distance in Kms from nearest Railway Station :

(Indicate Left/Right with reference to the

Increasing kilometreage of Railway track) :

2.2	Physical features of @ canal crossing	:
2.2.1	Section	:
2.2.2	Railway Bridge No.	:
2.2.3	Kilometreage	:
2.2.4	Span and Type	:
2.2.5	Rail level	:
2.2.6	Bottom of girder/slab or springing of arch	:
2.2.7	Whether flooring or any protection work	:
	Provided.	
2.3	Design data	:
2.3.1	Discharge	:
2.3.2	Bed level	:
2.3.3	Danger level	:
2.3.4	Top level of canal bund on U/s side	:
2.3.5	Ground level	:
2.4	Actual Maximum at any time in the past	:
2.4.1	Year of occurrence	:
2.4.2	Discharge	:
2.4.3	Water level	:
	(a)On D/S side	:
	(b)On U/S side	:
3.0	Whether lined	

(i)	Crossing	:
(ii)	Approach	:
4.0	Foundations	:
4.1	Type (Open/Pile/Well)@	:
4.2	Depth of foundations	:
4.3	Nature of strata with depth	:
5.0	Overflow weir	:
5.1	Type	:
5.2	Length	:
5.3	Design Discharge of weir	:
6.0	Head works and/or Regulators	:
6.1	Name of Head works or Regulators	:
	within 10 kms. U/s or 1.5 Kms. D/s.	
6.2	Distance from Railway Bridge	:
6.3	Designed maximum discharge	:
	Above the Head works or Regulators	
6.4	Whether manned	:
	(a) Wholly	:
	(b) Party	:
	(c) Unmanned	:
7.0	History of damages, if any	

APPENDIX-1 (D)

(Para.....)

**PROFORMA FOR PARTICULARS OF RAILWAY AFFECTING
CANAL RUNNING PARALLEL OR OBLIQUE**

StateRailway
.....

Notes :-

- (i) Levels refer to GTS/RAIL level at Bridge.
- (ii) Columns to be filled in by Railways shown @
- (iii) Dimensions to be in metres.

- 1.0 Name of work-Canal running parallel or oblique :
- 1.1 Reasons for considering it Railway affecting :
- 1.2 Serial No.(Distt.)/Department/No. :
- 1.3 Ownership :
- 1.4 State Government :
- 1.4.1 Authority for maintenance :
- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :
- 1.4.2 Authority for communicating warnings :
- (a) Designation :
- (b) Postal Address with Pin Code No. :

- (c) Telephone No. :
- (d) Telegraphic Address :

1.5 Railways @

1.5.1 Authority for Joint Inspection :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5.2 Authority for receiving warnings :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

2.0 Details of Canal :

2.1 Location :

2.1.1 Topo Map No. :

2.1.2 Nearest Village :

2.1.2.1 Distance in Kms from nearest village :

2.1.3 Nearest Railway Station

2.1.3.1 Distance in Kms from nearest Railway Station :

(Indicate Left/Right with reference to the
Increasing kilometreage of Railway track) :

2.2	Physical features of Canal	:
2.2.1	Classification	:
	(a) Main/branch canal	:
	(b) Distributory	:
	(c) Minor/Sub-Minor	:
2.2.2	Distance from Railway track	:
2.2.2.1	At its nearest place of crossing	:
2.2.2.2	Corresponding Railway Kilometreage	:
2.2.2.3	At the farthest place	:
2.2.2.4	Corresponding Railway Kilometreage	:
2.2.3	Level of top of canal banks	:
	(a) U/s	:
	(b) D/s	:
2.2.4	Maximum height of bank	:
	(a) U/s	:
	(b) D/s	:
2.2.5	Top width of canal banks	:
2.2.6	Side slope of canal banks	:
2.2.7	Free board	:
2.2.8	Designed maximum discharge	:
2.2.9	Actual maximum discharge	:
2.2.10	Design F.S.L.	:
2.2.11	Actual maximum water level at any time in the past	:

- 2.2.12 Length of canal (RD to RD) susceptible for damage (in order of risks involved). :
- 3.0 Cross drainage works in the lengths likely to affect the Railway independently or combined with canal damage. :
- 3.1 Particulars of cross drainage work :
- 3.1.1 Size of flood opening or regulated channel :
- 3.1.2 Opposite Railway Kilometreage :
- 3.1.3 Total waterway of such CD works in sq.m. :
- 3.1.4 Designed discharge :
- 3.1.5 Maximum observed discharge with year :
- 4.0 Head works and Regulators :
- 4.1 Type of controlling works within 10 kms. U/s and 1.5 Kms. D/s. :
- 4.1.1 Distance from Railway bridge along canal :
- 4.1.2 Designed maximum discharge of the Head Works or Regulator. :
- 5.0 Length of Railway Line @ (in Railway (Kilometreage) Vulnerable for damage in section From.....km tokm. :
- 6.0 Nos. of bridge likely to be affected :
- 7.0 Details of each affected Railway @ Bridge :

- 7.1 Section :
- 7.2 Railway Bridge No. :
- 7.2.1 Kilometreage :
- 7.3 Span & Type :
- 7.4 Rail level :
- 7.5 Bottom of girder/slab or springing of arch :
- 7.6 HFL with year
- 7.7 Lowest bed level :
- 7.8 Foundation :
- 7.8.1 Type (Open/Pile/Well) :
- 7.8.2 Nature of strata with depth :
- 7.8.3 Depth of foundation :
- 7.9 Flooring/Protection work :
- 7.10 Remarks with special reference to past history :

APPENDIX-1 (E)

(Para.....)

**PROFORMA FOR PARTICULARS OF RAILWAY AFFECTING
ROAD EMBANKMENTS IN THE VICINITY OF RAILWAY LINE**

StateRailway
.....

Notes :-

- (i) Levels refer to GTS/RAIL level at Bridge.
- (ii) Columns to be filled in by Railways shown @
- (iii) Dimensions to be in metres.

1.0 Name of work road embankment/river :

1.1 Reasons for considering it Railway affecting :

1.2 Serial No.(Distt.)/Department/No. :

1.3 Ownership :

1.4 State Government :

1.4.1 Authority for maintenance :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.4.2 Authority for communicating warnings :

(a) Designation :

(b) Postal Address with Pin Code No. :

- (c) Telephone No. :
- (d) Telegraphic Address :

1.5 Railways @

1.5.1 Authority for Joint Inspection :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5.2 Authority for receiving warnings :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

2.0 Details of Road Embankment :

2.1 Location :

2.1.1 Topo Map No. :

2.1.2 Nearest Village :

2.1.2.1 Distance in Kms from nearest village :

2.1.3 Nearest Railway Station

2.1.3.1 Distance in Kms from nearest Railway Station :

(Indicate Left/Right with reference to the

Increasing kilometreage of Railway track) :

2.2	Physical features of Road Embankment	:
2.2.1	Classification (N.H./S.H. or local road)	:
2.2.2	Distance from Railway track	:
2.2.2.1	At its nearest place of crossing	:
2.2.2.2	Corresponding Railway Kilometreage	:
2.2.2.3	At the farthest place	:
2.2.2.4	Corresponding Railway Kilometreage	:
2.2.3	Top of road	:
2.2.3.1	Lowest level	:
2.2.3.2	Highest level	:
2.2.4	Lowest ground level	:
2.2.5	Width of roadway between the kerbs	:
2.2.6	Side slope of road embankment	:
2.2.7	Length of road susceptible to damage	:
	From To	
3.0	Nos. of cross drainage works or culverts in road	:
4.0	Details of each Cross drainage work of culvert	:
4.1	Bridge No.	:
4.2	Road Kilometreage	:
4.3	Nos. & Span and Type	:
5.0	Nos. of Railway Bridges likely @ to be affected	:
6.0	Details of each affected Railway Bridge	:
6.1	Section	:

- 6.1.1 Bridge No. :
- 6.1.2 Railway Kilometreage :
- 6.1.3 Span & Type :
- 6.1.4 Railway level :
- 6.1.5 Bottom of girder/slab or springing of arch :
- 6.1.6 HFL with year
- 6.1.7 Danger level :
- 6.1.8 Average Bed level :
- 6.1.9 Total water way in sq.m :
- 6.1.10 Foundation :
- (i) Type (Open/Pile/Well) :
- (ii) Depth of foundations :
- (iii) Nature of strata with depth :
- 6.1.11 Flooring/Protection work :
- 6.1.12 Remarks with special reference to past history :

APPENDIX-1 (F)

(Para.....)

PROFORMA FOR PARTICULARS OF RAILWAY AFFECTING

MARGINAL BUNDS

StateRailway
.....

Notes :-

(i) Levels refer to GTS/RAIL level at Bridge.

(ii) Columns to be filled in by Railways shown @

(iii) Dimensions to be in metres.

1.0 Name of work marginal Bund/River and bank :
(Left or Right)

1.1 Reasons for considering it Railway affecting :

1.2 Serial No.....(Distt.)/Department/No. :

1.3 Ownership :

1.4 State Government :

1.4.1 Authority for maintenance :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.4.2 Authority for communicating warnings :

(a) Designation :

- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5 Railways @

1.5.1 Authority for Joint Inspection :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5.2 Authority for receiving warnings :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

2.0 Details of Marginal Bund :

2.1 Location :

2.1.1 Topo Map No. :

2.1.2 Nearest Village :

2.1.2.1 Distance in Kms from nearest village :

2.1.3 Nearest Railway Station

2.1.3.1 Distance in Kms from nearest Railway Station :

(Indicate Left/Right with reference to

Increasing kilometreage of Railway track) :

2.2	Physical features of Marginal Bund	:
2.2.1	Purpose of the bund	:
2.2.2	Distance from Railway track	:
2.2.2.1	At its nearest place	:
2.2.2.2	Corresponding Railway Kilometreage	:
2.2.2.3	At the farthest place	:
2.2.2.4	Corresponding Railway Kilometreage	:
2.2.3	Salient features of the bund	:
2.2.3.1	Details of the bund	:
	(a) Length	:
	(b) Top width	:
	(c) Maximum Height	:
2.2.3.2	Crest level at or near the bridge site	:
2.2.3.3	Direction of flow of water from the bund in case of its breach.	:
2.2.3.4	Minimum designed free board	:
2.2.3.5	Particulars of escape drainage	:
2.2.3.6	Past history if any	:
3.0	Length of Railway line (in Railway Kilometreage) Vulnerable for damage FromKm toKm. in the event of damage to the bund.	:

- 4.0 Nos. of Railway Bridges likely @ to be affected :
- 5.0 Details of each affected Railway Bridge :
- 5.1 Section :
- 5.1.1 Bridge No. :
- 5.1.2 Railway Kilometreage :
- 5.1.3 Span & Type :
- 5.1.4 Rail level :
- 5.1.5 Bottom of girder/slab or springing of arch :
- 5.1.6 HFL with year
- 5.1.7 Danger level :
- 5.1.8 Average Bed level :
- 5.1.9 Total water way in sq.m :
- 5.1.10 Foundation :
- (i) Type (Open/Pile/Well) :
- (ii) Depth of foundations :
- (iii) Nature of strata with depth :
- 5.1.11 Flooring/Protection work :
- 5.1.12 Remarks with special reference to past History :

APPENDIX-I (G)

(Para.....)

**PROFORMA FOR PARTICULARS OF RAILWAY AFFECTING
RIVER PROTECTION WORKS AND TRAINING WORKS**

StateRailway
.....

Notes :-

- (i) Levels refer to GTS/RAIL level at Bridge.
- (ii) Columns to be filled in by Railways shown @
- (iii) Dimensions to be in metres.

1.0 Name of work River Protection & Training :
Works for River(Spill bund, Retired
Bund or Spur).

1.1 Reasons for considering it Railway affecting :

1.2 Serial No.....(Distt.)/Department/No. :

1.3 Ownership :

1.4 State Government :

1.4.1 Authority for maintenance :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.4.2 Authority for communicating warnings :

(a) Designation :

- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5 Railways @

1.5.1 Authority for Joint Inspection :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5.2 Authority for receiving warnings :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

2.0 Details of River Protection & Training Work :

2.1 Location :

2.1.1 Topo Map No. :

2.1.2 Nearest Village :

2.1.2.1 Distance in Kms from nearest village :

2.1.3 Nearest Railway Station

2.1.3.1 Distance in Kms from nearest Railway Station :

(Indicate Left/Right with reference to the
Increasing kilometreage of Railway track)

2.2	Physical features of River Protection & Training Work	:
2.2.1	Purpose of Protection and Training	:
2.2.2	Distance from Railway track	:
2.2.2.1	At its nearest place	:
2.2.2.2	Corresponding Railway Kilometreage	:
2.2.2.3	At the farthest place	:
2.2.2.4	Corresponding Railway Kilometreage	:
2.2.3	Salient features of the work	:
2.2.3.1	Length of bund	:
2.2.3.2	Width at top	:
2.2.3.3	Side slopes of bund bank	:
	(a) U/s	:
	(b) D/s	:
2.2.3.4	Height of bund	:
2.2.3.5	Top level of bund	:
2.2.3.6	Average Bed level	:
3.0	How damage of these @ works affect the Railway	:
4.0	Length of Railway line (in Railway Kilometreage) Vulnerable for damage FromKm toKm.	:

5.0	Nos. of Railway Bridges likely to be @ affected	:
6.0	Details of each affected @Railway Bridge	:
6.1	Section	:
6.1.1	Bridge No.	:
6.1.2	Railway Kilometresage	:
6.1.3	Span & Type	:
6.1.4	Rail level	:
6.1.5	Bottom of girder/slab or springing of arch	:
6.1.6	HFL with year	:
6.1.7	Danger level	:
6.1.8	Average Bed level	:
6.1.9	Total water way in sq.m	:
6.1.10	Foundation	:
	(i) Type (Open/Pile/Well)	:
	(ii) Depth of foundations	:
	(iii) Nature of strata with depth	:
6.1.11	Flooring/Protection work	:
6.1.12	Remarks with special reference to past History	:

APPENDIX-I (H)

(Para.....)

**PROFORMA FOR PARTICULARS OF RAILWAY AFFECTING
TEMPORARY CHANNELS
(CUT FROM THE BED OF STREAMS AND TAIL ENDS OF
DISTRIBUTORIES)**

State.....Railway

.....

Notes :-

- (i) Levels refer to GTS/RAIL level at Bridge.
- (ii) Columns to be filled in by Railways shown @
- (iii) Dimensions to be in metres.

1.0 Name of work Temporary channels :

1.1 Reasons for considering it Railway affecting :

1.2 Serial No.(District)/Department/No. :

1.3 Ownership :

1.4 State Government :

1.4.1 Authority for maintenance :

(a) Designation :

(b) Postal Address with Pin Code No. :

(c) Telephone No. :

(d) Telegraphic Address :

1.4.2 Authority for communicating warnings :

(a) Designation :

- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5 Railways @

1.5.1 Authority for Joint Inspection :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5.2 Authority for receiving warnings :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

2.0 Details of Temporary channel :

2.1 Location :

2.1.1 Topo Map No. :

2.1.2 Nearest Village :

2.1.2.1 Distance in Kms from nearest village :

2.1.3 Nearest Railway Station

2.1.3.1 Distance in Kms from nearest Railway Station :

(Indicate Left/Right with reference to the
Increasing kilometreage of Railway track)

2.2	Physical features of Temporary channel	:
2.2.1	Purpose of the Temporary channel	:
2.2.2	Distance from Railway track	:
2.2.2.1	At its nearest place	:
2.2.2.2	Corresponding Railway Kilometreage	:
2.2.2.3	At the farthest place	:
2.2.2.4	Corresponding Railway Kilometreage	:
2.3	Descriptive nature of Obstruction	:
3.0	Length of Railway line (in Railway	:
	Kilometreage) Vulnerable for damage in Kms.	
	@ FromKm toKm. In the event	
	of damage to the temporary channel.	
4.0	Nos. of Railway Bridges likely to be affected@	:
5.0	Details of each affected Railway Bridge@	:
5.1	Section	:
5.1.1	Bridge No.	:
5.1.2	Railway Kilometreage	:
5.1.3	Span & Type	:
5.1.4	Rail level	:
5.1.5	Bottom of girder/slab or springing of arch	:
5.1.6	HFL with year	:
5.1.7	Danger level	:
5.1.8	Average Bed level	:

- 5.1.9 Total water way in sq.m :
- 5.1.10 Foundation :
 - (i) Type (Open/Pile/Well) :
 - (ii) Depth of foundations :
 - (iii) Nature of strata with depth :
- 5.1.11 Flooring/Protection work :
- 5.1.12 Remarks with special reference to past History :

APPENDIX-I (I)

(Para.....)

**PROFORMA FOR PARTICULARS OF RAILWAY AFFECTING WORKS
(LIKE LONG SOLID WALLS, BARRIERS, TOWNSHIPS, NEW DRAINAGE
SCHEMES ETC.)**

State.....Railway

.....

Notes :-

- (i) Levels refer to GTS/RAIL level at Bridge.
- (ii) Columns to be filled in by Railways shown @
- (iii) Dimensions to be in metres.

- 1.0 Name of work Long solid Wall/Barrier/ :
Township/New Drainage Scheme.
- 1.1 Reasons for considering it Railway affecting :
- 1.2 Serial No.(District)/Department/No. :
- 1.3 Ownership :
- 1.4 State Government :
- 1.4.1 Authority for maintenance :
 - (a) Designation :
 - (b) Postal Address with Pin Code No. :
 - (c) Telephone No. :
 - (d) Telegraphic Address :
- 1.4.2 Authority for communicating warnings :
 - (a) Designation :

- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5 Railways @

1.5.1 Authority for Joint Inspection :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

1.5.2 Authority for receiving warnings :

- (a) Designation :
- (b) Postal Address with Pin Code No. :
- (c) Telephone No. :
- (d) Telegraphic Address :

2.0 Details of Long Solid Wall/Barrier/Township/ New Drainage Scheme. :

2.1 Location :

2.1.1 Topo Map No. :

2.1.2 Nearest Village :

2.1.2.1 Distance in Kms from nearest village :

2.1.3 Nearest Railway Station

2.1.3.1 Distance in Kms from nearest Railway Station :

(Indicate Left/Right with reference to the
Increasing kilometreage of Railway track)

2.2	Physical features of Long solid wall/Barrier/ New Drainage Scheme.	:
2.2.1	Purpose of the work	:
2.2.2	Distance from Railway track	:
2.2.2.1	At its nearest place	:
2.2.2.2	Corresponding Railway Kilometreage	:
2.2.2.3	At the farthest place	:
2.2.2.4	Corresponding Railway Kilometreage	:
2.3	Descriptive nature of Obstruction	:
2.3.1	Afflux, discharge due to disturbance in natural flow.	:
2.3.2	Water way in Sq.m.	:
3.0	Length of Railway line (in Railway Kilometreage) Vulnerable for damage in Kms. @ FromKm toKm. in the event of breach.	:
4.0	Nos. of Railway Bridges likely to be affected@	:
5.0	Details of each affected Railway Bridge@	:
5.1	Section	:
5.1.1	Bridge No.	:
5.1.2	Railway Kilometreage	:
5.1.3	Span & Type	:

- 5.1.4 Rail level :
- 5.1.5 Bottom of girder/slab or springing of arch :
- 5.1.6 HFL with year
- 5.1.7 Danger level :
- 5.1.8 Average Bed level :
- 5.1.9 Total water way in sq.m :
- 5.1.10 Foundation :
- (i) Type (Open/Pile/Well) :
- (ii) Depth of foundation :
- (iii) Nature of strata with depth :
- 5.1.11 Flooring/Protection work :
- 5.1.12 Remarks with special reference to past History :

APPENDIX-II (A)

(Para.....)

**PROFORMA FOR THE ANNUAL INSPECTION OF RAILWAY AFFECTING
BARRAGES, WEIRS AND REGULATORS**

Date of Inspection

- 1.0 Name of work :
- 2.0 Serial No.(District)/Department/No. :
- 3.0 Village :
- 4.0 Tehsil :
- 5.0 Police Station :
- 6.0 Agency for Maintenance :
- 7.0 Railway line affected :
- 7.1 Section :
- 7.1.1 Kilometreage :
- 7.1.2 Between Stations :
- 8.0 Nos. of Railway Bridge affected :
- 8.1 Railway Bridge affected on Main River :
- 8.1.1 Bridge No. :
- 8.1.2 Kilometreage :
- 8.1.3 Span & Type :
- 8.2 Railway bridge affected by spill channel :
- 8.2.1 Bridge No. :
- 8.2.2 Kilometreage :
- 8.2.3 Span & Type :

9.0 Is the pitching or protection work provided to :

the bridge, in good condition?

10.0 Bund/Barrage/Weir/Regulator

- (i) Whether Section of Tank/Bund/Barrage/Regulator is as per details in the Railway affecting Tank list? If not, specify locations and extent of deficiency.
- (ii) Are there T.B.L. stones or other permanent marks to verify whether top of Bund/Barrage/Weir/Regulator is at prescribed level or not?
- (iii) Is the top Bund any where lower by more than 15 cms below prescribed level? If so, specify reaches and deficiencies in height.
- (iv) Are there any dangerous gullies and/or cart track etc. which must be repaired urgently? If so, specify locations.
- (v) Action taken to rectify defects noted in (b) to (d)
- (vi) Progress of work, if any, on hand and the probable date of completion of work.

11.0 Surplus Weirs.

(a) Whether the surplus weirs at site are as per the list or not? Specify the variations, if any

- (b) Whether the M.W.L. has exceeded or anything has happened to indicate that the surplus weir is inadequate or made inoperative due to obstruction etc? If so, the remedial measures contemplated and action taken.

12.0 Sluice and other masonry works.

12.1 Are the sluices and other masonry works in good order as not to endanger the safety of the structure?

12.2 Is the protection to the susceptible length in order?

13.0 Last date of inspection and compliance yet to be done, if any.

14.0 Special remarks, if any.

15.0 General Remarks:

Is the Maintenance of the work satisfactory so as to ensure the safety of the Railway line/track? If not, state the remedial measures necessary and probable date of completion of repairs, together with approximate cost.

NOTE

In case of works of Water Resources and Public Works Departments where regular annual/half yearly inspections are carried out and recorded in accordance with the codal provisions, it will be sufficient to give following certificate instead of filling the information for items 9 to 14 of this proforma.

CERTIFICATE

Certified that the undersigned has inspected the Tank/Barrage/Weir/Regulator as required vide para 8.016/2.068 of the Works Department Manual, 1983 on

Based on this Annual Inspection Report, it is certified that :

*(a) the aforesaid work is generally in good condition and nothing has come to notice which may endanger the safety of the structure with special reference to its effect on safety of Railways. Minor deficiencies if any, are being taken care of as a routine maintenance work.

OR

*(b) the following major deficiencies have been noticed with special reference to its effect on safety of railways :

(i)

(ii)

Action for attending to these deficiencies is being taken.

Signature

Name (in block letters)

Designation Department

*(Strike whichever is not applicable).

APPENDIX-II (B)

(Para.....)

PROFORMA FOR THE ANNUAL INSPECTION OF RAILWAY AFFECTING ROAD BRIDGES (INCLUDING CULVERTS, CAUSEWAYS ETC.)

Date of Inspection

- 1.0 Name of Road Bridge/River :
- 2.0 Serial No.(District)/Department/No. :
- 3.0 Bridge No./Road kilometreage :
- 4.0 Village :
- 5.0 Police Station :
- 6.0 Agency for Maintenance :
- 7.0 Railway line affected :
- 7.1 Section :
 - 7.1.1 Kilometreage :
 - 7.1.2 Between Stations :
- 8.0 Bridge No. :
 - 8.1.1 Kilometreage :
 - 8.1.2 Span & Type :
- 9.0 (a) Are there any cracks or any other :
Defects in the Super structure/sub-
Structure?
(b) If so, what steps are proposed :

10.0 Are the bridge flooring and apron in good :
Condition.

11.0 Is the river on upstream and downstream :

side of the bridge having regime flow?
12.0 (a) Is any scour observed in the vicinity of the bridge?
(b) If so, to what depth below bed level?

13.0 Last date of inspection and compliance yet to be done, if any.

14.0 Special remarks, if any.

15.0 General Remarks:

Is the Maintenance of the work satisfactory so as to ensure the safety of the Railway line/track? If not, state the remedial measures necessary and probable date of completion of repairs, together with approximate cost.

NOTE

In case of works of Water Resources and Public Works Departments where regular annual/half yearly inspections are carried out and recorded in accordance with the codal provisions, it will be sufficient to give following certificate instead of filling the information for items 9 to 14 of this proforma.

CERTIFICATE

Certified that the undersigned has inspected the Tank/Barrage/Weir/Regulator as required vide Para 8.016/2.068 of the Works Department Manual, 1983 on

Based on this Annual Inspection Report, it is certified that:

*(a) the aforesaid work is generally in good condition and nothing has come to notice which may endanger the safety of the structure with special reference to its effect on safety of Railways. Minor deficiencies if any, are being taken care of as a routine maintenance work.

OR

*(b) the following major deficiencies have been noticed with special reference to its effect on safety of railways:

(i)

(ii)

Action for attending to these deficiencies is being taken.

Signature

.....

Name (in block letters)

Designation

Department

*(Strike whichever is not applicable).

APPENDIX-II (C)

(Para.....)

PROFORMA FOR THE ANNUAL INSPECTION OF RAILWAY AFFECTING CANAL CROSSING WITH/WITHOUT HEAD WORKS & APPROACH

Date of Inspection

1.0 Name of Canal crossing :

2.0 Serial No. (District)/Department/No. :

3.0 Village :

4.0 Tehsil :

5.0 Police Station :

6.0 Agency for Maintenance :

7.0 Railway line affected :

7.1 Section :

7.1.1 Kilometreage :

7.1.2 Between Stations :

8.0 Railway bridge affected crossing the canal :

(Canal crossing Bridge)

8.1 Bridge No. :

8.1.1 Kilometreage :

8.1.2 Span & Type :

9.0 Is the flooring or protection work provided :

in good condition?

10.0 Are there any dangerous gullies in the canal :

banks, which requires immediate repairs?

- 11.0 Has the bed of the canal been silted or scoured? :
- 12.0 If overflow weir exists, whether its present condition? :
- 13.0 Are the regulators and other masonry works in good condition ? :
- 14.0 Last date of inspection and compliance yet to be done, if any :
- 15.0 Special remarks, if any. :
- 16.0 General Remarks :

Is the Maintenance of the work satisfactory so as to ensure the safety of the Railway line/track? If not, state the remedial measures necessary and probable date of completion of repairs, together with approximate cost.

NOTE

In case of works of Water Resources and Public Works Departments where regular annual/half yearly inspections are carried out and recorded in accordance with the codal provisions, it will be sufficient to give following certificate instead of filling the information for items 9 to 14 of this proforma.

CERTIFICATE

Certified that the undersigned has inspected the Tank/Barrage/Weir/Regulator as required vide para 8.016/2.068 of the Works Department Manual, 1983 on

Based on this Annual Inspection Report, it is certified that :

*(a) the aforesaid work is generally in good condition and nothing has come to notice which may endanger the safety of the structure with special reference to its effect on safety of Railways. Minor deficiencies if any, are being taken care of as a routine maintenance work.

OR

*(b) the following major deficiencies have been noticed with special reference to its effect on safety of railways :

(i)

(ii)

Action for attending to these deficiencies is being taken.

Signature

.....

Name (in block letters)

Designation

Department

*(Strike whichever is not applicable).

APPENDIX-II (D)

(Para.....)

**PROFORMA FOR THE ANNUAL INSPECTION OF RAILWAY AFFECTING
CANAL RUNNING PARALLEL OR OBLIQUE/TEMPORARY CHANNEL**

Date of Inspection

1.0 Name of work canal running parallel or :

Oblique/temporary channel.

2.0 Serial No.(District)/Department/No. :

3.0 Village :

4.0 Tehsil :

5.0 Police Station :

6.0 Agency for Maintenance :

7.0 Railway line affected :

7.1 Section :

7.1.1 Kilometrage :

7.1.2 Between Stations :

8.0 Nos. of Railway bridges affected :

8.1 Bridge No. :

8.1.1 Kilometrage :

8.1.2 Span & Type :

9.0 Is the flooring or protection work provided :
in good condition?

10.0 Are there any dangerous gullies in the canal :
banks, which requires immediate repairs?

- 11.0 Has the bed of the canal been silted or scoured? :
- 12.0 If overflow weir exists, whether its present condition? :
- 13.0 Are the regulators and other masonry works in good condition? :
- 14.0 Last date of inspection and compliance yet to be done, if any :
- 15.0 Special remarks, if any. :
- 16.0 General Remarks :

Is the Maintenance of the work satisfactory so as to ensure the safety of the Railway line/track? If not, state the remedial measures necessary and probable date of completion of repairs, together with approximate cost.

NOTE

In case of works of Water Resources and Public Works Departments where regular annual/half yearly inspections are carried out and recorded in accordance with the codal provisions, it will be sufficient to give following certificate instead of filling the information for items 9 to 14 of this proforma.

CERTIFICATE

Certified that the undersigned has inspected the Tank/Barrage/Weir/Regulator as required vide para 8.016/2.068 of the Works Department Manual, 1983 on

Based on this Annual Inspection Report, it is certified that:

*(a) the aforesaid work is generally in good condition and nothing has come to notice which may endanger the safety of the structure with special reference to its effect on safety of Railways. Minor deficiencies if any, are being taken care of as a routine maintenance work.

OR

*(b) the following major deficiencies have been noticed with special reference to its effect on safety of railways:

(i)

(ii)

Action for attending to these deficiencies is being taken.

Signature

.....

Name (in block letters)

Designation

Department

*(Strike whichever is not applicable).

APPENDIX-II (E)

(Para.....)

PROFORMA FOR THE ANNUAL INSPECTION OF RAILWAY AFFECTING
ROAD EMBANKMENTS IN THE VICINITY OF RAILWAY LINE

Date of Inspection

- 1.0 Name of work Road Embankment :
- 2.0 Serial No.(District)/Department/No. :
- 3.0 Village :
- 4.0 Tehsil :
- 5.0 Police Station :
- 6.0 Agency for Maintenance :
- 7.0 Railway line affected :
- 7.1 Section :
 - 7.1.1 Kilometreage :
 - 7.1.2 Between Stations :
- 8.0 Nos. of Railway bridges affected :
- 8.1 Bridge No. :
 - 8.1.1 Kilometreage :
 - 8.1.2 Span & Type :
- 9.0 Is the pitching or protection work provided :
in good condition?
- 10.0 Last date of inspection and compliance yet to :
be done, if any

11.0 Special remarks, if any.

12.0 General Remarks:

Is the Maintenance of the work satisfactory so as to ensure the safety of the Railway line/track? If not, state the remedial measures necessary and probable date of completion of repairs, together with approximate cost.

NOTE

In case of works of Water Resources and Public Works Departments where regular annual/half yearly inspections are carried out and recorded in accordance with the codal provisions, it will be sufficient to give following certificate instead of filling the information for items 9 to 14 of this proforma.

CERTIFICATE

Certified that the undersigned has inspected the Tank/Barrage/Weir/Regulator as required vide para 8.016/2.068 of the Works Department Manual, 1983 on

Based on this Annual Inspection Report, it is certified that :

*(a) the aforesaid work is generally in good condition and nothing has come to notice which may endanger the safety of the structure with special reference to its effect on safety of Railways. Minor deficiencies if any, are being taken care of as a routine maintenance work.

OR

*(b) the following major deficiencies have been noticed with special reference to its effect on safety of railways:

(i)

(ii)

Action for attending to these deficiencies is being taken.

Signature.....
Name (in block letters)
Designation Department

*(Strike whichever is not applicable).

APPENDIX-II (F)

(Para.....)

**PROFORMA FOR THE ANNUAL INSPECTION OF RAILWAY AFFECTING
MARGINAL BUNDS**

Date of Inspection

- 1.0 Name of work Marginal Bund/River and :
bank (Left or Right)
- 2.0 Serial No.(District)/Department/No. :
- 3.0 Village :
- 4.0 Tehsil :
- 5.0 Police Station :
- 6.0 Agency for Maintenance :
- 7.0 Railway line affected :
- 7.1 Section :
 - 7.1.1 Kilometreage :
 - 7.1.2 Between Stations :
- 8.0 Nos. of Railway bridges affected :
- 8.1 Bridge No. :
 - 8.1.1 Kilometreage :
 - 8.1.2 Span & Type :
- 9.0 Is the pitching or protection work provided :
in good condition?
- 9.0 (a) Is the section of bund as per details in :

the Railway affecting bund list? If not, specify locations and extent of deficiency

(b) Are there T.B.L. stones or other :

Permanent marks to verify whether top of bund is at prescribed level or not?

(c) Is the top Bund anywhere lower by :

More than 15 cms below prescribed level? If so, specify reaches and

deficiencies in height.

(d) Action taken to rectify defects noted in (a) to (c) :

(e) Progress of work, if any, on hand and :

the probable date of completion of work.

11.0 Last date of inspection and compliance yet to :

be done, if any

12.0 Special remarks, if any:

13.0 General Remarks:

Is the Maintenance of the work satisfactory so as to ensure the safety of the Railway line/track? If not, state the remedial measures necessary and probable date of completion of repairs, together with approximate cost.

NOTE

In case of works of Water Resources and Public Works Departments where regular annual/half yearly inspections are carried out and recorded in accordance with the codal provisions, it will be sufficient to give following certificate instead of filling the information for items 9 to 14 of this proforma.

CERTIFICATE

Certified that the undersigned has inspected the Tank/Barrage/Weir/Regulator as required vide para 8.016/2.068 of the Works Department Manual, 1983 on

Based on this Annual Inspection Report, it is certified that:

*(a) the aforesaid work is generally in good condition and nothing has come to notice which may endanger the safety of the structure with special reference to its effect on safety of Railways. Minor deficiencies if any, are being taken care of as a routine maintenance work.

OR

*(b) the following major deficiencies have been noticed with special reference to its effect on safety of railways:

- (i)
- (ii)

Action for attending to these deficiencies is being taken.

Signature

.....

Name (in block letters)

Designation

Department

*(Strike whichever is not applicable).

APPENDIX-II (G)

(Para.....)

PROFORMA FOR THE ANNUAL INSPECTION OF RAILWAY AFFECTING RIVER PROTECTION WORKS AND TRAINING WORKS

Date of Inspection

1.0 Name of work /River protection and Training :

works for river (Spill/Retired bund, Spur,
Groyne etc.)

2.0 Serial No.(District)/Department/No. :

3.0 Village :

4.0 Tehsil :

5.0 Police Station :

6.0 Agency for Maintenance :

7.0 Railway line affected :

7.1 Section :

7.1.1 Kilometreage :

7.1.2 Between Stations :

8.0 Nos. of Railway bridges affected :

8.1 Bridge No. :

8.1.1 Kilometreage :

8.1.2 Span & Type :

9.0 Is the pitching or protection work provided :

in good condition?

10.0 Whether any damage is noticed to the _____ :

Protection/Training works?

11.0 Last date of inspection and compliance yet to _____ :

be done, if any

12.0 Special remarks, if any.

13.0 General Remarks:

Is the Maintenance of the work satisfactory so as to ensure the safety of the Railway line/track? If not, state the remedial measures necessary and probable date of completion of repairs, together with approximate cost.

NOTE

In case of works of Water Resources and Public Works Departments where regular annual/half yearly inspections are carried out and recorded in accordance with the codal provisions, it will be sufficient to give following certificate instead of filling the information for items 9 to 14 of this proforma.

CERTIFICATE

Certified that the undersigned has inspected the Tank/Barrage/Weir/Regulator as required vide para 8.016/2.068 of the Works Department Manual, 1983 on

Based on this Annual Inspection Report, it is certified that:

*(a) the aforesaid work is generally in good condition and nothing has come to notice which may endanger the safety of the structure with special reference to its effect on safety of Railways. Minor deficiencies if any, are being taken care of as a routine maintenance work.

OR

*(b) the following major deficiencies have been noticed with special reference to its effect on safety of railways:

(i)

(ii)

Action for attending to these deficiencies is being taken.

Signature

.....

Name (in block letters)

Designation

Department

*(Strike whichever is not applicable).

APPENDIX-III

**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(Railway Board)**

No. 57/W-II/CMT/20 New Delhi, dated 22nd/23rd June 1957

To

The General Managers,
All Indian Railways.

Sub.: Appointment of a Committee of Engineers P.W.D., Irrigation and Railways etc. for Railway affecting and other public works.

The above subject was discussed at the Conference of the Chief Ministers with the Railway Minister on 5th June, 1957.

1. The attention of the Chief Ministers was invited to the fact that a number of works had been and are being carried out in the states, such as irrigation schemes, repairing or abandoning of bunds and tanks and deforestation of large areas, which affect the safety of railway track and bridges but no intimation of this activity is given to Railway Administration. These works may considerably change the pattern of flow of flood waters across the railway line. Some of the individual railway bridges designed for the original conditions may in the new circumstances be found inadequate. If such works are located at some distance from the Railway, the Railway Administrations have no means of knowledge & anything about them. In the interest of safety of Railways, it is imperative that Railway Authorities are kept in touch with the broad details and progress of such works by the Authorities concerned so that steps to ensure safety of track etc., if necessary, could be taken in time.

2. There was unanimity of opinion that close coordination between Railway and Civil Authorities was desirable. The State Governments offered full

co-operation. The consensus of opinion of the Conference was that for each State there should be a Committee consisting of senior officers from the Railway (s), and Public Works, Irrigation, Forest and Local Self Government Departments of the State Governments who should periodically review the position of flood affecting works. If any work proposed by one Department was likely to affect another, it should have the prior approval of this Committee.

3. These Committees will frame their own procedural rules but it is suggested that the Committees should hold meetings at predetermined intervals. Generally speaking, the functions might include:-

(a) Exchange of information about schemes envisaged by anyone Department and likely to affect the working or safety of assets of another Department and consequential safeguards to be adopted.

(b) Keeping up to date the list of Railway Affecting Works, etc., naming the officials responsible for joint inspection of each such work immediately after monsoons and, if possible, also in advance of monsoons, and watching that the Department responsible for proper maintenance of such works promptly carries out the necessary repairs.

(c) Evolving a procedure for:

(i) Obtaining and broadcasting by Departments concerned warning or forecasts of heavy rains, floods, storms etc., as well as the actual heavy rainfall recorded and expected floods down streams to the officers concerned in the various Departments and

(ii) Including public co-operation in promptly conveying to the Department concerned any unusual occurrence, e.g. breaches in tanks etc.

(d) Assessing whether waterways, protection works etc., provided by any Department, in an area severely affected by floods have proved to be inadequate and improvements needed for future.

(e) Co-ordination of related schemes of the various Departments represented. It would thus be seen that these Committees are principally concerned with safety aspect of Railway working and also the safety of other Public Works affected by railway track, bridges etc.

4. Will the General Managers now kindly get in touch with the State Governments concerned immediately so that these Committees are constituted and start functioning very early. The Railway Board would like to be kept informed about the progress made. A copy of this letter has been endorsed to the Chief Secretaries of State Governments.

DA: Extra three copies of the letter.

AWASTHY
Director, Civil Engineering,
Railway Board

(Copies from pages 55 to 56 Report of the Commission of Engineers Oct. 1959)

APPENDIX – IV

Government of India
MINISTRY OF RAILWAYS
(Railway Board)
New Delhi
Dated the 4th March 1957
RESOLUTION

No. E 57001/3 (RBI). A large number of bridges including their protection works were designed and constructed in this country in the latter half of the last century on the basis of technical knowledge and with the data then available. Hydraulic Science and technical knowledge in this sphere have since advanced considerably and further data has become available. It would, therefore, be profitable at this stage to review the designs of bridges in the light of the latest knowledge and experience gained and to indicate the standards which should generally guide the design of new bridges in future. With this object in view, it has been decided to set up a committee of engineers to investigate and review the methods of estimating the maximum flood discharge from catchment areas in order to determine the water way etc. and other connected works required in connection with the design of bridge.

2. The Committee will consist of :-
 - (i) Shri A.N. Khosla, Vice Chancellor, Roorkee UniversityChairman.
 - (ii) Major General R.E. Accrappa, Engineer-in-Chief Ministry of DefenseMember.
 - (iii) Shri N.K. Roy, Additional Member (Works) Railway BoardMember
 - (iv) Shri H.P. Sinha, Consulting Engineer, Central Water & Power Commission Member.
 - (v) Shri D.R. Mehta, Chief Engineer, Central

Water & Power Commission..... Member

(vi) Shri B.C. Gandhi, Jt. Dir. Civil Engineering
Railway BoardSecretary.

3. The Chairman and the members of the Committee will do this work in addition to their existing duties.

4. The terms of reference of the committee are as follows:-

(i) To indicate for different regions the method of determining the maximum discharge to design the water way for bridges. In places empirical formula are recommended to be used the value of constants to be prescribed for guidance;

(ii) To indicate the general principles for determining the extent of bed scour for the design of foundations and the design of training works, the extent of afflux to be permitted at bridge openings for the peak discharge, the minimum free board for various types and sizes of bridges and waterways to be provided; and

(iii) To indicate measures to ensure safety of railway bridges against failure of various Railway affecting works like tanks, canal etc.

5. The committee, will, if necessary, co-opt as members any other engineers with knowledge and practical experience of construction and maintenance of bridge.

6. The Committee will endeavor to submit their report within six months.

Ordered.- that a copy of this Resolution be communicated to the Chairman and Members of the Committee and Members of the Committee referred to above, the Private and Military Secretariats to the President, the Prime Minister's Secretariats, the Cabinet Secretaries, the Planning Commission, the Ministers of Government of India, all the State Governments in India and all Indian Railways.

Ordered.- also that the Resolution be published in the Gazette of India for general information.

Sd/.
(D.C. BAIJAL)
Secy. Railway Board

APPENDIX-V

EXTRACT FROM INDIAN RAILWAYS WAY & WORKS MANUAL

726. Railway-affecting tanks :- Whereas as per current practice the Public Works or the Revenue Department forwards to the Divisional/District Engineers every year, inspection reports of their officials on the condition of those tanks which are classified as “railway-affecting”, the action should be taken as follows:-

- (a) The Divisional/District Engineer should pursue the reports carefully and mark those tanks which he considers are not in satisfactory state of repair. He should then forward the reports to the Assistant Engineers with instructions that the tanks so marked should be inspected and reported on.
- (b) The Assistant Engineer should inspect the said tanks and reports to the Divisional/District Engineer on details of action being taken by the Public Works or Revenue Department. The Divisional/District Engineer should prevail on the authorities concerned to carry out all necessary repairs before the ensuing monsoon.
- (c) Copies of the inspection notes of “railway affecting” tanks as received from the Public Works or Revenue Department with particular of date of inspection and notes of action taken or proposed by him should be included in the list of protective works maintained by the Assistant Engineer, vide para 642.

727. Vigilance over railway affecting tanks during heavy rains. - The Divisional/District Engineer and Assistant Engineer should arrange with the local authorities for village headmen in whose jurisdiction “railway affecting” tanks are situated, to watch them during periods of heavy rains and give timely intimation to the nearest Station Master if there is likelihood of any tank failing. The Station Master will telegraph reports received from village headmen to the Permanent Way. Inspector, Assistant Engineer and Divisional/District Engineer.

When the railway line is threatened, the Assistant Engineer and permanent Way Inspector shall take steps to ensure the safety of staff and arrange patrolling of the line or post watchmen with necessary equipment at the place or places threatened and advise the Divisional/District Engineer accordingly.

APPENDIX-VI

EXTRACT FROM INDIAN RAILWAY PERMANENT WAY MANUAL –
1986

Para 726. - Railway Affecting Works (Including Railway Affecting Tanks):-

- (1) Definition. :- The term “Railway Affecting Work” may broadly be taken to mean any work which is not constructed and maintained properly, or not operated properly may result in danger to the Railway line (Bridge/Embankment). This may include tanks, storage works, canals, bunds, etc.
- (2) Register of Railway affecting works- The Divisional Engineer/ Assistant Engineer will maintain up to date list of Railway Affecting Works as jointly approved by the Railway and State Government. The list shall invariably show the particulars of State Authority responsible for maintenance of each Railway Affecting Work.
- (3) Inspection Railway Affecting Tanks – Whereas per current practice the Public Works or the Revenue Department forwards to the Divisional/District Engineers every year, their inspection reports on the condition of these tanks which are classified as Railway-affecting, action should be taken as follows:-
 - (a) The Divisional Engineer should peruse the reports carefully and mark those tanks which he considers are not in satisfactory state of repairs. He should then forward the reports to the Assistant Engineers with instructions that the tanks so marked should be inspected and reported on.
 - (b) The Assistant Engineer should inspect the said tanks and reports to the Divisional Engineer details of action being taken by the Public Works or Revenue Department. The Divisional Engineer should prevail on the authorities concerned to carry out all necessary repairs before the ensuing monsoon.
 - (c) Copies of the inspection notes of “railway affecting” tanks as received from the Public Works or Revenue Department with particular of date of

inspection and notes of action taken or proposed by him should be included in the Register of Railway Affecting Works maintained by the Assistant Engineer.

Para-727. Vigilance over Railway Affecting Tanks during heavy rains. -

- (1) The Divisional/District Engineer and Assistant Engineer should arrange with the local authorities and village head man in whose jurisdiction "Railway Affecting" tanks are situated, to watch them during periods of heavy rains and give timely intimation to the nearest Station Master if there is likelihood of any tank failing. The Station Master will telephone/telegraph reports received from village Head man to the Permanent Way Inspector, Assistant Engineer and Divisional Engineer.
- (2) When the railway line is threatened, the Assistant Engineer and Permanent Way Inspector shall take adequate steps to ensure the safety of Railway property & staff and arrange patrolling of the line or post watchmen with necessary equipment at the place or places threatened and advise the Divisional Engineer accordingly.
- (3) All the Bridges which are likely to be affected by Railway affecting tanks or other storage works should be provided with a tablet on top of the parapets, with the letters R.A.W. engraved on it, followed by an arrow mark painting in the direction of the railway affecting storage work in question.

Technical Sketch of R.A.W. table is shown below:-

**DETAILS OF RAILWAY AFFECTING WORKS TABLET
(R.A.W.)**

Note :-

- (i) R.A.W. tablet to be painted in white.
- (ii) Letters and arrow to be painted in red.
- (4) If the bridge in whose catchment a Railway Affecting tank is located is specified as a vulnerable location stationary watchman should be posted during the monsoon. If for any reason, repairs as envisaged during the inspection as per Para 726 (3) are not carried out, the section of the Railway line likely to be affected should be considered as vulnerable and watchman as considered necessary be posted.

APPENDIX-VII

EXTRACT FROM INDIAN RAILWAY BILL-1989, CHAPTER-IV CLAUSE-20

“Notwithstanding anything contained in any other law, the Central Government may, if it is of the opinion that any work across, under, over or near a railway is likely to alter or impede the natural course of water flow there by endangering any cutting, embankment or other work on a railway, issue directions in writing to any person officer or authority responsible for such work directing such person, officer or authority to close, prohibit or regulate that work”.

APPENDIX-VIII

INDIAN RAILWAYS PERMANENT WAY MANUAL ADVANCE CORRECTION SLIP NO. 112 dated 25.04.2008

The existing Para 726(3) of Indian Railways Permanent Way Manual shall be modified by the following:-

Para 726(3)(b)- Assistant Engineer shall jointly inspect with civil authorities, all RAW/RAT before the monsoon every year and arrange for their safe maintenance to avoid any danger to nearby tracks and structures. Records of the annual inspection should be kept in registers as prescribed. Assistant Engineer should report to the Divisional Engineer details of the action being taken by the Public Works or Revenue Department. The Divisional Engineer should timely prevail on the authorities concerned to carry out all necessary repairs before the ensuing monsoon and other actions to ensure safety of Railway assets.

Appendix-IX

List of Indian Standards Codes for Reference

S.No.	IS code	Subject
1	IS 12169-1987	Design of small embankment of dams.
2	IS8826-1976	Guidelines for design of large earth and rock fill dams.
3	IS7894-1975	Code of practice for stability analysis of earth dam.
4	IS8237-1985	Code of practice for protection of slope for reservoir embankment
5	IS8414-1977	Guidelines for design for under seepage control measures for earth and rock fill dams.
6	IS9429-1980	Code of practice for drainage system for earth and rock fill dams.
7	IS10635-1993	Free board requirement in embankment dams guidelines.
8	IS1498-1970	Classification and identification of soils for general engineering purpose.
9	IS 1893	Criteria for Earthquake resistance design of structure
10	IS6512	Design of solid gravity dams
11	IS 6966	Design of barrage and weir
12	IS11130-1984	Structural design of barrage and weir
13	IS14262-1995	Planning & design of revetments guidelines
14	IS11532-1995	Construction and Maintenance of river embankments guidelines.
15	IS12926-1995	Construction and Maintenance of guide banks in alluvial river.
16	IS10751-1994	Planning & design of guide banks foundation river.
17	IS 8408-1994	Planning & design of grayness in alluvial rivers guidelines.

Note: - Relevant IS codes may be referred whenever and wherever required for design and construction of structure.