
Design Check Report submitted to

CTARA, IIT Bombay

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I. Introduction

CTARA, IIT Bombay along with Academy of Development Science, Karjat (ADS) plans to build a small dam in Gudwan/Belachiwadi in Karjat Taluka. Details on this are available at: www.cse.iitb.ac.in/sohoni/dam. The plan is to build an earthen dam of length about 90m and height 9.2m, with a waste weir arrangement. The estimated storage of the dam is 19480. The stream on which this dam is to be constructed has two small soil-conservation dams.

The design and estimation of the dam project has been done by Gangotree Resources Developers Pvt. Ltd, Pune. CTARA, IIT Bombay requested Department of Civil Engineering, IIT Bombay to check and assess the design and estimation provided by the Consultants. This report is based on the evaluation of the design and estimation of the report provided.
II. Hydrologic Features

1. Design of Percolation Tank

   1. Average Annual Intensity of Rainfall = 116.17 inches/yr = 2950.72 mm/yr = 
      \( \frac{2950.72}{(30 \times 24 \times 12)} \) = 0.342 mm/hr.

   2. Average Intensity of Rainfall (Monsoon, 5 months) = 116.17 inches/yr = 0.82 
      mm/hr.

   3. Catchment Area = 0.1093 sq.mile = 0.2829 sq. km.

   4. Yield Calculation:
      
      (i) From Inglis formula = 22.02 MCF

      (ii) From Strange Formula = 9.138 MCF

      (iii) From Binnie Formula = 9.550 MCF

   5. Minimum Yield is 9.138 MCF (Strange) and Maximum is 22.02 MCF (Inglis).

   6. Minimum yield has been taken for design.

   Note:
   
   1. Detailed calculations for runoff should be provided.

   2. Appropriate references (Formula, Strange Table, etc.) for calculations should be 
      provided.(Page15)

Design of Waste Weir

   1. Velocity (By Manning’s) = 5.19 ft/s

   2. Discharge (By Manning’s) = (5.19 \times 112.7935) = 585.3983 \text{ ft}^3/\text{s} (cusec)

   3. Discharge (By Eytelwein Formula) = 677.491 \text{ ft}^3/\text{s} (cusec)
4. Flood Discharges using, a) Inglis (Western Maharashtra) = 248 cusecs, b) Dickens (Marathwada) = 931 cusec, c) Vidarbha = 543 cusec

Note:

1. Design is done for the discharge obtained from the Inglis formula applicable to western Maharashtra region (minimum of the calculated discharges). Why other discharges (Marathwada & Vidarbha) are calculated? Is there any significance related to this?

2. Drawing of the section should be provided

3. The extreme rainfall of the year 2005 also may be considered in the design and appropriate arrangements for corresponding flooding should be considered in the design.

**Design of Silt level**

1. Design is done as per manual.

2. Calculations are OK
III. Quantity Calculation

1. **Seat for Dam Excavation**: Quantity calculation is OK.

2. **COT Excavation**: Quantity calculation is OK.

3. **Filling**: Same as COT excavation.

4. **Hearting**: a) Top width is shown in drawing as 2.5m, but is taken as 2.0m in calculation. B) Which one is correct?

5. **Casing**: Quantity calculation is OK.

6. **Rock Toe**: a) Designed as per M.I. Manual. B) Height is taken as H/6 as H>5m. c) Calculation is OK.

7. **Pitching and Quarry Spoil Bedding**: a) Sample Calculation for the slant length should be given. B) Slant length should be calculated separately for U/S & D/S sides. C) How the quantity calculation of pitching has been made?

8. **Main Drain**: Quantity calculation is OK.

9. **Rainfall**: How Dependability of the rainfall is achieved? Is there any statistical calculation? Details should be given.
IV. Measurement Sheet

1. **Excavation for foundation**: 
   a) Quantity calculation is OK, 
   b) Drawing showing the sections of Flank wall, Guide wall and Key wall should be given.

2. **Excavation for waste weir**: 
   a) Quantity calculation is OK; 
   b) Drawing showing the sections of the different channels should be given.

3. **PCC for foundation**: Quantity calculation is OK

4. **Construction of UCR 1:5 CM for foundation**: Quantity calculation is OK.

5. **Construction of UCR 1:5 CM for superstructure**: Quantity calculation is OK.

6. **Providing & laying M-15 cement 1:2:4 for coping**: Quantity calculation is OK.

7. **Pointing 1:3 for UCR foundation**: Quantity calculation is OK.

8. **Pointing 1:3 for UCR superstructure**: Quantity calculation is OK.

9. **Dewatering**: Quantity calculation is OK.

10. **Excavation for foundation**: 
    a) Quantity calculation is OK, 
    b) Drawing showing the sections of the L-drains, Cross-drains & Toe-drains should be given.

11. **Filling of Drains with Sand, Metal & Gravels**: Quantity calculation is OK.

12. **Cleaning the site**: How the quantity is calculated? Can this be quantified? It can be a lump sum amount based on labor cost.

13. **Construction of temporary roads**: Quantity calculation is OK. Which material is to be used? If it is locally available the material cost will be nil, but labor cost will be there.

14. **Providing and Laying dry stone masonry**: Quantity calculation is OK.
V. Abstract of the Measurement Check

Item No.1: OK
Item No.2: OK
Item No.3: OK
Item No.4: OK
Item No.5: OK
Item No.6: OK
Item No.7: OK
Item No.8: OK
Item No.9: OK
Item No.10: OK
Item No.11: It includes both pitching and spoil bedding, OK
Item No.12: OK
Item No.13: OK
Item No.14: OK
Item No.15: OK
Item No.16: OK
Item No.17: OK
Item No.18: OK

Note: The storage calculation has not been made in detail.
VI. CONCLUDING REMARKS

- The design of the dam is done as per the norms of the Irrigation Manual of Maharashtra.

- The details of the hydrologic design are not given, but the rough estimation based on the available data showed that the hydrologic design is ok.

- The hydraulic design found to be satisfactory.

- The estimates for the various items are found to be ok.

- As the local cost of the material/ labor are not known, we are not in a position to comment on the cost estimate provided.

- The extreme rainfall of the year 2005 also may be considered in the design and appropriate arrangements for corresponding flooding/ overflow should be considered in the design.

- To prolong the life of the dam, some silt exclusion measures should be adopted in the design.