APPENDIX - V : DESIGN EXAMPLE OF CHECK DAM

DESIGN EXAMPLE OF CHECK DAM

Data

Catchment area = 15.68 sq. km (6.127 sq. miles)
Nature of Catchment = Good
Average annual rainfall = 825 mm
65 percent dependable rainfall = 717 mm

Gauge-Discharge Table

Discharge	Water Level
50	89.98
60	91.59
70	93.21
80	94.83
90	96.45
110	99.69
115	100.50

Yield from Catchment

From Strange's Table
Yield/sq. km for 717 mm rainfall is 26.08 percent of rainfall = 0.187 MCM
Yield from the catchment = 15.68×0.187
= 2.93 MCM

Design Flood

Where a formula applicable to a given situation is available viz. Dicken's or Ryve's formula. Assuming that following Dicken's formula is available

$Q = 1000\ A^{¾}$

$Q = 1000\ (6.127)^{¾}$
= 3894 cusecs
= 110.37 cumecs

Design of Sharp Crested Weir

Discharge, $Q = 1.84\ (L - KnH)\ H^{3/2}$

Where,

L = Length of weir
K = Coefficient of end contraction (adopted 0.1)
n = Number of end contractions (in this case = 2)
H = Total head over spillway crest
Q = Discharge

Providing a total head (including velocity head of 0.05) = 1.05 m

$110.37 = 1.84 (L - 0.1 \times 2 \times 1.05) 1.05^{3/2}$
$= 1.84 (L - 0.21) \times 1.076$

L = 55.95 m
Say 56 m

Discharge intensity, $q = \frac{110.37}{56}$
= 1.97 cumecs

Normal Scour depth, $R = 1.35 (\frac{q^2}{f})^{1/3}$
$= 1.35 (\frac{1.97^2}{f})^{1/3}$

Assuming, f = 1

R = 2.12 m below the maximum flood level

Computed flood level at weir site corresponding to the design discharge of 110.37 cumecs is 99.75 m

Keeping the crest level = 99.00 m
Maximum water level = 99.00 + 1.05
= 100.05 m

Thus, there will be a net flood lift of (100.05 – 99.75) i.e. 0.3 m at the weir site

Depth of downstream cutoff = 1.5 R
= 1.5 × 2.12
= 3.18 m

Desired R.L. of cut off = 100.05 – 3.18 = 96.87 m

Average bed level of deep channel is 97.30 m

Providing a minimum depth of 1 m for cutoff

Actual R.L. of cutoff = 97.30 – 1.00
= 96.30 (against the desired level of 96.87)

Design of Weir Floor

Design flood = 110.37 cumecs

Length of weir = 56 m

Height of weir above the bed = 99.00 – 97.30
= 1.7 m

Bottom width of weir = 1.6 m

Total maximum head, H = 1.7 m

Total creep length required, L = C × H

Adopting C = 4

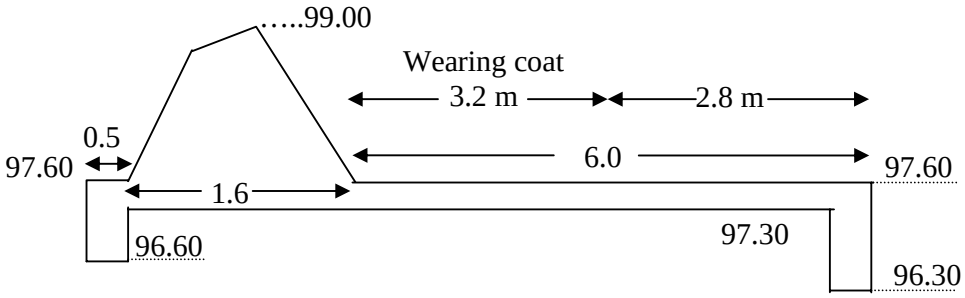
L = 4 × 1.7
= 7.22 m
Say 7.25 m

Length of downstream floor, $L_d = 2.21\ C \sqrt{\left(\frac{H}{13}\right)}$

$= 2.21 \times 4 \sqrt{\left(\frac{1.7}{13}\right)}$

= 3.19 m
Say 3.20 m

Provide a length of 6.0 m and provide wearing coat for 3.20 m.



Bottom level of downstream cutoff = 96.30

Assuming bottom level of U/S cut off = 96.60

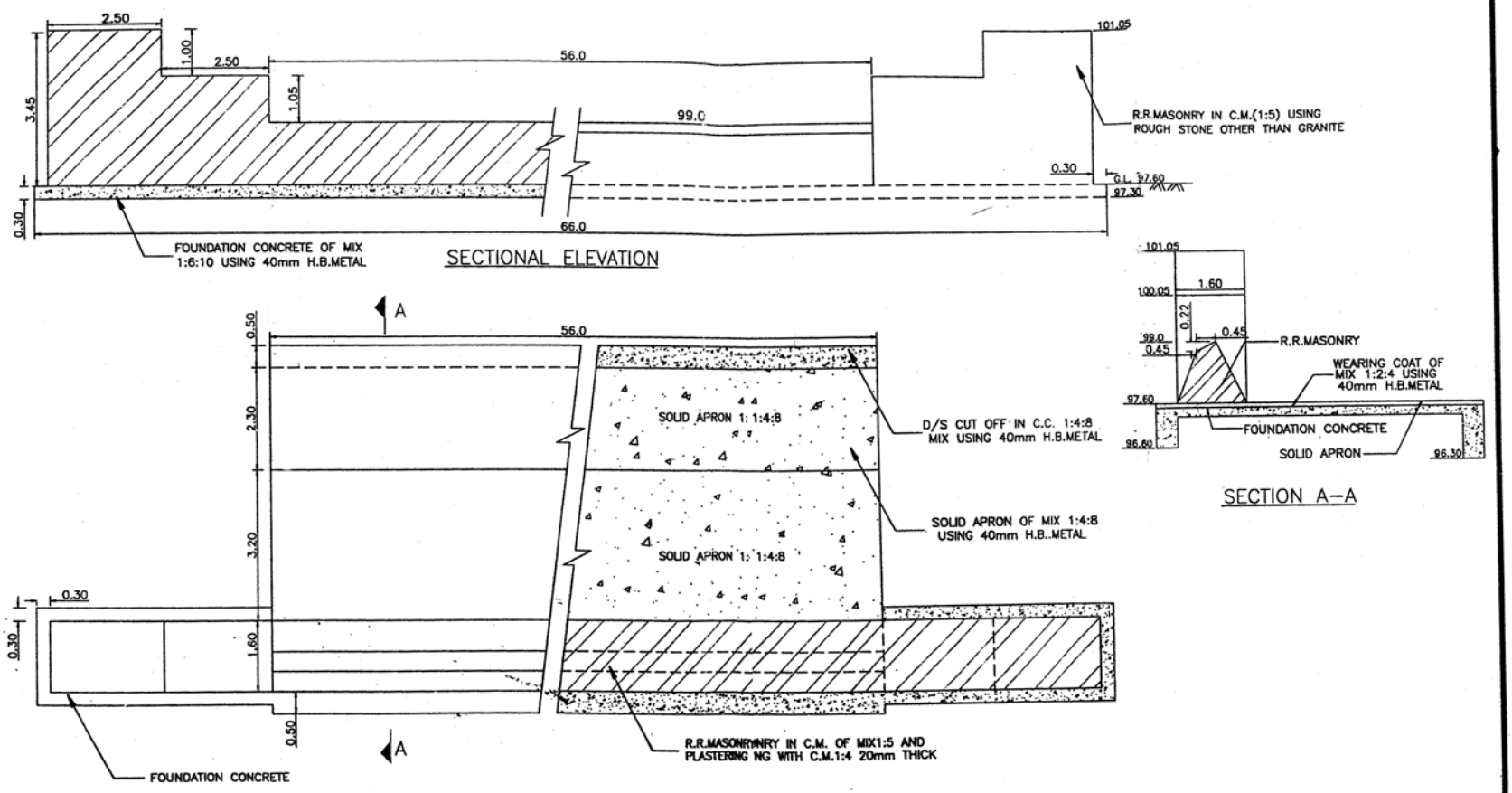
Provide floor thickness = 0.3 m

Actual creep length = 1.0 + 0.5 + 1.6 + 3.2 + 2.8 + 1.3 = 10.4 m against 7.25 m required. Hence O.k.

The sample drawings for Check Dam are shown in Figure A-5.1.

Figure A-5.1

PLAN SHOWING CHECK DAM



HALF PLAN AT TOP AND HALF PLAN AT BOTTOM

NOTE:– ALL DIMENSIONS ARE IN METRES.