ABSTRACT

The question of determination of lateral earth pressure against the retaining walls is one of the oldest in civil engineering field. A lot of theoretical and experimental work has been done in this field and many theories and hypothesis have been proposed. Retaining wall with pressure relief shelves is one of the special types of retaining wall particularly high R. C. C. retaining walls may be used economically by providing relief shelves on the back fill side of the wall. Such walls may be termed as the "Retaining Wall with Pressure Relief Shelf".

Study of retaining wall with pressure relief shelf is somewhat an un-noticed area in the field of Geo-technical Engineering. Very less study has been carried out so far on this topic. It is also observed that rarely such retaining wall structures are constructed. The study of this type of retaining wall is therefore important to see the performance of such wall. The analytical and practical solutions regarding reduction in earth pressure is interesting to observe.

Although the horizontal shelf is known to reduce the effective force due to active earth pressure, its magnitude could not be ascertained with any degree of certainty. The literature review reveled that; there is lot of scope available for performing study in this area. Theoretical analysis of retaining wall with pressure relief shelves has not been carried out systematically by using Rankine's theory. Raychaudhuri adopted Coulomb's theory in his study, which has many deficiencies. In the present study an attempt has been made here to study the behavior of a retaining wall with one or more relief shelves and a theory has been proposed which agrees fairly well with experiments conducted on a model. The earth pressure distribution behind retaining wall with relief shelves of different width and at different locations is studied experimentally.
The conclusions are drawn based on the discussion and results obtained experimentally and analytically related with; earth pressure measurement on IMRW without and with single relief shelf for different width factor and location factors, earth pressure measurement on IMRW when two relief shelves with different combination of width and location factors, the overturning measurement of IMRW by allowing its moment about the toe (Sliding restricted), measurement of sliding of IMRW due to backfill, measurement of deflection of IMRW due to backfill. A computer program is also developed for the design of retaining wall with and without single pressure relief shelf.

Experimental results of active earth pressures on instrumented model retaining wall (IMRW) with pressure relief shelves have been found to be in close agreement with the analytical results. The pressure distribution diagram changes considerably due to addition of shelf. To have optimum reduction in active earth pressure the shelf should have width up to the failure plane. The IMRW is more stable when two shelves are provided. In practice, there is limitation for using more number of shelves, but up to three shelves may be used economically for high retaining walls. There is significant effect of width factor found on the development and variation of active earth pressure on IMRW. The maximum active earth pressure reduction is obtained between location factors 0.4 to 0.6. The optimization of the location factor for minimum value of active earth pressure on IMRW is found to be 0.55. A cantilever retaining wall which is usually provided for height more than 6 m, if built with relief shelf helps in saving of steel quantity. It is also observed that, the saving in cost of construction is 15% to 25% by the provision of relief shelf over the conventional cantilever retaining wall. More economy may be achieved by providing multiple relief shelves.