

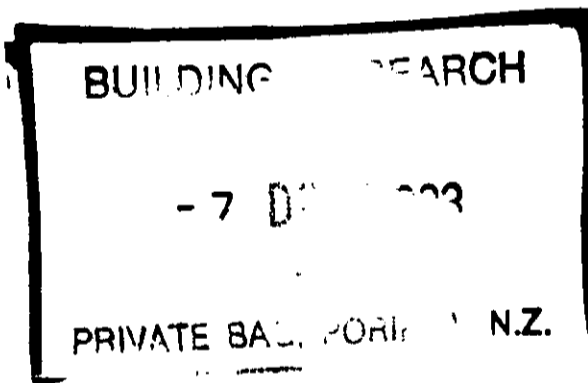


# TECHNICAL RECOMMENDATION

NO. 14 (1993)

BUILDING CONSTRUCTION METHODS TO  
SATISFY NZS 3604:1990 JOIST ROLL-OVER  
CRITERIA

S. J. Thurston



# **BUILDING CONSTRUCTION METHODS TO SATISFY NZS 3604: 1990 JOIST ROLL-OVER CRITERIA**

S.J. Thurston

## **REFERENCE**

Thurston S.J. 1993. Building Construction Methods To Satisfy NZS 3604:1990 Joist Roll-Over Criteria. Building Research Association of New Zealand, Technical Recommendation 14. Judgeford, New Zealand.

## **1. INTRODUCTION**

The latest version of the New Zealand non-specific design code for light timber frame houses NZS 3604:1990 (SANZ, 1990) dictates that the connection between joists and bearers at each braced pile or anchor pile is required to resist a horizontal force totalling 12 kN applied parallel to the bearer at floor level. Figure 4.10(c) in the Standard, depicting the design forces, is reproduced as Figure 1 of this Technical Recommendation. If unresisted, the horizontal forces tend to roll the joists over onto the bearer below. This BRANZ Technical Recommendation details the recommended construction methods to resist joist roll-over actions.

The connections detailed in this report will not satisfy NZS 3604:1990 strength requirements for the connection between joist and bearer for loads parallel to the joist such as described in clauses 4.7.7.2 or 4.7.7.3 of the Standard. If the pile is required to resist loads in this direction, the builder must provide this strength by other methods. Some specific examples are discussed below.

Where an M12 bolt connects a brace to a bearer (see Figure 1) and there is no brace on the pile in the orthogonal direction, then any of the five systems shown below are adequate without additional strengthening. The 6 kN force at each joist which is parallel to the joist, need not be resisted. However, for an anchor pile, a steel brace or other detail must be provided to resist this 6 kN force per joist in the direction parallel to the joist.

This is similar to where a concrete or masonry foundation wall sits directly under the bearer, or where sheet foundation cladding is connected to the bearer. In this case the systems outlined below are capable of providing a bracing of 240 BU (Bracing Units) for wind and 120 BU for earthquake. However, the bracing values used in design must not exceed that of the foundations below. Reputable published values only should be used.

## **2. SYSTEMS SATISFYING NZS 3604:1990**

The systems which have sufficient strength (12 kN) to satisfy the relevant clauses of NZS 3604:1990 are described below and shown in Figure 2. To comply with this recommendation they must be used on the bearer passing over the applicable braced pile or anchor pile; the distance between the centre of the system used and the pile must not exceed 1.5 m. The blocking must be tight and cut from No.1 Framing Grade Radiata Pine or Standard Building Grade Douglas Fir. The methods can only be applied where the joist

spacing divided by the joist height is not less than 2. Nailing and timber treatment (including ply) must comply with NZS 3604:1990. In particular, at each end of the blocking there must be two 100 x 3.75 mm horizontal nails connecting the joist to the blocking and at each joist there must be two 100 x 3.75 mm skew nails between joist and bearer. Full joist depth blocking is used in all instances except as discussed for System 1.

BRANZ has appraised several proprietary pile foundation connection systems and these are still considered to be suitable solutions. The systems outlined below are merely alternative methods of resisting the roll-over forces.

**SYSTEM 1:** Instead of normal blocking, use a deep "blocking" nailed to the side of the bearer with ten 100 x 3.75 mm flat head nails at 50 mm centres. The depth of this blocking is 100 mm more than the depth of the joists. Thus, use 300 x 50 mm blocking with 200 mm deep joists.

**SYSTEM 2:** The blocking is connected to the bearer with a single 240 mm length of 100 x 1 mm (minimum size) of perforated nail plate symmetrically placed. Use fourteen 3.15 x 30 mm pan head galvanised nails in both bearer and blocking. The plates shall be hot dipped galvanised to SAA (1981) where required by the durability requirements of Section 2.2 of NZS 3604:1990.

**SYSTEM 3:** The blocking is connected to the bearer with two 127 x 116 mm (minimum size) claw steel nail plates located close to the ends of the blocking. Note that the orientation of the plate is such that the wide side of the plate teeth is perpendicular to the timber grain. This system is limited to sub-floor spaces not exposed to the weather and where dampness and condensation do not normally occur. The durability requirement is specified in Section 2.2.3 of NZS 3604:1990.

**SYSTEM 4:** The blocking and bearer are joined with a 100 mm wide strip of 12 mm (minimum) thick H3 or better treated plywood with eleven 30 x 2.8 mm galvanised plasterboard clouts at equal spacing between both the ply and blocking and ply and bearer.

**SYSTEM 5:** Blocking is used between two adjacent joists. Four 100 x 3.75 mm skew flat head nails connect each length of blocking to the bearer.

### **3. REFERENCES**

Standards Association of Australia. 1981. Galvanised Coatings. AS 1650. Sydney.

Standards Association of New Zealand. 1990. Code of Practice for Light Timber Frame Buildings Not Requiring Specific Design. NZS 3604. Wellington.

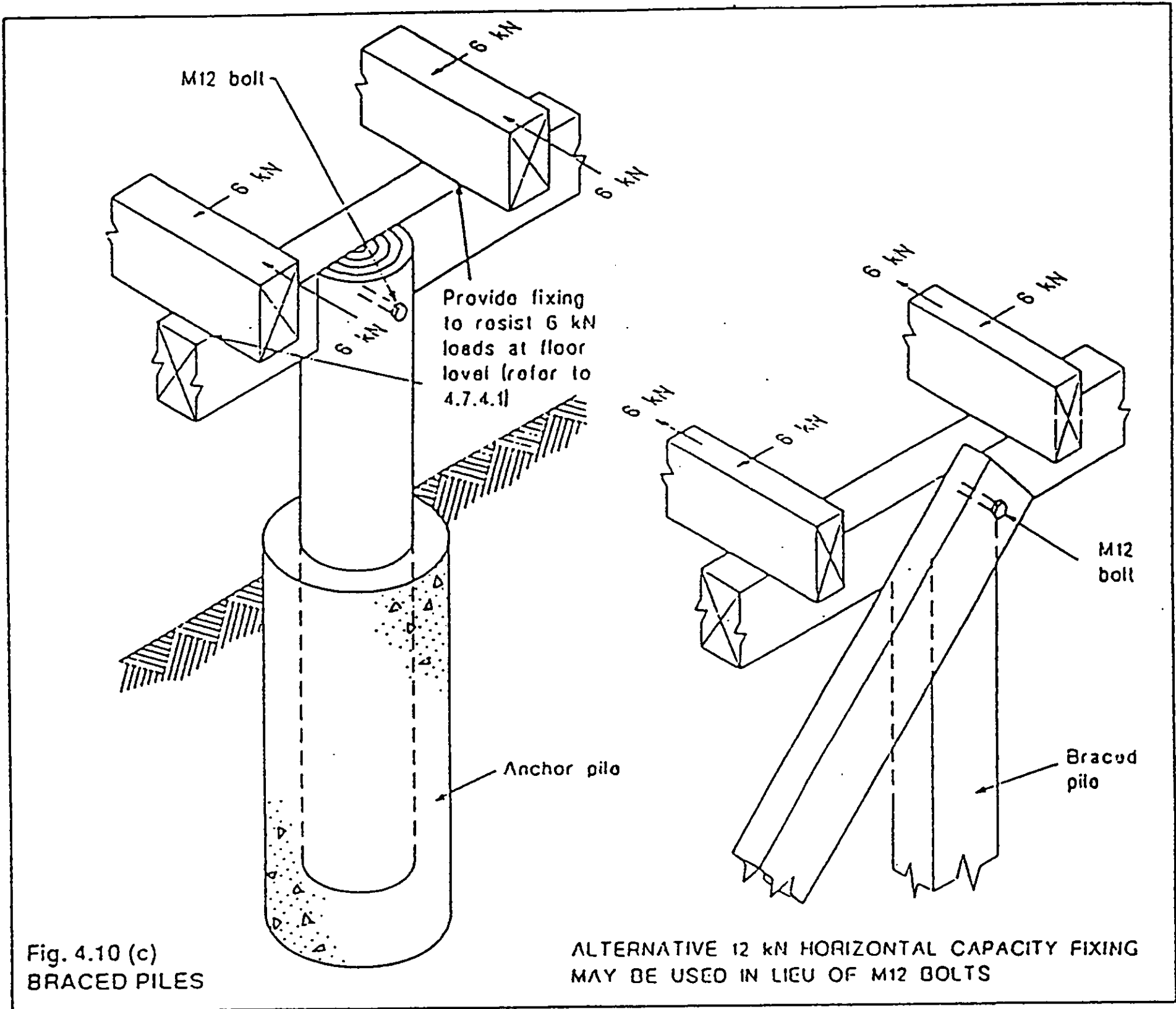


Fig. 4.10 (c)  
BRACED PILES

ALTERNATIVE 12 kN HORIZONTAL CAPACITY FIXING  
MAY BE USED IN LIEU OF M12 BOLTS

FIGURE 1 EXTRACTS FROM NZS3604:1990 (SANZ, 1990)  
(REPRODUCED WITH PERMISSION FROM SANZ)

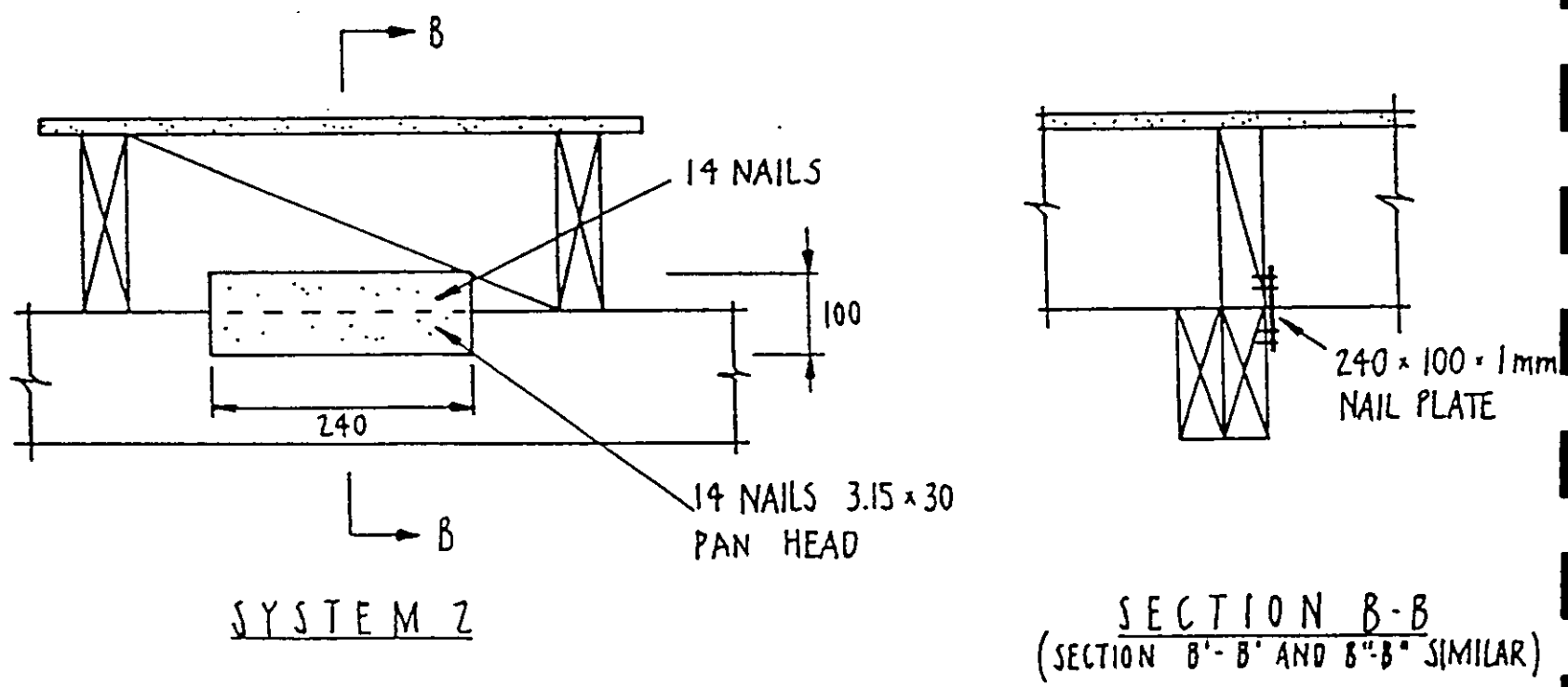
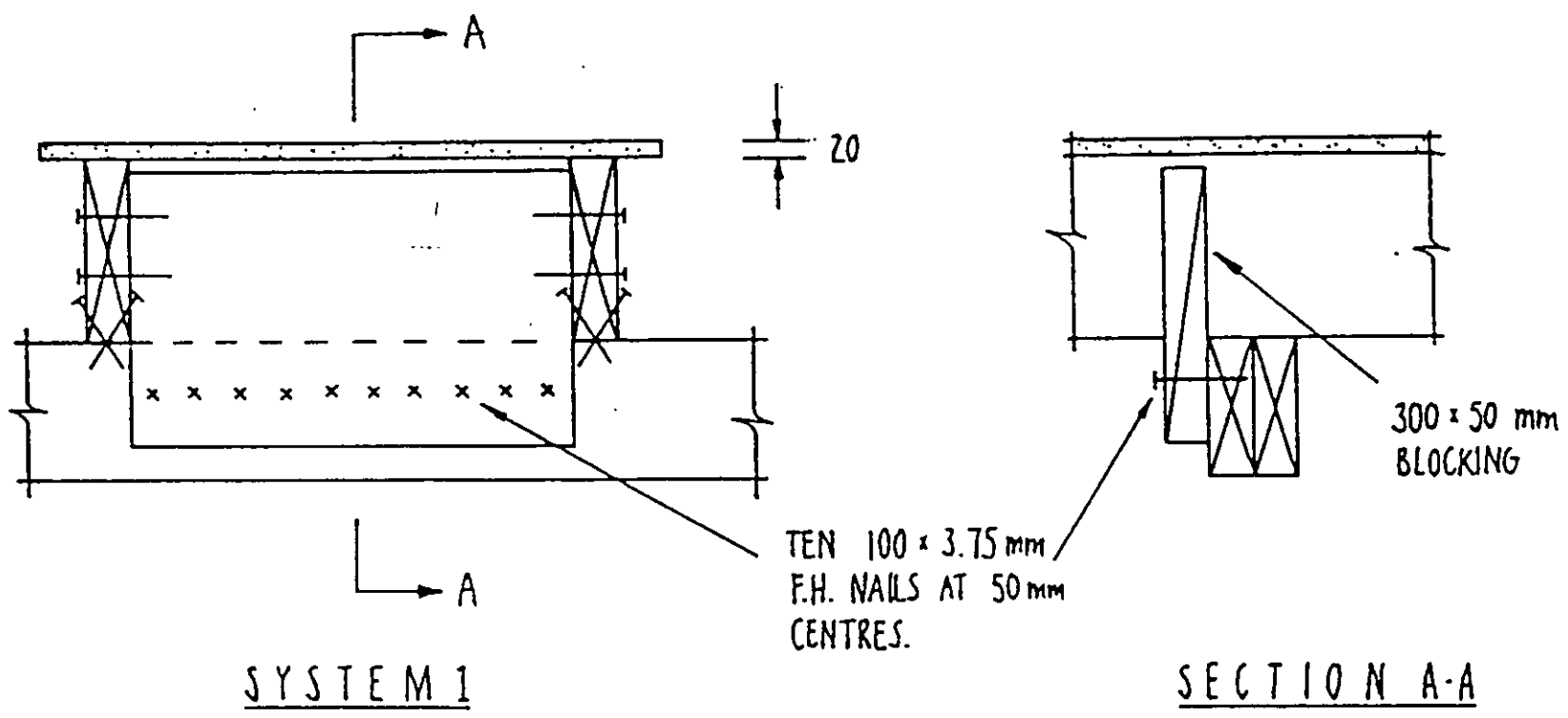
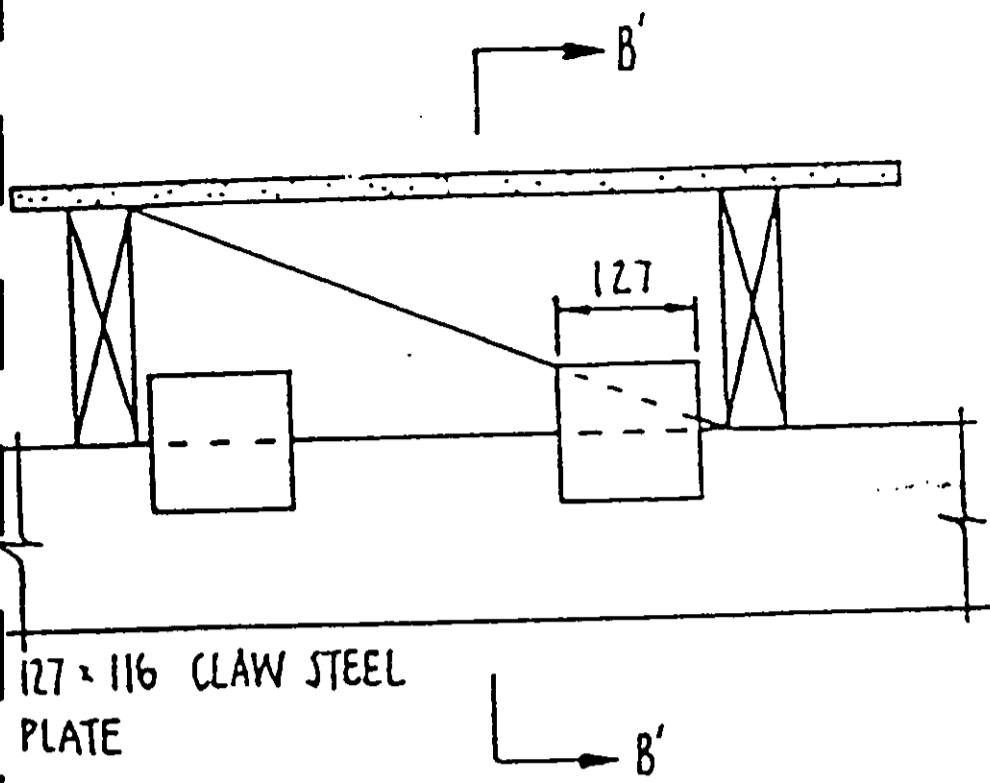
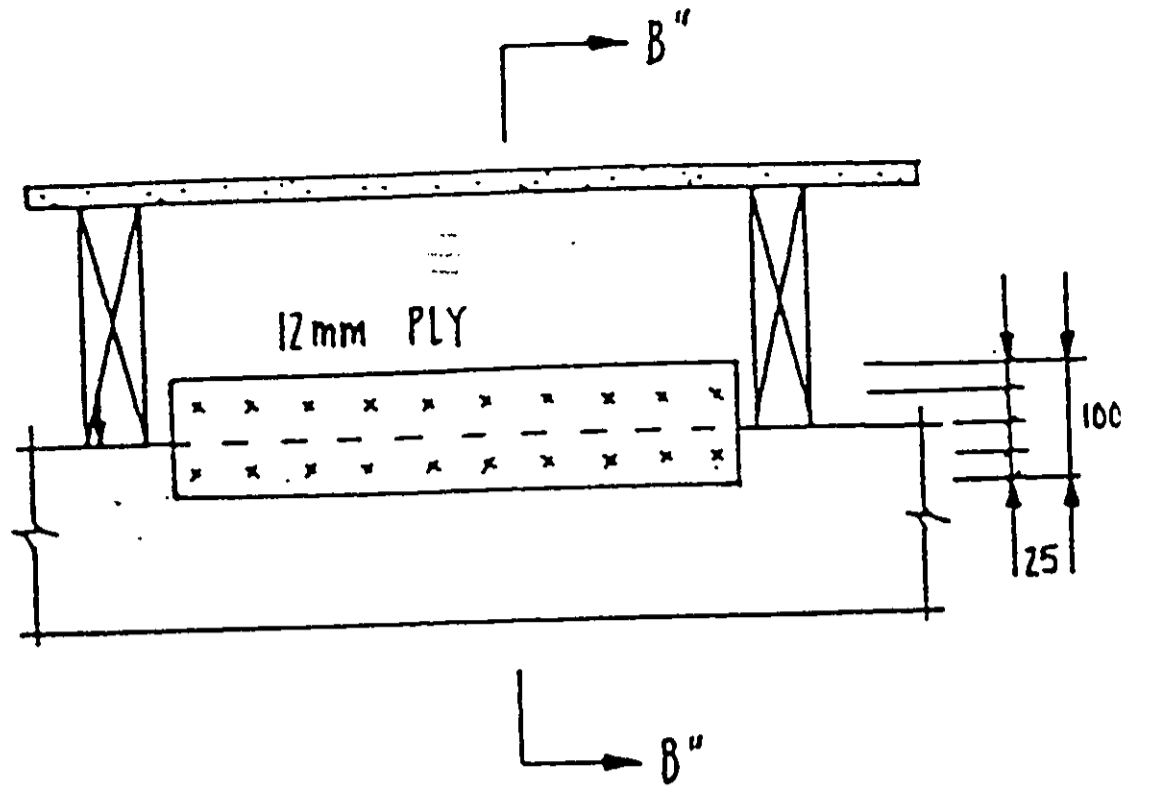


FIGURE 2 12KN CONNECTIONS TO PREVENT JOIST "ROLL OVER"

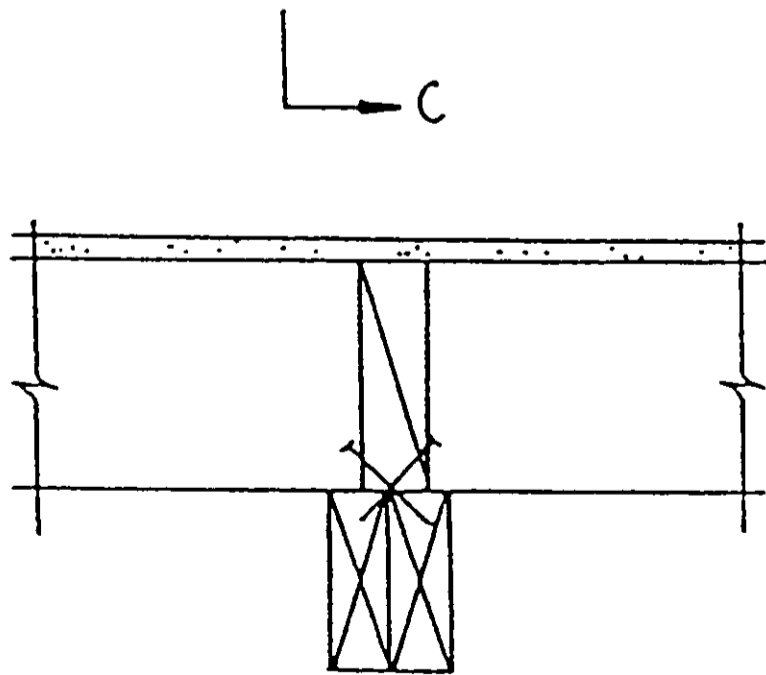
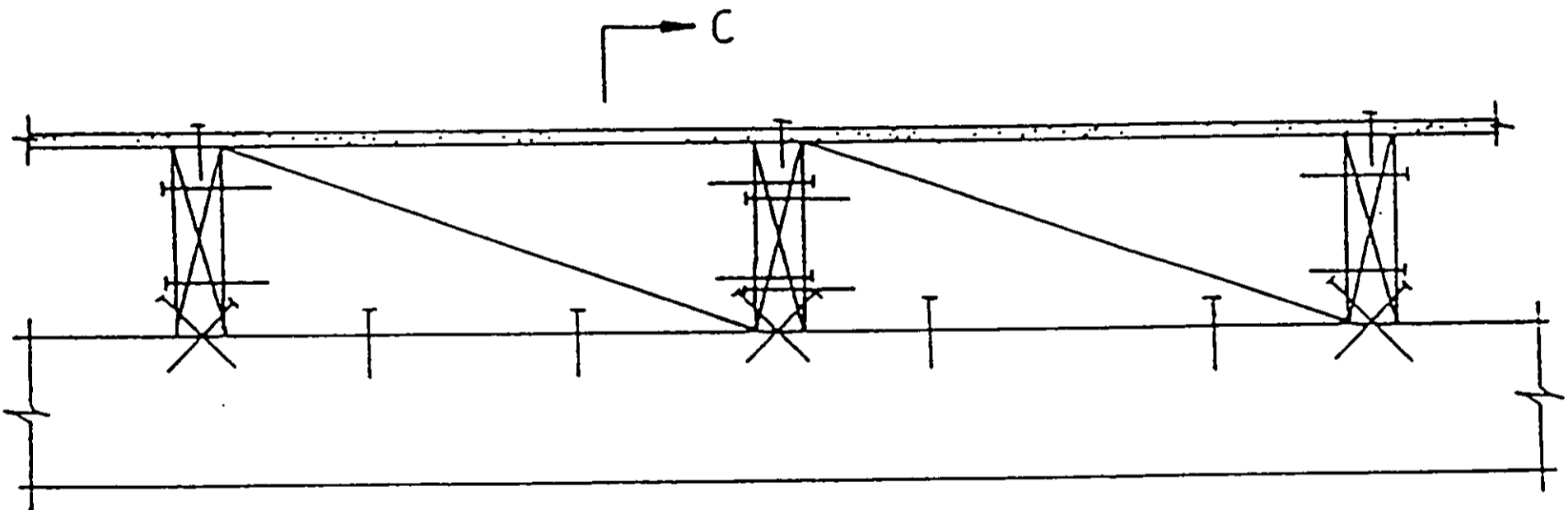


SYSTEM 3



ELEVEN No 30 x 2.8 mm PLASTERBOARD CLOTHS AT EQUAL CENTRES. TOP AND BOTTOM

SYSTEM 4



FOUR 100 x 3.75 mm F.H. NAILS PER BLOCKING (IE 2 PER SIDE)

SECTION C-C

SYSTEM 5  
FIGURE 2 CONTINUED

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Building construction met  
hods to satisfy NZS 3604:



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