

## CONFERENCE THEME 3: ESTURINE AND COASTAL ENGINEERING

### FAILURE MECHANISM FOR BLOCKWORK BREAKWATERS

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#### 1. Introduction

Many coastal rock structures consist of multiple layers of rock and are built on prepared foundations, but some are rather simpler and are placed on unprepared foundations. Some aspects of the design process (e.g. armour sizing to withstand wave attack) have been extensively researched (Jones & Allsop, 1994) and may be undertaken with a relatively high degree of confidence, but requirements for foundations and internal layers are much less well understood.

#### 2. Present practice

A large number of failure mechanisms are possible for a blockwork breakwater. Failure mechanisms include instability of the structure due to geotechnical instability erosion of fines from the structure. However, in this paper it is focused on failure mechanism that lead to removal of blocks from the blockwork due to wave attack.. The measurements show the sharp pressure peak during impact and the relatively slow pressure variations due the fluctuating water level.

#### 3. Advantages and constraints

Simplified structures offer a number of real advantages over conventional designs. A recent research study and industry workshop attended by clients, designers, contractors and rock suppliers identified the following key issues (Crossman & Allsop, 2000).

It has long been claimed that rock structures can easily be adjusted, repaired or modified during the scheme life of the structure. In reality the use of different gradings, multiple layers and prepared foundations has resulted in this being uneconomic in most cases. Thus whilst timber groynes may be adjusted annually, rock groynes have largely been perceived as unchanging throughout the design life.

#### 4. Conclusion and recommendations

There is considerable potential for increased use of innovative and simplified rock structures in coastal defense schemes. These structures offer a number of advantages, but will not become widespread unless additional design guidance, describing limiting conditions and expanding empirical 'best practice' becomes available. Recent research has identified that there is a considerable volume of information that could be rapidly collated to provide the practical guidance required. The development of more sophisticated design methods requires more fundamental research and it will be some time before this can contribute to the design process.

#### References

Allsop N.W.H. & Bray R.N., (1994), "Vertical breakwaters in the United Kingdom: historical and recent experience", Proc. Workshop on Wave Barriers in Deep Waters, pp76-100, Port and Harbour Research Institute, Yokosuka, Japan.

Bezuijen A, Allsop W and Bruce T. (2002) Stability of blockwork breakwaters and seawalls. Proc ICCE 2002, Cardiff.