
Connections for Timber Shoring

Scope

This document details the methods and components used to connect elements of timber shores together.

Use of Gusset Plates, Cleats and Bracing

In theory, joints or connections between most of the elements of timber shores need only minimal securing as the design transmits forces so that the wood is in compression. In practice, connections must be reinforced to protect the joint from movement due to vibration, equipment failure, human error, etc. In most cases both sides of a joint require gusset plates, cleats, diagonal bracing or a combination of these.

When installing these items, care must be taken to ensure that they do not come into contact with the load or the ground, as this could affect the stability and integrity of the shore. A gap of about 10mm is sufficient.

The shape of gusset plates can be varied to accommodate access requirements, for example by using triangular plates instead of square ones on window and door shores. Cleats are used where access to wedges is important, since gusset plates tend to make adjustment of wedges difficult.

Cleats are also used as structural elements to collect and transfer load in raker shores and sloped floor shores. These have specific lengths and numbers of nails depending on the forces involved.

Type of Nails

The capacity of a joint depends on the bearing surfaces of the timber. Forces in the bracing are dependent on the shear strength of the nails and the resistance of the timber to the nails pushing/pulling through it.

Calculations and tests have shown that a variety of nails will provide the security required. Nails must have a minimum tensile strength of 600N/mm².

British Standard tables show that for a 3.8mm diameter nail driven into a C16 timber-timber joint or a timber-plywood joint, the basic single shear lateral load expected is about 450 Newtons. This is important for engineering joints formed at cleats, for example, as a cleat with 26 nails will have the lateral shear strength of 11.7kN or about 1200 Kg.

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The commonest hand driven nails suitable for shoring are bright round wire nails. The lengths needed are 100mm for structural timber and 75mm for plywood. These lengths ensure the maximum penetration with minimum interference from nails driven into the opposite side of the wood. Note that the embedment of the nail in the piece they are secured in (i.e. the piece below the piece they are first driven into) should be at least half the length of the nail.

Suitable diameters of nails range from 3.75mm to 4.5mm. The smaller diameter nails allow them to be used closer to the edge of the timber.

Power driven nails should be chosen for suitability with the type of nail gun in use. Nail length should be 90mm for both structural timber and plywood.

Duplex nails are nails with two heads, spaced 10mm apart. The nail is driven to the first head, and can then be withdrawn easily using the second head when adjustments need to be made.

Nail Patterns

Nailing patterns should adhere as far as possible to British Standard BS5268-2:2002 patterns to gain the maximum strength of connection.

Where possible, nails should be spaced as shown in the diagrams. This will lessen the possibility of splitting the wood and provide the strongest possible joint

Note that the following diagrams describe 75mm and 100mm nails, which are commonly used for hand driven nails. If other nails are used the strength of the joint may vary (see also Type of Nails section).

75mm Nails in Plywood Gussets

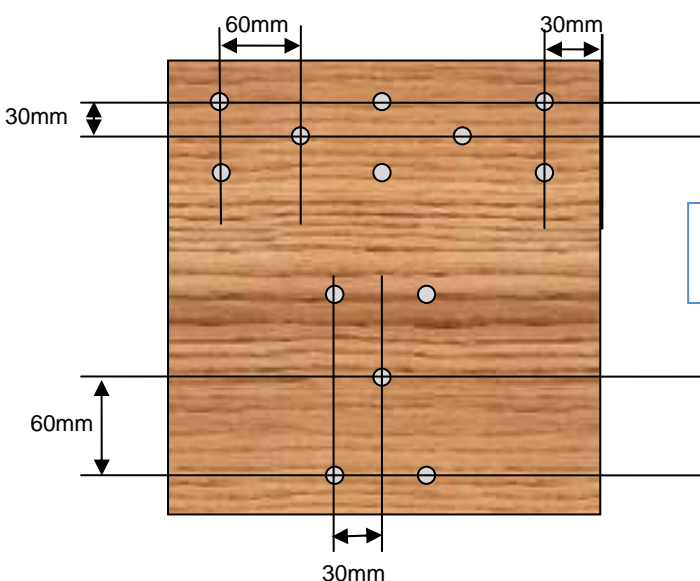


Figure 1 [SOP_SHO015]
75mm nails in plywood gussets

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100mm Nails in 100mm x 50mm Bracing

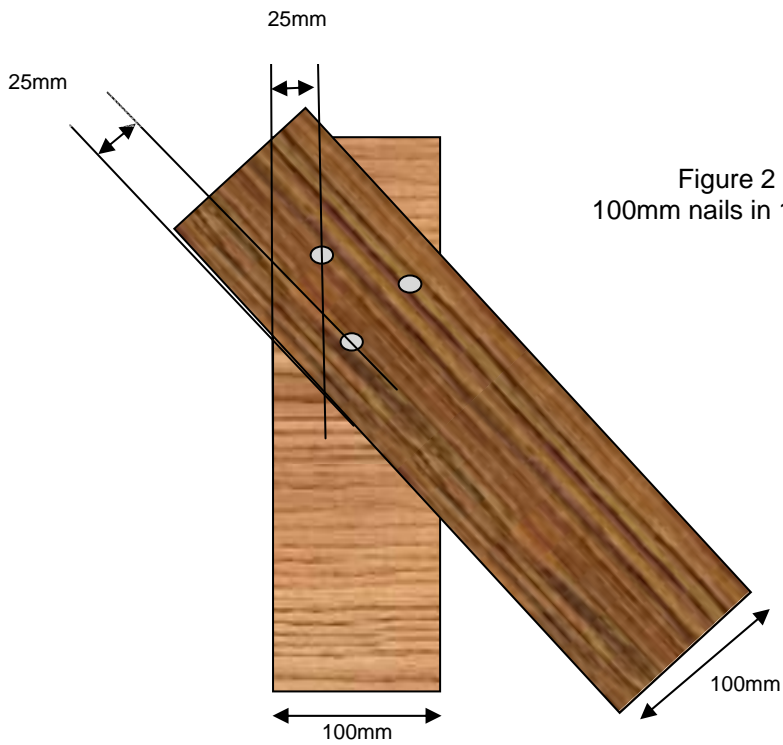


Figure 2 [SOP_SHO015]
100mm nails in 100mm x 50mm bracing

100 mm Nails in 100mm x 150 mm Bracing

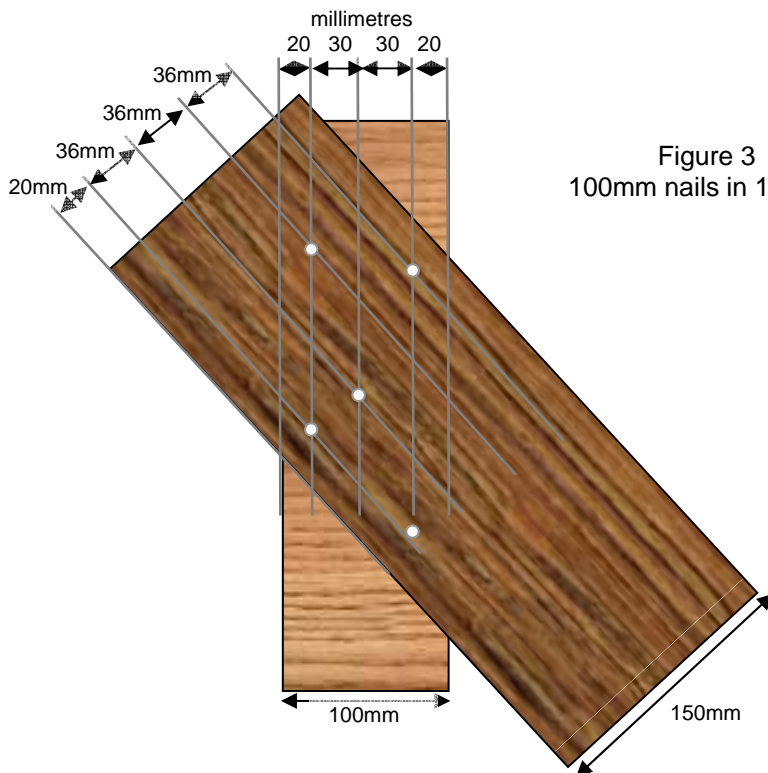


Figure 3 [SOP_SHO015]
100mm nails in 100mm x150mm bracing

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Gusset Nailing Patterns – Half Gusset (removal)

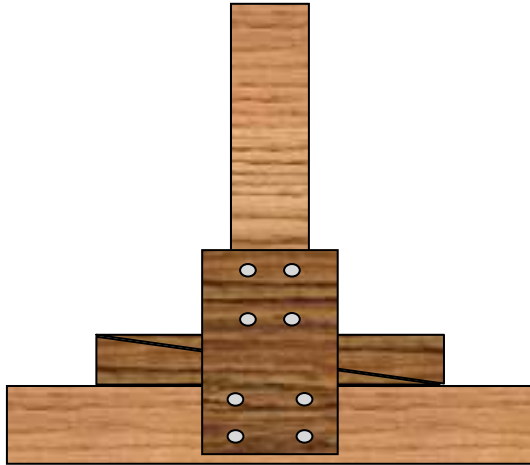


Figure 4: [SOP_SHO015]
Gusset nailing patterns – Half gusset (Removal)

Gusset Nailing Patterns – Double Gusset

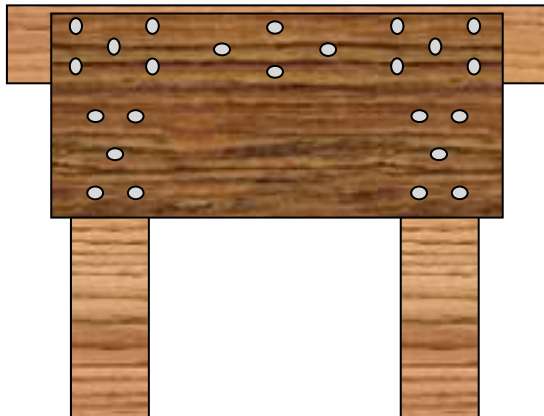


Figure 5: [SOP_SHO015]
Gusset nailing patterns – Double Gusset

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Gusset Nailing Patterns – 75mm nails

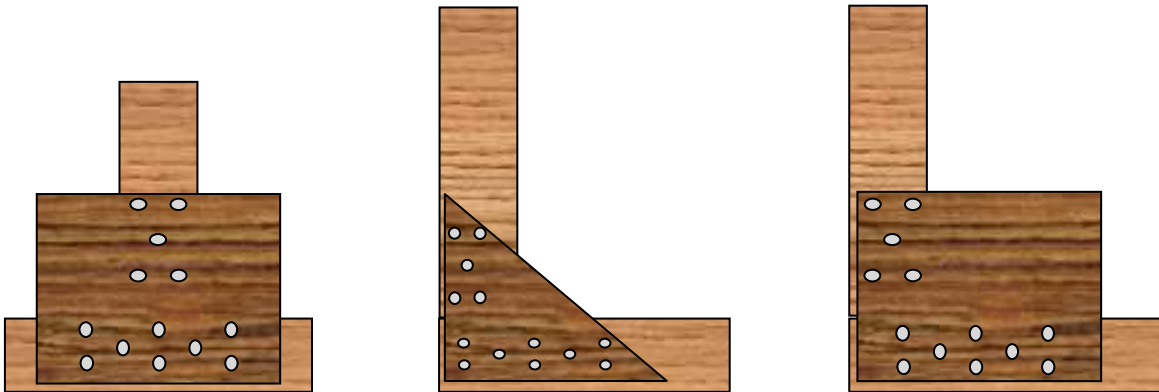


Figure 6 [SOP_SHO015]
Gusset nailing patterns (75 mm nails)

Cleat Nailing Patterns

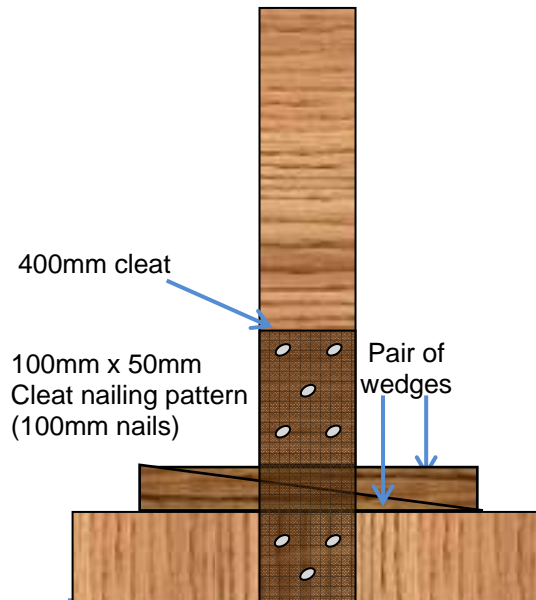


Figure 2 [SOP_SHO015]
Cleat nailing patterns

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Cleat Nailing Pattern – 17 x 100mm nails for 600mm cleat

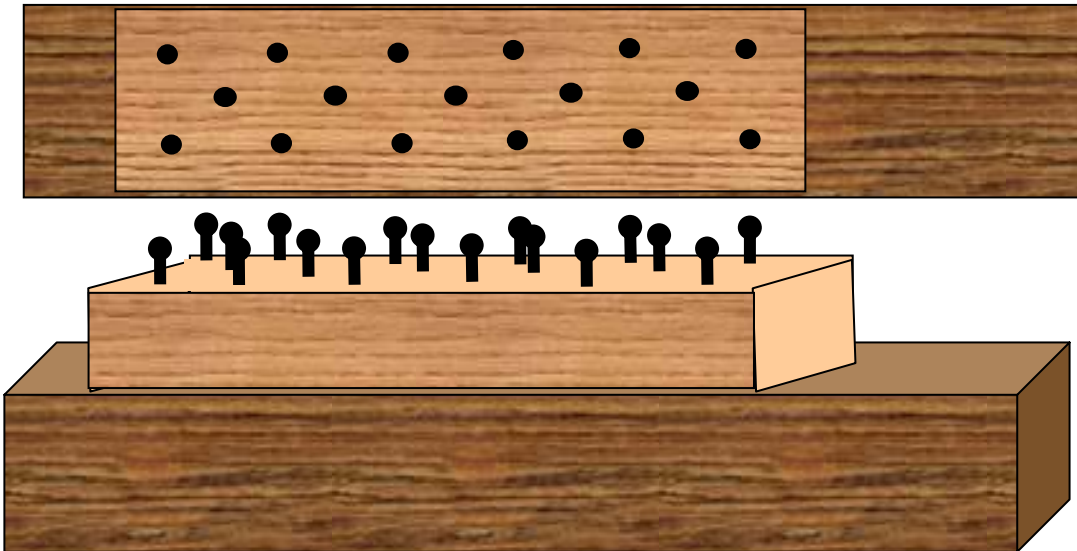


Figure 8 [SOP_SHO015]
 Cleat nailing pattern (17 x 100mm nails for 600 mm cleat)
 NB, use 26 nails for 900mm cleat.

Bracing Connections

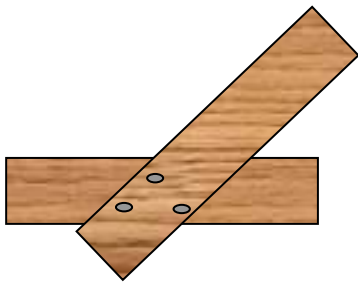


Figure 9: [SOP_SHO015]
 100mm x 50mm nailing pattern (100mm nails)

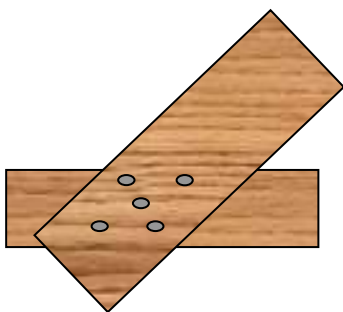


Figure 10: [SOP_SHO015]
 150 X 50MM nailing pattern (100mm nails)

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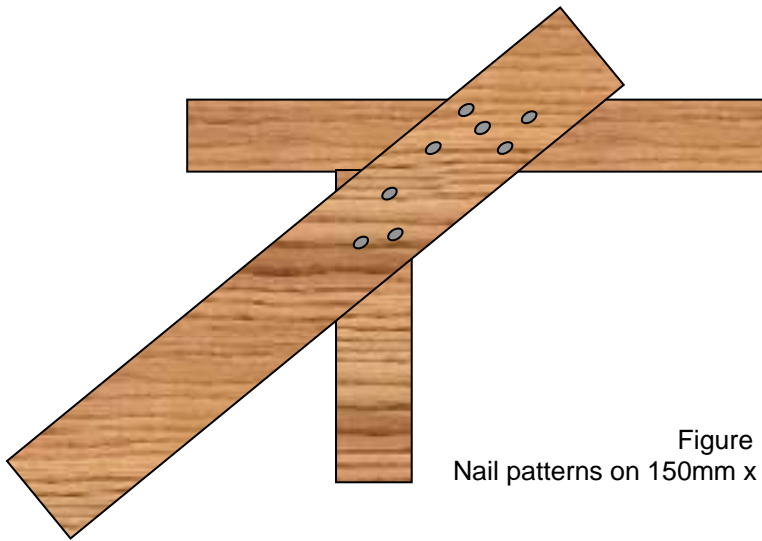


Figure 11 [SOP_SHO015]
Nail patterns on 150mm x 50mm diagonal braces (100mm nails)

Mid Point Brace – wall plate/sole plate

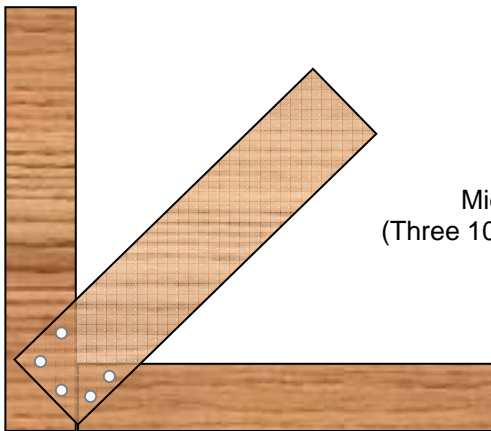


Figure 12 [SOP_SHO015]
Mid point brace – wall plate/sole plate
(Three 100mm nails in wall place, two in sole plate)

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Raker Splice Pattern (all 75mm nails)

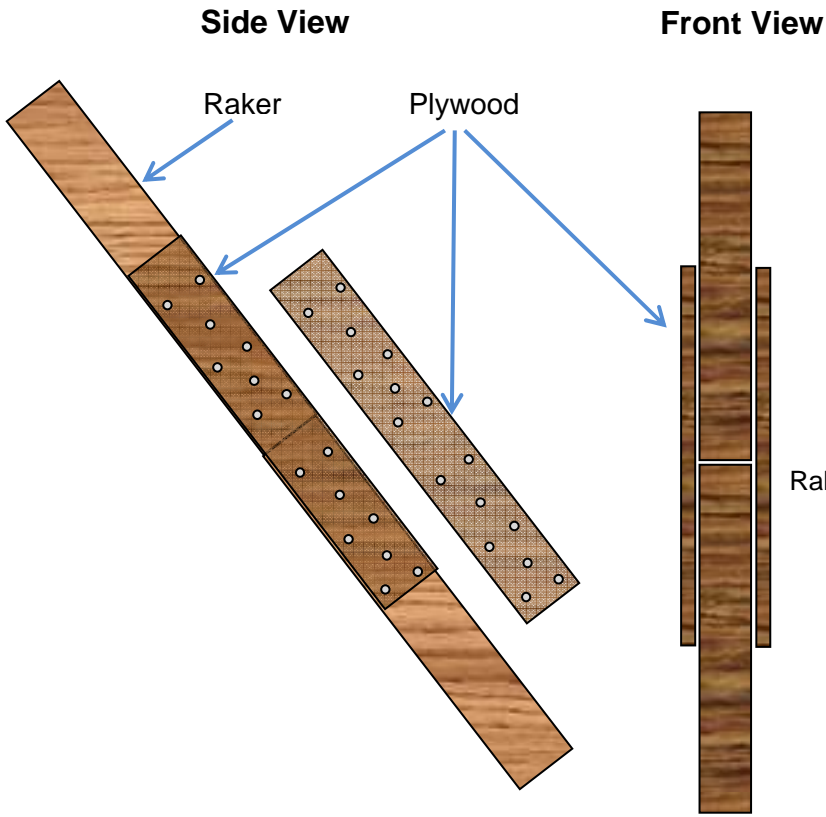


Figure 13 [SOP_SHO015]
Raker splice pattern (all 75 mm nails)

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Wedges

Sloped surfaces must be in full contact.

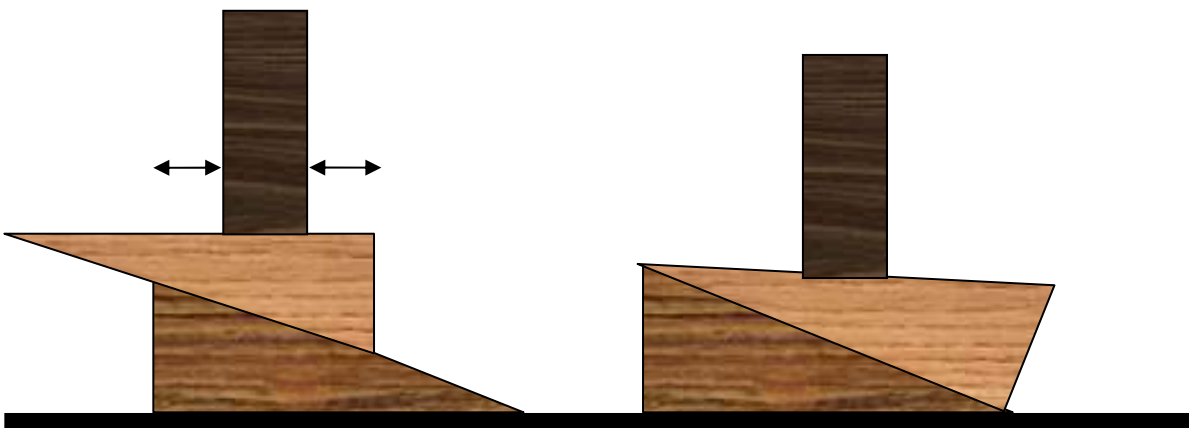


Full driven - best

Under driven - wrong

Figure 14 [SOP_SHO015]

Figure 15 [SOP_SHO015]



Over driven – OK
Minimum 25mm overlap

Wrong
Cut faces should be together

Figure 16 [SOP_SHO015]

Figure 17 [SOP_SHO015]

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References

Structural Use of Timber – Part 2: Code of practice for permissible stress design, materials and workmanship (BS 5268-2:2002)
Glanville Document (ST240738/JW/DW/011)
Department of Homeland Security Structural Collapse Technician Module 2A Shoring
US Army Corps of Engineers USAR Structures Specialist FOG (5th edition October 2006)

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