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Comparison Between Design of RCC Box Culvert by Analytically and Staad.Pro

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Abstract—box culvert problems are complicated examples of soil structure interactionwhere relative stiffness between the backfill soil and the culvert materials is a critical factor in the load carrying capacity of culvert. DUNCAN ETAL proposed and equation for the design of this class of structures. This equation doesn't take into consideration the soil structure interaction phenomenon .A modified form of derived equation, which is presented here with an allowance for the soil properties and culvert stiffness provides a better agreement with the finite element solution .Furthermore the presence of PCC relieving slabs and their action in transferring live loads is analyzed and another better agreement with the finite element method is obtained. A sophisticated computer program called STAAD.pro is used to verify the results obtained from MOMENT DISTRIBUTION METHOD. The result of both is compared with an experimental data on box culvert.

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1. INTRODUCTION

Box Culverts comprises of two Horizontal and two vertical sections constructed solidly are in a perfect world suited for a street or railroad span crossing with high dikes crossing a stream with a constrained stream. On the off chance that the release in a channel or channel crossing a street is little, and if the bearing Capacity of the dirt is low, and afterward the container course is a perfect extension structure. This is a fortified cement unbending casing box course with square or rectangular openings are utilized around ranges of 4m. The tallness of the vent by and large does not surpass 3m .Box ducts are conservative because of their unbending nature and solid activity and separate establishment are not required subsequent to the base section laying specifically on the dirt, serves as pontoon chunk. For little releases, single celled box course is utilized and for expansive releases, multicelled box ducts can be adequate length to suit the carriageway and the kerb. For a container duct, the top piece is required to withstand dead loads, live loads from moving movement, earth weight on sidewalls, water weight from inside, and weight on the base section other than self-weight of the chunk. The structure is planned like an unbending edge embracing minute dissemination strategy for acquiring last dispersed minutes on the premise of the relative firmness of the chunk and vertical walls. The technique is understood and does not require any explanation. A couple of things like profundity of pad, coefficients of earth weight for parallel weight on dividers, width or point of scattering for live loads on box without pad and with pad for auxiliary misshapening are essential things where sentiment of the creators differ and should be managed in much detail. These influence the outline altogether and consequently, required to be evaluated accurately to design a protected structure. Accordingly an endeavor is made to concentrate on the impacts of pad, co-effective of earth weight and edge of scattering for live load. [1].

An audit of writing gives the different work done in the field of ducts furthermore future extension for the studies. This part displays an audit of important writing to draw out the foundation for studies.

Sardgard has talked about the creased metal box ducts as substitution for short – traverse spans. As an aftereffect of expanding utilize, the interest for building up a normal configuration system for these ducts was awesome. The accessible configuration techniques depend on experience or scientific displaying. Just a predetermined number of endeavors were made to check these outline procedures with fall scale field tests. Three creased metal box courses were completely instrumented and field tried under comparative inlay conditions and live loads. The First course was globule point rib fortified layered aluminum; the second was rib strengthened ridged steel; and the third was creased rib strengthened folded steel. [4]

2. METHODOLOGY

There are the incline should have been taken after preceding the initiation of the genuine site work .Methodology stream graph and the work would be done for just 50% of the course first and second part would take after the completion of the principal part. Existing structures would be evacuated with earlier endorsement of the specialist and according to the specialized particular.

This work comprises of the vital exhuming for establishment of course head dividers, wing dividers and different structures. Essential redirecting of streams, development and resulting expulsion of vital coffer dams, sheet heap driving, shoring, dewatering, pumping and evacuation of any block for putting establishment, refilling, clearing the site of garbage and transfer of overabundance exhumed materials would be additionally incorporated into this work routine. Preceding initiation of exhuming, the utmost of uncovering would be set out as appeared in the drawings and coordinated by architect. All overabundance soil and other material from the exhuming including logs, stones and so forth would be expelled from the site and arranged to the areas affirmed by the architect.

Before initiation auxiliary and workmanship work, the exhumed regions would be compacted to the required level given by the specialist if fundamental. Solid trial blending, inspecting and testing would be completed as mentent on specialized determination and understanding with the bs 1881 standard and in this manner all the test outcomes would be submitted to the architect for endorsement. In this manner from work of base and re-bar would be done concurring the development drawing and the base would be made with an evaluation as trained by the designer and cement completely compacted by vibration. Cement would be set in such a way as to maintain a strategic distance from isolation by method for chutes and the uprooting of fortifying bars and would be spread in flat layers where practicable. All solid surfaces would be kept wet for 7 days in the wake of setting cement. Projection and wing divider would be developed by utilizing irregular rubble or cement up to the level of topping bar with giving sob gaps according to the points of interest given by a specialist. All the uncovered surface of rrm would be mortar with concrete mortar. As done in the base every one of the systems would be completed for developing the topping pillars according to the development drawings. Having finished all the vital works in putting strengthening bars and from work the deck would be cemented with an evaluation as taught by the architect. The surface of the deck would be kept wet for no less than 7 days in the wake of setting cement. No brief burdens would be put on the deck. Section would be interested in activity after the designers bearing and not sooner than 28 days after the setting of the solid has been finished.

The most important step in the fixation of water way of a cross drainage structure is to determine the design flood discharge.an accurate determination of the discharge will-

- Govern the safety of the structure.
- Influence the selection of design of foundation, water way and protective works.
- Affect the cost of structure.

There are many ways of estimating the flood discharge. Theymay be grouped into these categories-

- Method based on empirical formula.
- Estimation based on rational formula.
- Methods based on bed slope and area of cross-section of flow.
- Method based on flood works on existing structures.

In India, there are popular empirical formulae for determining the maximum run-off, all of them based on the catchment area. these formulae have been developed on the basis of past experience in a different part of country. there are simple and reasonably accurate, provided sufficient execised in the determining the catchment area accurately and selecting the appropriate coefficient. One of the formula is given here.

Dicken's formula:

$$Q=CM^{3/4}$$

Where,

Q=the pick run-off in m^3/sec.

M=catchment area in sq.km.

C=a constant having the following value:

C=11-14 where the annual rainfall is 60-120 cm.

=14-19 in Madhya pradesh .

=22 in western ghats .

DESIGN OF TYPICAL BOX CULVERT

After the hydraulic details the size of the raft walls slab will be revised and following steps will be followed.

- Load calculations
  - Live load as per structure.
  - Dead load of structure.
  - Side wall pressure.
  - Surcharge load.
  - Breaking force.
- Analysis
  - By M.D.M
  - STAAD.pro(design and analysis)

STAAD.Pro

STAAD.pro is a structural analysis and design computer program originally developed by research engineers international in Yorba Linda, Ca. In late 2005, research engineer international was bought by Bentley Systems.

www.bentley.com/en-US/Products/STAAD.Pro/

STAAD.Pro is one of the leading structural analysis and design software which supports more than 100 steel, concrete and timber design codes and has the largest worldwide user base.

I can make use of various forms of analysis from the traditional first order static analysis, second order p-delta analysis, geometric non-linear analysis or a buckling analysis. It can also make use of various forms of dynamic analysis from model extraction to time history and response spectrum analysis.

In recent years it has become part of integrated structural analysis and design solutions mainly using an exposed API called Open STAAD.pro to access and drive the program using an VB Macro System included in the application or other by including open STAAD.pro functionality in applications that themselves include suitable programmable Macro systems. Additionally STAAD.Pro has added direct links to the application such as RAM connections and STAAD.pro Foundation to provide engineers working with those applications which handle design post processing not handed by STAAD.Pro itself. Another form of integration supported by STAAD.Pro is the analysis scheme of the CIM integration standard, version 2 commonly known as CIS/2 and used by a number modeling and analysis applications. In figure 1 & 2 gives us diamensions of culvert .figure 3&4 gives details about nodes and members of culvert. Figure 5 shows the rendered view of culvert.

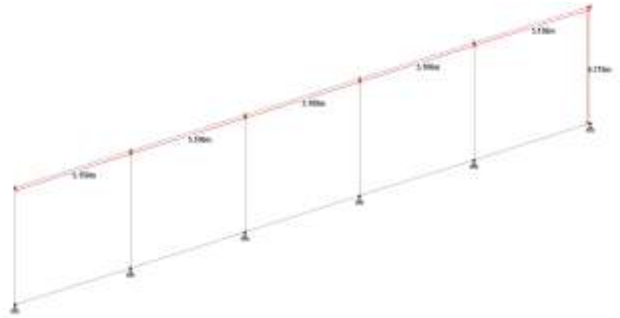

Fig 1: Isometric view

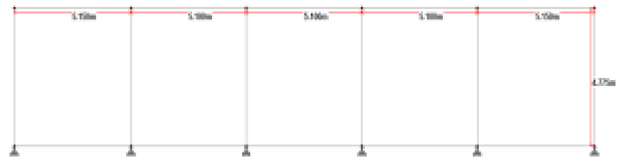

Fig 2: View along Z direction

Node	X m	Y m	Z m
1	0.000	0.000	0.000
2	5.150	0.000	0.000
3	10.250	0.000	0.000
4	15.350	0.000	0.000
5	20.450	0.000	0.000
6	25.600	0.000	0.000
7	0.000	-4.775	0.000
8	5.150	-4.775	0.000
9	10.250	-4.775	0.000
10	15.350	-4.775	0.000
11	20.450	-4.775	0.000
12	25.600	-4.775	0.000
13			

Fig 3: Nodes

Beam	Node A	Node B	Property Refn.	Material	Beta	Length m
1	1	2	1	CONCRETE	0.0	5.150
2	2	3	1	CONCRETE	0.0	5.100
3	3	4	1	CONCRETE	0.0	5.100
4	4	5	1	CONCRETE	0.0	5.100
5	5	6	1	CONCRETE	0.0	5.150
6	7	8	4	CONCRETE	0.0	5.150
7	8	9	4	CONCRETE	0.0	5.100
8	9	10	4	CONCRETE	0.0	5.100
9	10	11	4	CONCRETE	0.0	5.100
10	11	12	4	CONCRETE	0.0	5.150
11	7	1	2	CONCRETE	0.0	4.775
12	8	2	3	CONCRETE	0.0	4.775
13	9	3	3	CONCRETE	0.0	4.775
14	10	4	3	CONCRETE	0.0	4.775
15	11	5	3	CONCRETE	0.0	4.775
16	12	6	2	CONCRETE	0.0	4.775
17						

Fig 4 : member arrangement

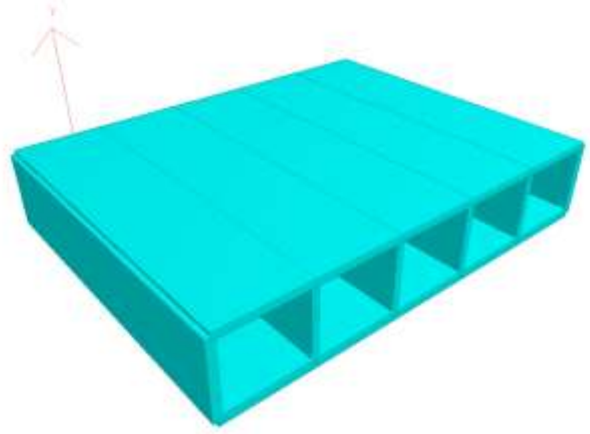

Fig 5: Rendered view

3. PROBABLE CONCLUSION

We are going to compare moments calculated theoretically by MDM (Moment Distribution Method) and STAAD-PRO program. Moment values calculated by STAAD-PRO program may be greater than moment values calculated by MDM (Moment Distribution Method).

Hence structure will be design with maximum applied moments and it will become safer as well as efficient.

4. REFERENCES

[1] Paper No. 555: RCC BOX CULVERT - METHODOLOGY AND DESIGNS INCLUDING COMPUTER METHOD, B.N. Sinha& R.P. Sharma.

[2] Ramamurtham S., “Design of Reinforced concrete Structures” DhanpatRai Publishing Company.

[3] IS : 456 : 2000 “Plain and reinforced concrete code of practice.

[4] SardgardS.M.,”structural evaluation of box culvert “,J.struct.eng.118,3297,1992. Structural analysis,laursen,McGraw-Hill.