

# Failures and Rehabilitation of Retaining Walls

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**Abstract** The failure of retaining walls and the potential methods to rehabilitate them are documented with a few case studies. Based on the case studies, most failures were due to the ground water building up behind the wall. The rehabilitation methods are also included.

## 1 Introduction

Retaining wall is a type of structure typically constructed with concrete, timber, stone, or brick to hold the soil in situ or backfill in its place thereby preventing it from getting displaced. Usually retaining walls have soil on one side and built structure or water on the other side. The thickness of the wall is an important aspect that distinguishes the retaining walls from dams. Cantilevered, anchored, gravity and sheet piled are common types of retaining walls.

## 2 Objectives

The objective of this study is to document the failures and methods of rehabilitation of retaining walls.

## 3 Review of the Concept

Theoretically speaking, lateral earth pressure is created behind the wall by the soil. The ground water behind the wall also contributes to the force acting on the wall. Number of other factors influence the performance of the retaining wall including the following.

- a. Soil (in-situ or backfill) properties.
- b. Height of Retaining wall
- c. Type of Foundations (Shallow, deep)
- d. Factor of Safety
- e. Drainage
- f. Active Zone
- g. Vegetation (Trees)
- h. Construction Quality.

Long term performance of the retaining wall is also very much influenced by the drainage design that prevents the rain water from undermining the retaining wall.

## 4 Case Studies

Three case studies were analyzed as a part of this study (Table 1). The first case study described the project by Coastal Drilling East contractors in eastern Maryland. The second and third case studies described the project work undertaken by Nicholson Construction Company in Wadsworth, Illinois and Southeast Washington D.C.

## 5 Analyses

The failures were caused by ground water build up and poor drainage behind the walls. Rehabilitation methods included addition of anchors and soil nailing.

**Table 1. Summary of Case Studies**

S.No	Location	Retaining Wall	Purpose	Size	Cause and condition of Failure	Rehabilitation method	Remarks
1	Historic community in eastern Maryland	Concrete retaining wall	Damaged road rehabilitation	350 lineal feet	Ground water accumulation and rotation of retaining wall but not settlement.	Installation of 100 rock anchors with 5000 pound capacity and 12 inch cast in place concrete wall facing.	Existing retaining wall was 100 years old. Duration of the project was 6 months.
2	Tri state Tollway near intersection of federal Highway 41, Wadsworth, Illinois	Mechanically stabilized earth retaining wall		Length – 740 feet radius – 1896 feet. Height – 24 feet.	Horizontal displacement reported. Storm sewer pipe was obstructed with debris. Concrete panels were misaligned due to excessive displacements.	Installation of one soil nail per panel, shooting a reinforced shotcrete facing.	Was constructed in 1982
3	“O” street in Southeast Washington , D.C.	rehabilitation of anchored slurry wall.		50 x 22 foot reinforced concrete panels	Improper drainage from behind the wall, Zones of highly plastic slickensided clay, lack of corrosion protection on the initial thread bars.	Stabilization of the slurry wall and construction of new wall	Age of the wall – 23 years.

## 6 Conclusions

Based on the documented case studies, multiple causes of failure have been identified. The procedure of rehabilitation of retaining wall can be done by constructing a wall in front of the retaining wall to share the load carried by the existing wall and also from behind by connecting the retaining wall to the soil using tiebacks and anchors etc.,.

## 7 Acknowledgements

This work is supported by the Center for Innovative Grouting Materials and Technology (CIGMAT), University of Houston, Texas.

## 8 References

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