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Analysis of Canvas Concrete For Canal Lining Over Conventional Techniques.

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Abstract

Water resource is most important natural resource needed for survival and progressiveness of mankind. Canal lining is the process of reducing seepage loss of irrigation water by adding an impermeable layer to the edges of the trench. The conventional methods use for lining can cause seepage which result in losses of 30 to 50 percent of irrigation water from the canals. The Concrete Cloth is a unique property material because of which its fire and water proof. Concrete Cloth (CC) is a flexible cement impregnated fabric that hardens on hydration to form a thin, durable water proof and fire proof concrete layer. The Babulgaon dam canal is earthen canal had a water loss of over 0.33 m³ per sec. The concrete canvas proposed for the site helps in controlling the seepage loss and only the initial cost of construction is more than earthen lining and concrete lining

I. INTRODUCTION

1.1 Background

Canal Irrigation is the most important and cheaper irrigation in India. About 85lakh hectare land was irrigated by canals during 2008-2009 survey. The seepage losses from unlined canals in India have been found to vary 106 m² of land in 1 second about 0.3 to 7 m³ i.e. 30%. According to analysis cement concrete lining is more feasible than stone masonry and burnt clay tile lining. The drawbacks of concrete lining is that it needs 28 days for curing and for gaining its full strength and a need of skill labour. To overcome all this drawbacks an innovative versatile construction material "CONCRETE CANVAS" can be implemented.

1.2 Concrete Canvas

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Concrete Cloth is a unique proprietary material because of which its fire and water proof. Concrete Cloth (CC) is a flexible cement impregnated fabric that hardens on hydration to form a thin, durable Water proof and fire proof concrete layer. CC has a number of applications in the civil and construction sectors. Other applications for CC include Roofing, Asbestos Containment, Water Tanks, Flood Defenses, Shot Crete Replacement, Tunnel Lining, Retaining Walls, culvert, weed inhabiting, basement lining, Erosion Control, Building Cladding, and Etcetera CC consists of a 3-dimensional fiber matrix containing a specially formulated dry concrete mix. A PVC backing on one surface of the cloth ensures the material is completely waterproof. The material can be hydrated either by spraying or by fully immersed in water.

1.3 Case Study of Hingoli Village

Hingoli is situated at the northern part of Marathwada in Maharashtra. Borders of Hingoli are surrounded by districts Washim and Yavatmal in northern side, Parbhani in western side, and Nanded at south-eastern side. The Babulgaon Dam is located in the Sengaon Taluka on Hingoli district. The dam is handled by the Purna Irrigation Division Hingoli. The dam was built in the 1979 and the cost required for construction of the dam was 30.47 lakh. The Gross Command Area of this dam is around 576 hectare, Cultivable Command Area is 533 hectare. The total storage of this dam is 2.448 TMC, the Live and Dead storage of the dam are 0.302 TMC and 2.146 respectively. The length of dam is 900m and the height of the dam is 1176m. The canal is unlined earthen typed and trapezoidal cross section. The length of the canal 25km and the opening from the dam to the canal is of 0.9x0.9m.

II. OBJECTIVES

1) To study irrigation canal at Hingoli, Maharashtra.
2) To study the discharge in irrigation canal.
3) Cost analysis of different canal lining.
4) To built a prototype of canvas concrete canal lining, earthen canal and cement concrete canal lining.
5) To compare the three prototype of canal lining.

III. LITERATURE REVIEW

1. **Article Name**: Concrete Canvas: Solution Of Pavement
   Author: Mr. Rajan Pandey, Dr D. Jegatheeswaran
   Description: Certain test were conducted on the specimen like impact test, tensile strength test, and flexural strength. For the impact test Energy absorption of the specimen was 8.8291J which is more than 2 times of the conventional pavement slab.
2. **Article Name**: The Use Of Canal Lining Available Materials and its Comparative Study.
   Author: Mr. Amrut Sangale, Dr. S.S Valunjkar
   Description: Comparative study of irrigation canal lining by use of existing material. This study reveals why irrigation canal lining and describes a number of various lining and their analysis. There are various material which are adopting canal lining. However in our country as per

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environmental condition mostly cement concrete lining is popular, cost of each lining is different than others.

3. **Article Name**: Effect of vegetation growth in drainage canals on water management
   Author: Mr. Wilgert Veldman, Mr. Fredrik Huthoff
   Description: In 2002 a new regulation was adopted in the Netherlands to protect flora and fauna. As a consequence mowing of drainage canals will be restricted during the growing season leading to vegetated canals that may hamper the discharge of water. In the summer of 2006 a field experiment has been executed in combination with a model study to investigate the effects of vegetation growth in the Fliert, a drainage canal located in the central part of the Netherlands

4. **Article Name**: A critical study of water loss in canals and its reduction measures
   Author: Mr. Bikram Saha
   Description: Water is a very precious natural resource. When this precious resource moves through the canals certain part of the water is lost by seepage, evaporation etc. This loss is known as conveyance loss. The conveyance loss was calculated experimentally by different researcher on different canals around the world. In this paper author have tried to review some of the research work and recommend an average water loss from the canal irrespective of the soil and other environmental condition

IV. METHODOLOGY

4.1 Design of model:

Since the length of the river is too long and the depth is too short, so it is not feasible to develop undistorted model and therefore, the prismatic distorted model was prepared. Since the model is distorted model the ratio for depth and width will be same whereas the ratio for length will be different. The type of model selected for analysis of project is undistorted type. By using the plans provided by The Irrigation Department of Hingoli district the length and other parameters of the prototype are decided. The scale of model is taken to be 1:4 for width and depth and with the scale 0f 1:1 length of 1km canal the 1m length is taken as to actual section selected. With the help of giving adequate slope the actual site condition are created. As given in table below we decided the suitable scale of 1:4 as it is feesible to make model.

Sr. No.	Scale Ratio	Depth(mm)	Bottom Width(mm)	Top Width(mm)
1	1:1	700	1200	2800
2	1:2	350	600	1400
3	1:3	233.33	400	933.33
4	1:4	175	300	700

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5	1:5	140	240	560
6	1:6	116.67	200	466.67
7	1:7	100	171.43	400
8	1:8	87.5	150	350
9	1:9	77.78	133.33	311.11
10	1:10	70	120	280

Table 1: Scale ratios

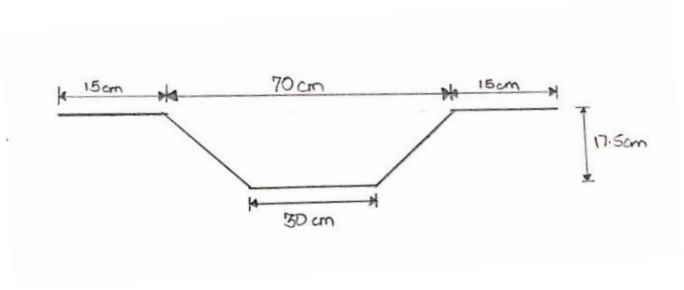

Figure 1: Scale dimensions 1:4

4.2 Model Setup:

The base skeleton of the prototype is formed by the use iron rod. The steel sheet of 5mm is of size 1m X 1m is used to form base surface of canal .the sheet is molded into the desired shape as per dimensions decided. This sheet is welded on the skeleton. At adequate distance holes are provided for the collection of seepage losses in canal.

Image 1

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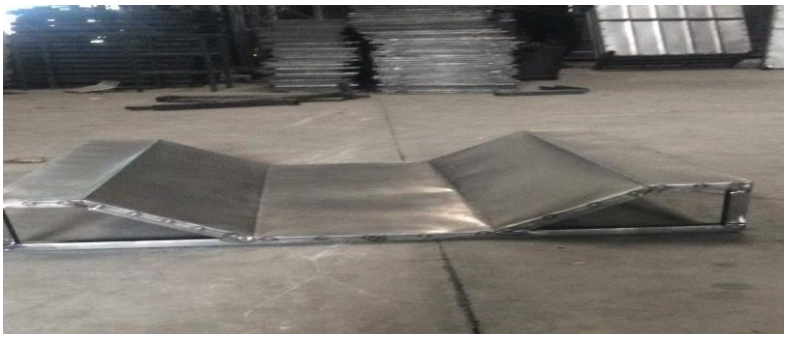

Image 2

4.3 Cost Analysis:

The cost analysis is concerned with determining money value of inputs (labor, raw material), called as the overall cost of production which helps in deciding the optimum level of production.

Formula:

Volume of Total Excavation = Area of trapezoid * 1,000m (length of canal)

$$= \{[(B+b)/2] * h\} *1000$$

Rate of Excavation = 300 Rs per m^3

Total cost of Excavation = vol. of excavation * rate of excavation

Concrete lining:

Grade of Cement M20 (ratio 1:2:4).

Perimeter of trapezoidal section (P) = 2a+b

Total area over entire span = Perimeter * Length (1000m)

Total volume of concrete = Total area * Thickness of Concrete (15cm to 30cm)

Total cost of concrete = Total volume of concrete * cost of concrete per m^3

Canvas Concrete Lining:

Size of CC sheet required = 1m * 3.4m

Number of sheet required = 1000

Number of bolts required = 4 bolts per sheet

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Number of J hooks required = 2 J hook per sheet

Binding solution = 1L per 10 sheets

Total labour cost = approx. 35% of total material cost

Contractors profit = approx. 15% of total construction cost

V. Calculation and results

Calculation of costing:

Volume of Total Excavation = Area of trapezoid * 1,000m (length of canal)

= {[(B+b)/2] * h} * 1000

= 2 * 0.7 * 1000

= 1400 m^3

Rate of Excavation = 300 Rs per m^3

Total cost of Excavation = vol. of excavation * rate of excavation

= 1400 * 300

= 4,20,000/- Rs

Perimeter of trapezoidal section (P) = 2a+b

= 2(1.06)+1.2

= 3.32m

Total area over entire span = Perimeter * Length (1000m)

= 3.32 * 1000

= 3320 m^2

Total volume of concrete = Total area * Thickness of Concrete (15cm to 30cm)

= 3320 * 0.3

= 996 m^3

Cost of concrete per m^3 = 4000/- Rs

Total cost of concrete = Total volume of concrete * cost of concrete per m^3

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= 996 * 4000

= 39,84,000/- Rs

Therefore, total material cost = 39,84,000/- Rs

Cost of CC sheet of size (1m * 3.4m) = 5900/- Rs

Total cost of CC sheets = 5900*1000

= 59,00,000/-Rs

Cost of each bolt = 5/- Rs

Total cost of bolt = 5*4000

= 20,000/- Rs

Cost of each J hook = 15/- Rs

Total cost of J hook = 15*2000

= 30,000/-Rs

Cost of binding solution = 150/-Rs per liter

Total cost of solution = 150*100

= 15000/- Rs

Total cost of material = 59,65,000/- Rs

Observations of cost analysis:

Sr. No.	Parameters	Concrete lining	C.C lining
1.	Excavation cost	4,20,000/-	4,20,000/-
2.	Material cost	39,84,000/-	59,65,000/-
3.	Water required	More	Less
4.	Completion time	More	Less
5.	Ready to use	7 days	1 day

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6.	Total cost	44,04,000/- Rs	63,85,000/- Rs

VI. CONCLUSION

This study provides the detail of construction cost of variant of lining and its durability. Compare cement concrete and canvas concrete. According to analysis in this topic canvas concrete lining is more felicitous than the cement concrete lining. Cost analysis in the topic cement concrete lining more cost efficient than the canvas concrete. Other parameters of canvas concrete make its easily useable material than cement concrete.

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