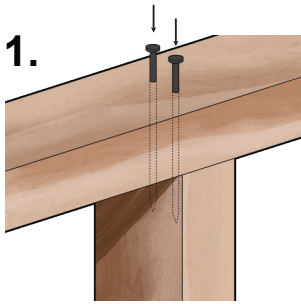


# HURRICANE STRAP CONNECTIONS

WEAK

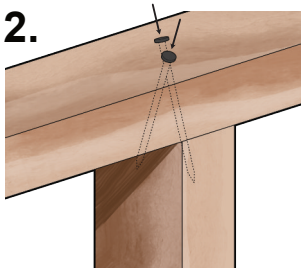


100mm nails  
Nailed vertically  
No strap

**weakest**



The guidance presented here is a simplification of the results of testing carried out at the UCL engineering laboratories. To make this a usable field document the findings have been reduced to just a few arrangements and the numbers rounded to orders of magnitude. It is intended to give an approximate indication for un-engineered buildings.



100mm nails  
Skew nailed  
No strap

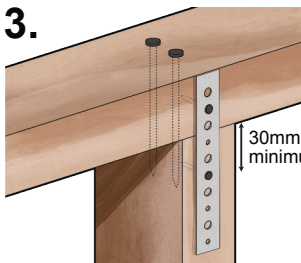
**1.5x stronger than 1.**



In particular, keep in mind:

- The properties of timbers vary.
- The properties of nails also vary. Rougher nails are less likely to pull-out. In all the tests, the nails failed (pulled out) and the strap did not break.

STRONG

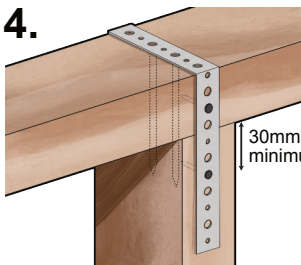


100mm nails  
Nailed vertically  
One strap on each side, not wrapped  
2x 30mm nails on each strap

**4x stronger than 1.**



- The tests were a straight vertical pull. In reality, the dynamic forces of a storm would introduce other forces and a flexing of the strap could induce different failures. It is possible that the strap would break before the nails pull-out.



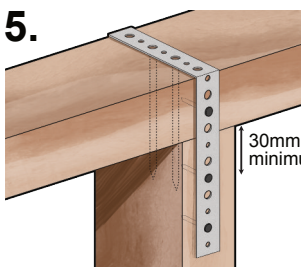
100mm nails  
Nailed vertically  
One strap wrapped  
2x 30mm nails on each side of the strap

**4x stronger than 1.**



- The position of the first nail in the vertical piece of timber was not considered in the testing but can be critical. It is recommended that this nail should be a minimum of 30mm from the end of the timber – see diagrams.

STRONGER

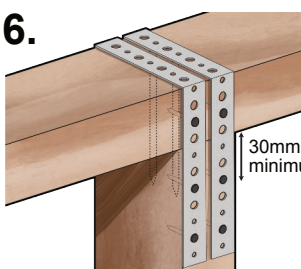


100mm nails  
Nailed vertically  
One strap wrapped  
3x 30mm nails on each side of the strap

**7x stronger than 1.**



- The cost effectiveness of different arrangements has not been presented here and the practitioner should exercise their own judgement. However, it is clear that “skew nailing” has zero cost increase, and the addition of an extra nail causes a minimal increase in cost and considerable extra strength.



100mm nails  
Nailed vertically  
Two straps wrapped  
3x 30mm nails on each side of the strap

**10x stronger than 1.**



- The straps were 20mm wide and 1mm thickness, with 4mm and 6.5mm diameter holes.