

Shoring Principles

Scope

Shoring is the provision of temporary support to damaged buildings or structures using proprietary metal shoring systems or bespoke shores constructed on site from timber, which will provide:

- Temporary stability of structures/debris
- Sufficient protection from secondary collapse to enable search and/or rescue operations to proceed at reduced risk
- Support to vertical, horizontal or sloping surfaces

Shoring forms the last resort of the hazard mitigation strategy. Only if a secondary collapse hazard cannot be avoided or removed, should it be shored or otherwise stabilised.

Objectives

The objectives of shoring are to:

- Maintain the integrity of all structurally unstable elements
- Transmit the load of the remaining structure to the ground or suitable structural elements
- Give warning of impending collapse of the structure

Shoring Principles

A shoring system must be capable of supporting a load from a damaged or unstable structure, transferring it to the supporting structure or to the ground and distributing it safely. The system must have elements that will:

- Collect, transfer and distribute the load without sudden failure or buckling
- Give warning of impending failure if overloaded

Shores must also incorporate connections or joints that will withstand shock loads caused by structural failure, blast, equipment malfunction, vibration or movement.

Shores must be capable of being adjusted.

Where shores have more than one load-carrying element, bracing must be provided to link these elements together and prevent distortion of the shore caused by elements moving in relation to one another.

A safety factor is built in to the capacity of the shore.

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Collecting, Transferring and Distributing the Load

The engineering principles that underpin shoring operations are concerned with the safe transference of the building or structure loads through to the ground, the ‘load path’.

The upper part of the shore (usually the header) collects the load from the building or structure. The vertical elements of the shore (usually the posts) transfer the load between the upper and lower elements. The lower part of the shore (usually the sole plate) distributes this load safely into the ground. This is termed the ‘Double-Funnel Principle’.

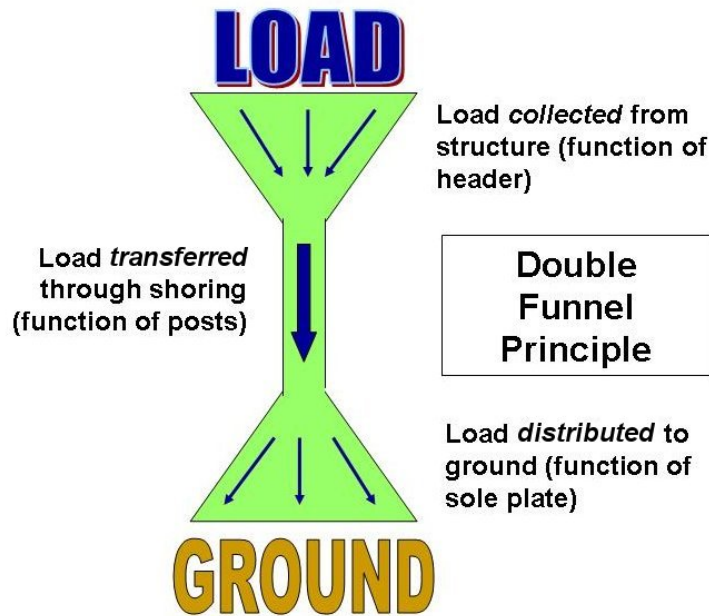


Figure 1: [SOP_SHO001]
Double-Funnel Principle

By performing these functions, the shoring replaces, on a temporary basis, the structural elements of the building (beams, columns and floors) that normally perform these functions but are damaged or destroyed.

Providing Warning of Failure

One of the main advantages of using timber in shoring systems is that it emits an audible warning when overloaded. There are distinctive cracking noises as the timber fibres part when subjected to an overload. In addition, there is a visual warning as timber loaded across the grain deforms considerably when overloaded.

Metal shores can incorporate timber elements to give these safety features. Alternatively, load cells included in the USAR cache can be incorporated into metal shoring systems to give an indication of the load (or increase in load).

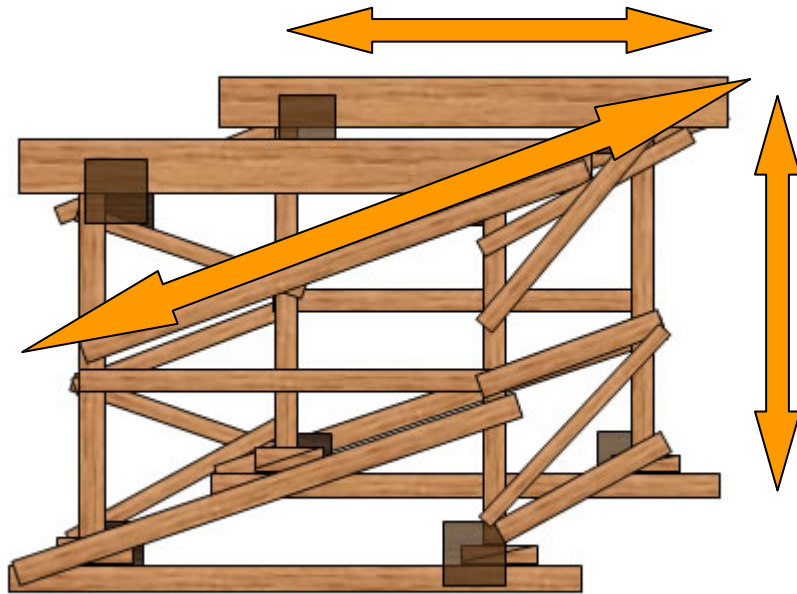
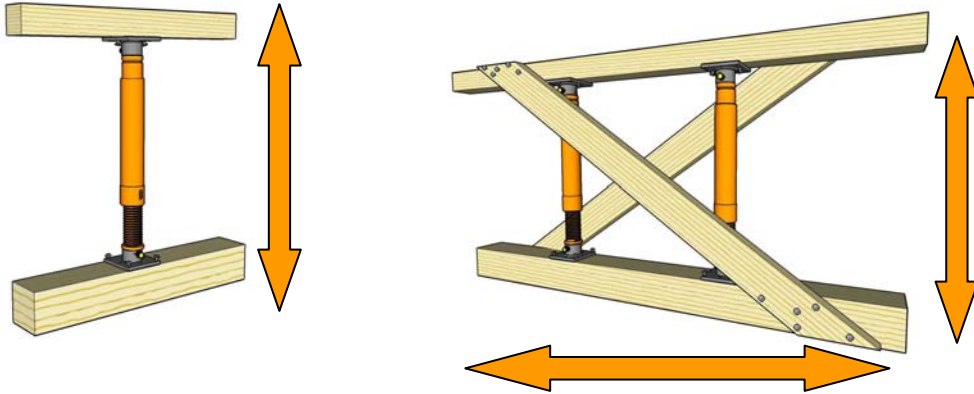
Shoring must be continuously monitored. If these warnings occur or the load is seen to increase, the building or structure must be immediately evacuated and the shoring provisions re-evaluated.

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Types of Shoring

Shores can be classified into three types, depending on their stability.

- Class 1 shores are stable in one dimension (e.g. T-spot shore)
- Class 2 shores are stable in two dimensions (e.g. two post vertical shore)



- Class 3 shores are stable in three dimensions (e.g. laced post shore)

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Engineering Support

A qualified engineer who is familiar with USAR operations will be invaluable for giving advice on shoring operations. They will be able to provide advice on anticipated loadings, placement of shores, the stability of the structure and rubble, determining the level of risk for those inside and from hanging hazards and monitoring the building for movement.

An engineer will also provide advice (based on calculation) regarding any variations to standard shores that may have to be made, depending upon the physical position of the shore and the configuration of the hazard area.

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