International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 7 July 2022, pp: 1214-1219 www.ijaem.net ISSN: 2395-5252

# Stbability Analysis and Optimization of Buttress Retaining Wall with and Without Relief Shelf Using Etabs

Shreyas S[1], Naveenkumar S[2]

[1]*Student, CAD of structures, Civil engineering department, P.E.S College of Engineering, Mandya.*
[2]*Assistant Professor,CAD of structures,Civil engineering department, P.E.S College of Engineering, Mandya.*

Submitted: 10-07-2022 Revised: 18-07-2022 Accepted: 23-07-2022

**ABSTRACT :** Retaining walls are widely used for enormous functions. To make structure economical, the dimensions of the structure should be reduced without effecting the purpose of that structure. Relief shelf which is having an ability in reducing the moment in the structure is involved in the structural analysis. The analysis of buttress retaining wall with and without relief shelf using ETABS is carried out. The relief shelf is located on a stem of retaining wall at different positions and the impact of relief shelf is determined for various position in the stem. The structure is also analyzed in different soil type condition to know the impact of soil type on the structure.

## I. INTRODUCTION :

Retaining walls are buildings made to hold up soil, water, and other retaining materials, also referred to as backfill. Retaining walls' primary purposes are to stabilize hillsides, stop landslides, and guard against erosion. Retaining walls are used to prevent erosion anywhere there are unstable soils, steep slopes, or a lot of runoff. Roadways and other infrastructure can be harmed by excessive runoffs, therefore controlling sediment runoff is important for the environment and water quality. It also helps reduce runoff-related erosion. Once more, vegetation will support the soil. Before entering the water source, sediments and contaminants are filtered out, enhancing the quality of the water. The supporting substance Structures experience an overturning and sliding effect as a result of the force the supported material applies to it. Earth pressure, together with one's own weight, is the primary driving force behind retaining wall analysis and design. The lateral earth pressure is highly dependent on the soil's cohesiveness and the angle of internal friction. The distribution of earth pressures is typically triangular, with the least pressure at the top of the wall and the maximum pressure at the bottom. If not correctly examined, this push force has the potential to either push the wall forward or overturn it.

**RELIEF SHELF :** The component which helps in reducing the moment in the retaining structures.

**DESIGN PARAMETERS**

- A wall's height.
- Type of soil.
- Terrain that slopes down and up from the retaining wall.
- Loads behind the retaining wall and above it.

## II. METHODOLOGY

- To Evaluate the Stability Aspect for Buttress Retaining Structures with and without Relief Shelf.
- To study the impact of soil type on structure.
- Analysis of Retaining Wall for different soil type using ETABS

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 7 July 2022, pp: 1214-1219 www.ijaem.net ISSN: 2395-5252

## III. MODELLING AND ANALYSIS

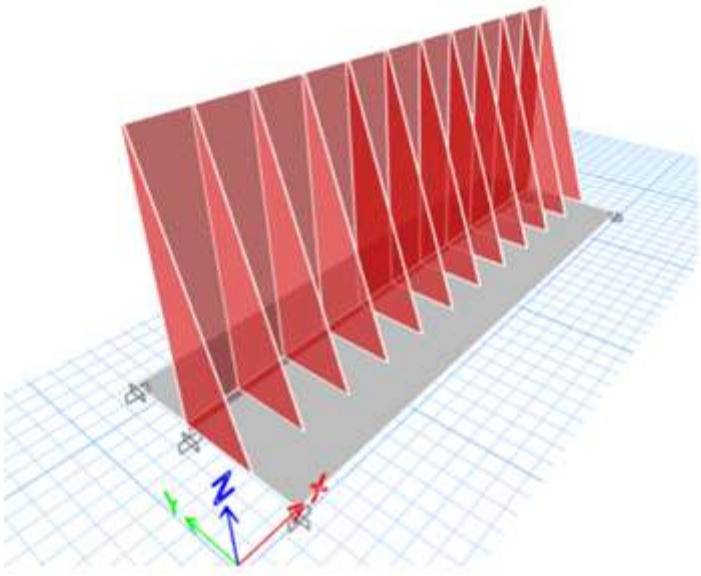


Fig III.a : 3D Model of buttress retaining wall without relief shelf

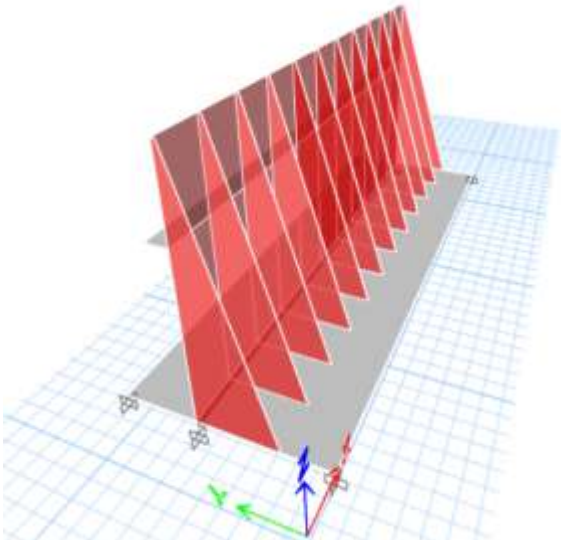


Fig III.b : 3D Model of Buttress retaining structure with relief shelf at 2H/3 m from bottom

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 7 July 2022, pp: 1214-1219 www.ijaem.net ISSN: 2395-5252

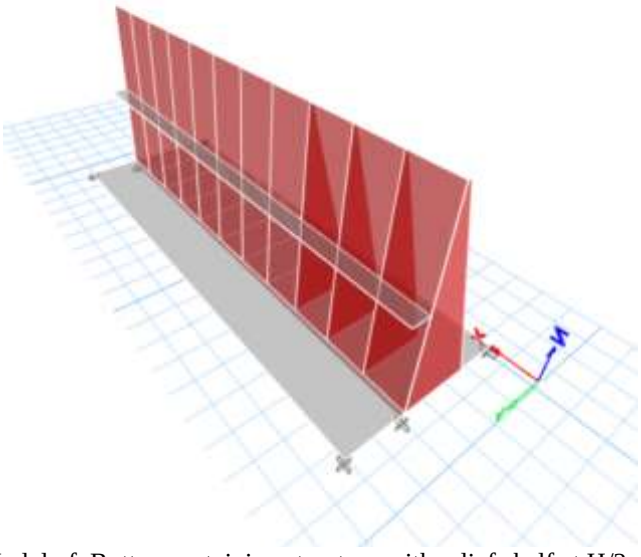


Fig III.c:3D Model of Buttress retaining structure with relief shelf at H/2 m from bottom

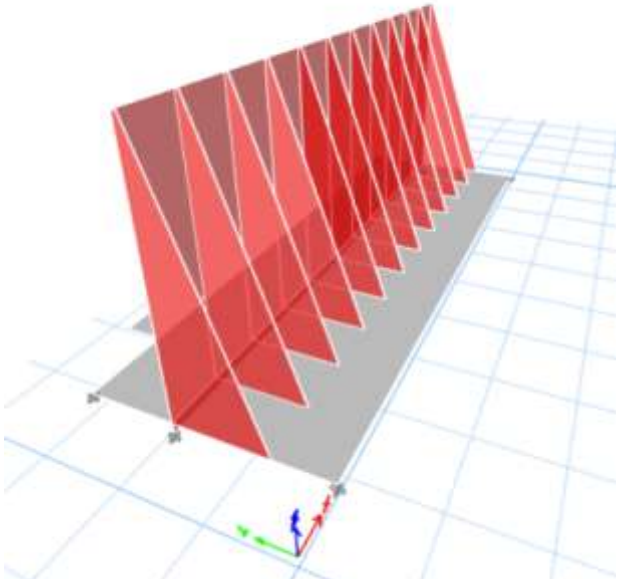


Fig III.d: 3D Model of Buttress retaining structure with relief shelf at H/3 m from bottom

## IV. RESULTS AND DISCUSSION

**RESULTS OBTAINED FOR BUTTRESS RETAINING STRUCTURE WITHOUT RELIEF SHELF FOR SOIL TYPE I, II, III**

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 7 July 2022, pp: 1214-1219 www.ijaem.net ISSN: 2395-5252

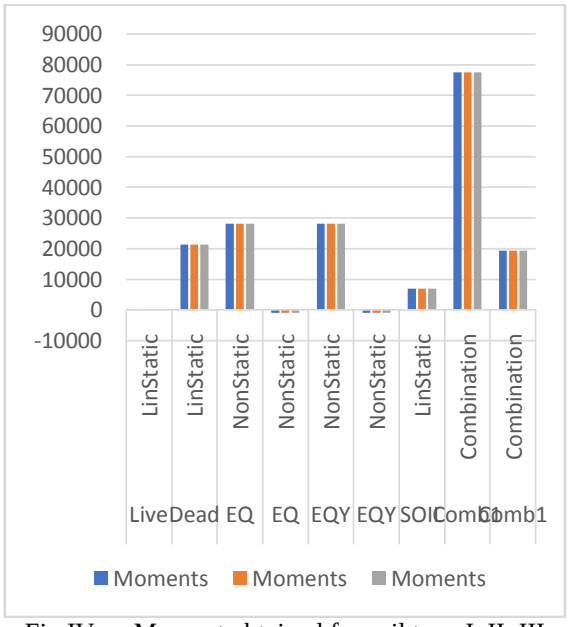



Fig IV.a : Moment obtained for soil type I, II, III

**RESULTS OBTAINED FORBUTTRESS RETAINING STRUCTURE WITH RELIEF SHELF AT HEIGHT 2H/3 FOR SOIL TYPE I, II, III**

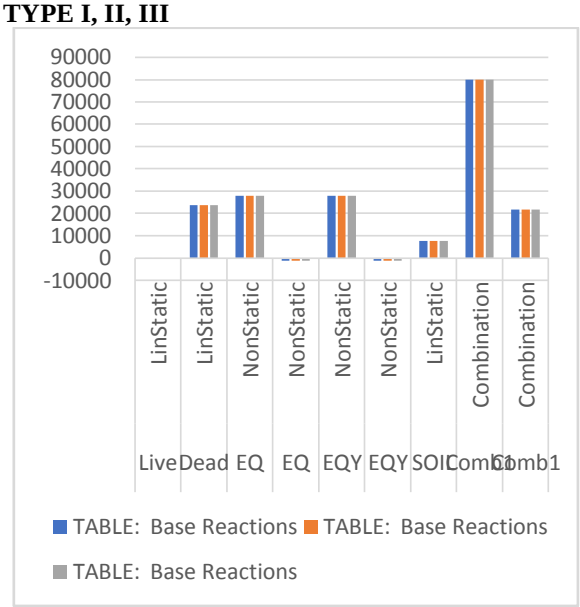
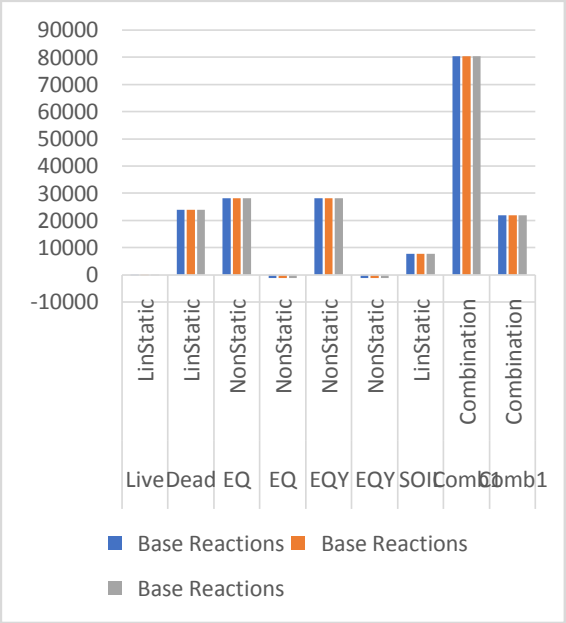



Fig IV.b: Moment obtained for soil type I, II, III

**RESULTS OBTAINED FORBUTTRESS RETAINING STRUCTURE WITH RELIEF SHELF AT HEIGHT H/2 FOR DIFFERENT SOIL TYPE I, II, III**

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 7 July 2022, pp: 1214-1219 www.ijaem.net ISSN: 2395-5252




FigIV.c: Moment obtained for soil type I, II, III

**RESULTS OBTAINED FORBUTTRESS RETAINING STRUCTURE WITH RELIEF SHELF AT HEIGHT H/3 FOR SOIL TYPE I, II, III**

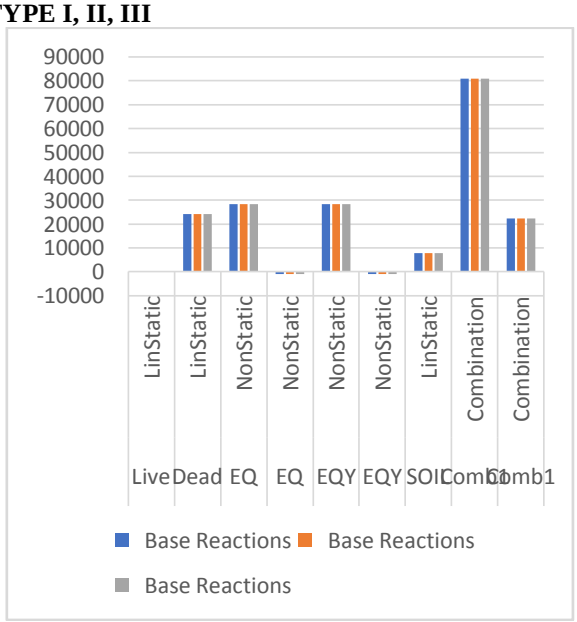



Fig IV.d: Moment obtained for soil type I, II, III

**RESULTS OBTAINED FORBUTTRESS RETAINING STRUCTURE WITH AND WITHOUT RELIEF SHELF**

International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 7 July 2022, pp: 1214-1219 www.ijaem.net ISSN: 2395-5252

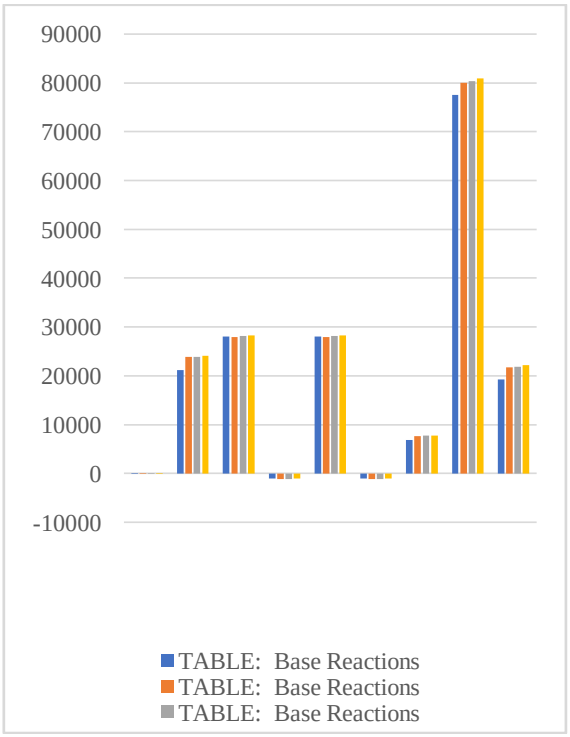



Fig 7.5.a : Moment obtained for Buttress Retaining structure with and without relief-shelf

## V. CONCLUSION

Buttress retaining wall without and with relief shelf at the height of 2H/3, H/2, H/3 are analyzed using ETABS. Each model is analyzed for soil type I, II, and III. The results obtained for soil type I, II, and III are similar, it shows that the change in soil type doesn't impact any changes in analysis.Buttress retaining wall with relief shelf at height2H/3 increases the moment by 1.12%, Buttress retaining wall with relief shelf at height H/2 increases the moment by 1.13%, and Buttress retaining wall with relief shelf at height H/3 increases the moment by 1.14%. Buttress retaining wall without any relief shelf produces minimum moment compared to the Buttress retaining wall with relief shelf.

Providing relief shelf doesn't influence in optimizing the structure, it develops additional moment and make a structure uneconomical as per the analysis. However analysis of this kind of structures in ETABS is not suitable.

## REFERENCE

[1]. U C Sari, M N Sholeh, And I Hermanto- "the stability analysis study of conventional retaining walls variation design in vertical slope" (2019)

[2]. Snehal R. Lahande- "Analytical study of cantilever retaining wall including effect of soil structure interaction" (2016)

[3]. Karthik Babu C, And Keerthi Gowda B S – "Analysis of counterfort retaining wall with and without pressure relief shelf using soft computing technique" (2016)

[4]. Tonne V.R, Mohite P. M – "Optimization and improvement in stability of counterfort retaining wall with relief shelf (2015)

[5]. Dr. B.C. Punmia - R.C.C DESIGNS (Reinforced Concrete Structures).