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Study of the Box Culvert under Various Loading Cases

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A B S T R A C T

The Word culvert comes from the Tamil language which means to be engraved, speaking of culverts is a direct reminder of the shape that needs to be shaped which helps to pass the shape of an annual waterfall not exceeding three meters wide. This paper attempts to reduce the pressure on the box by partially lighting the box. local animals that live in the area. During road construction, highways (commonly used) are laid to pass traffic, rainwater, water from one side to the other side of the road is called a culvert placed under the road. As a result of the use of the structure, many loads are placed in a box that creates various types of stress.

Keywords:Box culvert, flared portion, pressure cases, side walls, staad pro

1. Introduction

The Box culvert is a very important RC structure that is frequently built underground to provide an unobstructed view of water and animals under the roads and a stress-free, safe way for divers. different types of loading .Helps to provide water flow, provide crossing pipelines, roads or railways, take power lines or other cables from one side of the road to the other side of the road. proper design of these high-load-bearing materials for various stresses and shears are produced at very high prices paper materials to reduce the stress levels produced in various cases

TYPES OF BOX CULVERTS

On basis of shape:-

1.1 Pipe culvert
1.2 Pipe Arch culvert
1.3 Box Culvert (single/multiple)
1.4 Arch culvert
1.5 Bridge culvert

On basis of material used:-

2.1 Concrete
2.2 Steel
2.3 Plastic
2.4 Aluminum
2.5 High density polyethylene

TAKEN CASES ARE: -

For the purpose of design, culverts are subjected to following cases: -

1:Dead Load, Live Load and Earth Pressure Acting from Outside, no Water Pressure Acting from Inside.

2:Dead Load, Live Load and Earth Pressure Acting from Outside, Water Pressure Acting from Inside.

3:Dead Load and Earth Pressure Acting from Outside, no Water Pressure Acting from Inside.

2 Objective

1.1. In the structure author assumed discreet boundaries for getting results which was then applied mdm and analysis was done and structure was safe
1.2. By using boundary conditions the author limited the dimensions of work.
1.3. He also told adding of boxes on edge's is safe has zero maintenance, box size can be placed by within embankment at any elevation which is not possible in slab culvert ..
1.4. Above the research paper indicates the potential for efficient box culvert.
1.5. There is a slight less emphasis on reduction of bending moments, shear etc. we can emphasis on the renewal of structure by flaring its parts and reducing the stresses which will help in increase in Factor of safety
1.6. When factor of safety will increase it will directly increase the loading capacity in terms of designed load.

3 Result and Discussion

Eccentricity
Eccentricity is the ratio of maximum bending value to that of shear stress value which specifies the minimum thickness of wall to one side . Generally denoted by 'e'. values are measured in mm.

Vonmis stress
Vonmiss stress is the stress developed due to maximum energy criteria also known as maximum distortion energy criteria, which suggests the yielding of a ductile material is a part of plastic theory applied to some materials.
The von miss stress is used to predict yielding of material under complex loading conditions .The stress satisfies the property where two stress states with equal distortion energy have an equal von miss stress.
It is the critical value of distortion energy stored in a particular / isotropic material.

Tresca stress
If a ductile material will plastically deform continuously and with increase in stress applied such stress are called as Tresca stress. It is also called as Maximum shear stress.
It says that plastic deformation of material begins when difference between maximum and minimum principal stress equals twice yield stress in shear.

Principal stress
These are the stress generated when shear value drops to zero. Principal stress is the maximum normal stress a body can have as its some point it represents purely normal stress and doesn't have any shear component.

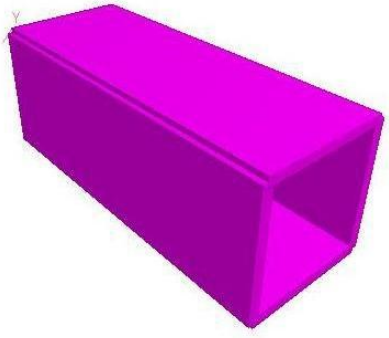
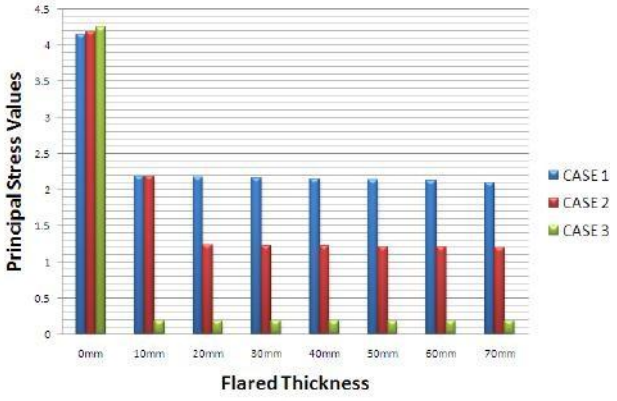


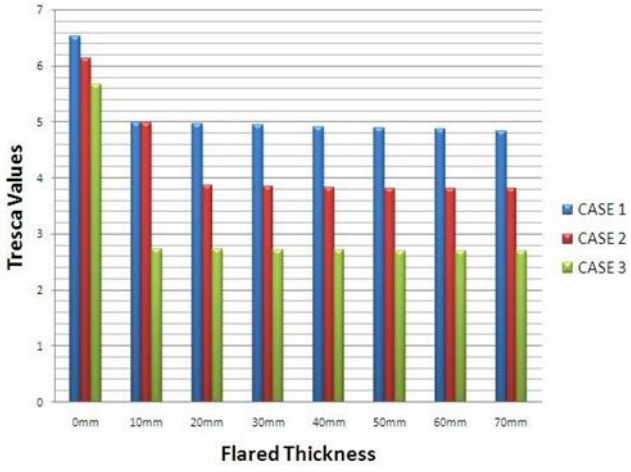
Fig.1: 3-D View of Flared Box Culvert

3 Result and Discussion

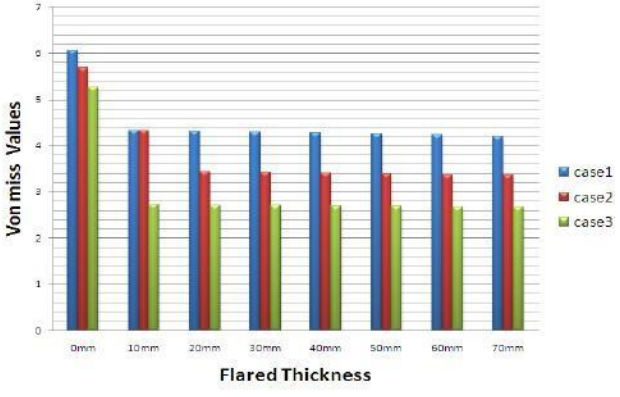
The analysis results obtained using staad pro software is shown in various graphs for various parameters as a mean of maximum values are as follows:



Graph.3: Principal stress v/s Flared Thickness



Graph.3: Tresca Values v/s Flared Thickness



Graph.3: Von miss Values v/s Flared Thickness

4 Conclusion

After evaluation of all the results these points are concluded below:-

1. By practice of Staad pro software analysis of structure was thoroughly done.
2. Shear values reduced on raise of flared portion.
3. Shear Value was found to be 686.944KN/MMSQ in modal number 7 case number 1 which is the least value in all over the study.
4. Principal Top was found to be 0.178 KN/MMSQ in modal number 7 case number 3 which is the least value in all over the study.
5. Tressca was found to be 2.69 KN/MMSQ in modal number 7 case number 3 which is the least value in all over the study.
6. Vonmiss was found to be 2.673KN/MMSQ in modal number 7 case number 3 which is the least value in all over the study.
7. Displacement Values was found to be 1.55 (MM) in modal number 7 case number 3 which is the least value in all over the study.
8. Bending Moment was found to be 1.226 (kNm/m) in modal number 7 case number 3 which is the least value in all over the study
9. Vonmiss values reduced very dissolute and continued endless on further increase of thickness.
10. Principal stress failed and provided a positive response for structural alteration.
11. Tresca values also fell

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