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	<b>Shoring of Excavations</b>			

## Introduction

Shoring of excavations generally falls into two categories. The first type is temporary shoring, where the stability of the excavation is maintained by works of a temporary nature which are either left installed in the ground behind the permanent structure, or removed at some point in time prior to completion. It is common practice in many projects, for temporary shoring to be designed and documented by the excavation contractor. In this light, the responsibility of the design and documentation of the shoring system should be clearly defined and understood between the relevant parties (ie consulting engineer, client and contractor).

The second type of shoring is that which is incorporated into the permanent structure and frequently includes underpinning or measures to retain the surcharge loads from adjoining buildings or pavements.


By far the most frequent failures in building projects occur in retaining structures and they are most often associated with the failure of the shoring system during construction. Shoring and underpinning frequently do not receive sufficient attention from either consulting engineers and builders. The purpose of this practice note is to bring to the consulting engineers' attention key factors which may need to be considered when dealing with projects involving shoring. It is not the role of this practice note to examine the various types of shoring, as geotechnical and site conditions encountered at each individual site are different and the methodology to be followed should be properly considered in each case as appears appropriate to the situation. Nor is it the intent of this practice note to suggest that the consulting engineer is by default responsible for the following shoring considerations. The matter of responsibility needs to be clearly defined with the client at the outset and the consulting engineer for the building may need to have his brief extended by the client.

## Common Factors to Be Considered

1. All shoring should be properly designed and documented by a suitably qualified and experienced consulting engineer based on appropriately qualified and experienced geotechnical advice with respect to design pressures and bearing capacities. Where the shoring is documented and designed by the excavation contractor, the line of responsibility for the shoring should be clearly defined. However, the client should be encouraged to appoint his consulting engineer to check the design and to inspect the work regularly during construction. Naturally, if the original fee does not include the shoring work, a fee should be negotiated for this service.
2. Experience suggests that many failures could have been prevented by regular inspections by the consulting engineer so that any discrepancy between actual and assumed site conditions may be addressed quickly.

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3. Irregular or 'milestone' inspections by the consulting engineer are often not adequate for shoring and underpinning works. It is recommended that the client be made aware of the need for regular frequent inspections.
4. The building owner should be advised that in carrying out shoring works, it is virtually impossible to entirely prevent any movement of the excavation, and that excavation movement may lead to damage to adjoining properties. It is recommended that consulting engineers, with the appropriate advice from the geotechnical consultant, advise owners of the possible risk associated with the works and the potential for damage to adjoining properties, which may subsequently need repairs (eg the damage may be in the form of cracks which would need to be repaired at the developer's expense). This course of action is not intended to be or appear to be alarmist, but simply a proper discharge of the engineer's responsibilities. The building owner should be advised to allow a sum of money as a contingency for any repairs to adjoining buildings.
5. In many instances, shoring of excavations is left in place for a substantial period of time without the rest of the building development proceeding, and the clients need to be advised of the potential life of the shoring. Recent experience has shown that this can be less than two years in the case of unprotected ground anchors. Suitable notes about expected life should be placed on the drawings.
6. De-watering of excavation sites can cause settlement problems on adjoining properties and the zone of influence can extend quite some distance from the site in certain conditions. Wherever de-watering is anticipated, it is necessary that the consulting engineer and the geotechnical engineer examine the potential for settlement external to the site and advise the client accordingly.
7. In the light of the above, dilapidation surveys of adjoining buildings are a necessary part of the process of claim protection, ie avoiding spurious claim of damage where, in fact, the damage existed prior to excavation (or demolition) commencing. In many cases, it is appropriate to install monitoring stations on adjoining buildings and to monitor them for level and alignment using precise surveying techniques at regular intervals through the construction process. This acts as a warning if undue or unexpected movement is encountered, and further acts as a claim protection in the event that adjoining owners claim that movements are taking place (eg as a result of doors failing to close properly etc). Such 'preventive' measures should be offered to and discussed with the client, as naturally there are benefit and cost implications that may affect the client's decision.
8. The builder or owner should be reminded to obtain permission and co-operation from owners of adjoining properties for work done on their properties associated with dilapidation surveys, installation of temporary anchors under their building and other issues which may affect their properties. Consulting engineers are often engaged by owners of adjoining properties to check on the effects of the proposed shoring system. The co-operation between

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consulting engineers acting for both parties can lead to successful shoring with minimum dispute between the parties.

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