Cut off trench for Minor Irrigation Dams
Amendments to the Manual of
Minor Irrigation Works 1983 Edition

GOVERNMENT OF MAHARASHTRA
Irrigation Department
Circular No. MNS 1088/490/88-MIN-2,
Mantralaya, Bombay 400 032, dated the 17th April 1989.

GOVERNMENT CIRCULAR MEMORANDUM.

Introduction :

Instructions regarding the depth and width of cut-off trench under minor Irrigation dams are contained in para 5.11 of chapter 5 of the "Manual of Irrigation Works, in Maharashtra state", 1983, edition. These guidelines have been prevalent for many years now and we have the experience of construction of several hundred minor Irrigation dams. It has now come to the noticed of Government that there are many cases of minor Irrigation Earth Dams where post construction problems have arisen. These are in the form of heavy seepage affecting the availability of water, or in the form of slushy conditions on the downstream requiring relief wells for ensuring stability apparently such situations have arisen where a positive cut-off was not provided. A partial cut-off was provided in these cases without detail investigations of the permeability or the piping resistance of the sub stratum. The cost of the cut-off trench in relation to the cost of Earthen Dam is small and a positive cut-off trench in such cases, at a little extra cost would minimise the problem during maintenance phase and also would reduce the cost of remedial measure therefor. After considering this experience, the following modified instructions are now issued in replacement of para 5.11 and Appendix IV/15 of the minor Irrigation manual.

5.11 Cut-off Trench:

Location : Cut-off trench is provided below the hearting zone so as to cut-off seepage of water form below the dam. The distance between the centre line of the cut-off trench and the centre line of dam at ground level should be equal to 1/4th of the height of hearting top from ground level this distance to be measured on the upstream side of centre line of the dam as shown in the sketch (see Annexure). The centre line of C.O.T. may be shifted on the downstream if in the above process the upstream edge of the C.O.T. goes beyond the upstream toe of the hearting at ground level.

Preparation of dam seat : Dam seat should be prepared by removing up to 0.6 m of top soil. It is not necessary to cut the dam seat in shallow triangular notches as shown in plate No.17 of minor Irrigation manual.

Depth : All Earth Dam should have a positive cut off trench going down to impervious stratum. An impervious stratum is defined as one of the following :

(a) Hard rock
(b) Soft rock impervious in nature (non erodible strata - insitu material)
(c) Impervious clay underlain by impervious clay down to hard rock without any sand layers or sand deposits in between.

It will be necessary to investigate the rock profile in every case. This can be done by taking trail pits, where the overburden is shallow. The trail pits should be taken at 60

m interval and down to rock. Where the overburden is deep bores will have to be taken at a minimum spacing 150 m centre to centre. Where bores are taken, it is necessary to take them to a depth of 5 m below the bed rock. In such cases it is also necessary to investigate whether there are any deposits of pervious material between the ground level and the rock. This assessment can be made either through augar holes or by consulting the Geologist in the Irrigation projects Investigation Circle.

The L-section of the rock profile should be plotted along with the ground profile The cut-off trench should be necessarily be taken down to rock or the impervious stratum. However, where the depth of cut off trench to rock appears too large compared to the height of water, a partial cut-off can be provided as an exception only if the following conditions are satisfied :-

(i) The decision to provide a partial cut-off trench should be taken by an authority not less than the Superintending Engineer.

(ii) In that portion of the dam where the depth of water (F.S.L. - G.L.) is more than 4 m and depth to rock is more than 1.25 times the height of water; and in that portion of the dam where the height of water is less than 4 m only where depth to rock is more than 5 m from ground level.

In other words where the rock is met with at less than 5.0 m from ground level or up to 1.25 times the water height in deeper section, a positive cut-off trench is a must In other cases a partial cut-off trench can be provided under the orders of Superintending Engineer subject to detail investigations mentioned earlier in this para (see Annexure - Table -1 & Table-2). In all cases of partial C.O.T., anticipated seepage should be mentioned.

At the location of the head regulator it is necessary to provide positive cut-off trench. This is irrespective of the depth of rock from ground level. In additions if the dam is provided with a partial cut-off on either side of the head regulator atleast for a length of 15m on wither side of the head regulator there should be a positive cut-off trench.

Depth of cut-off trench should be taken to 0.6 m in hard rock or in other impervious strata, and 1.2 m in impervious soft rock.

In many cases exposed rock is met with particularly in the portion of nalla bed In such cases to ensure a proper key in effect between earth dam and the foundation, it is necessary that the depth into the rock is taken as minimum of 1 m .

Bed Width : The bed width of the C.O.T. should be atleast 3m in the gorge portion or where the height of dam is more than 10 m and where rock is exposed or is at shallow depth (say within 2 m from ground level) the bottom width of C.O.T. should be minimum of 5 m.

Side Slopes :The side slopes of the cut-off trench are specified as below where ever the depth is less than

8 metre.

i) Soft soil and soft murum 1/2 : 1.

ii) Hard material 1/4 : 1.

iii) Rock 1/4 : 1.

For depths greater than 8 m suitable stable slopes in the strata met with should be adopted.

Keying : It is also seen that the cut-off trench is abruptly terminated in soil at the abutments. It is necessary that the C.O.T. is properly keyed in to the abutment. It is therefore directed that the C.O.T. should be taken as a positive C.O.T. for atleast 5 m in the hill side from the point where the H.F.L. line mixed hill side. In L-section after the length of 5m it should be tapered off with the slope of 1/2 : 1".

This instruction should be followed here after for all minor Irrigation dams which are at present being constructed in accordance with the manual of minor Irrigation Works 1983 edition both at the stage of investigations for Administrative Approval and the state of Investigations for Technical Sanctions.

By order and in the name of Governor of Maharashtra.

Sd/-
(D.N.Kulkarni)
Chief Engineer (Irrigation) &
Joint Secretary, to the
Government of Maharashtra.

Copy to :-
All the Chief Engineers Irrigation Department/All the S.E.'s I.D./All the E.E.'s I.D.

Accompaniment to Government Circular Memorandum No. MNS 1088/190/88/MIN-2 dated 1st April 1989

ANNEXURE

TABLE - 1

Cases where a positive C.O.T. is a must.

Height of water (FSL-GL)	Depth to rock	whether partial C.O.T. can be Provided	By whom
4m. or less	5m. or less	No	-
more than 4m.	1.25 h or less	No	-

TABLE - 2

Cases where partial C.O.T. is permissible:

Heights of water (FSL-GL)	Depth to rock.	Investigation required	who can permit partial C.O.T
4m. or less	more than 5m.	Assessment of permeabilities Of overburden	Superintending Engineer
More than 4m.	more than 1.25 h	- do -	- do -

Sketch showing location of cut-off trench.