

# JJI-JOIST TECHNICAL BULLETIN

**SUBJECT: Squash Loads on JJI-Joist, Kerto S LVL & JJ Glulam Rim Joists**  
**Sheet 1 of 7**

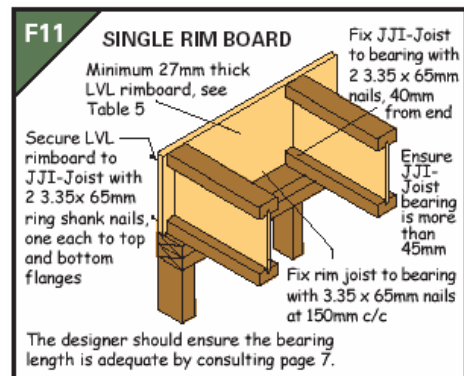
**Bulletin Number: 13 Rev F**      **Date Issued: 31.03.2005**

The engineering of timber frame (TF) structures must account for the specific roof, wall panel and floor loads as they are transferred through the many individual structural elements to the foundations. One of the tasks of the Building Designer (BD) is to identify and quantify these loads, and thus specify the rim, header, blocking material and integral beam requirement of the TF structure, see *TB 21 'Role of the JJI-Joist Supplier in Floor design' Part 2 Section C*. Rim joists give the B D the capability to transfer some of these loads through the perimeter of the timber frame floor, see *Figure 1*, thereby not influencing the separate component Floor Design. The aims of this Technical Bulletin are:

- Provide the B D with the load capacities of the various JJI-Joists, Kerto S LVL & JJ Glulam designations & show how the introduction of holes affects this capacity.
- Provide the Floor Designer (FD) with a method of pricing these materials in the form of a **'Prime Cost Sum'**\* if the BD has vet to undertake this material assessment.

## Bearing Capacity of Rim & Header Joists.

The following Table gives the long-term load capacity of JJI-Joist, Kerto S LVL and JJ Glulam rim, header and blocking material subject to compression perpendicular to the joist direction, i.e. vertical loads from above.



**Figure 1. Rim Joist**

**Table 1. Bearing Capacities of JJI Joists, Kerto S LVL & JJ Glulam.**

JJI-Joist Depth	Maximum long-term load per metre run (kN/m) <sup>[1]</sup>	Maximum single point load (kN) <sup>[2]</sup>
195*	25	12
220*	20	
235*	20	
245*	19	
300*	17	10
350*	15	
400*	13	
450*	12	8
Kerto S LVL		
Width (mm)		
27 #	30	18
45 #	50	30
Glulam		
Width (mm)		
38 #	53	32
45 #	63	38

[1] JJI-Joist & Kerto S LVL maximum long-term loads as defined in BS5268; these can be modified by  $k_3$ , see *BS5268:Part2* ( $k_3$  1.25 Medium Term, 1.5 Short Term). JJ Glulam maximum medium term actions ( $k_{mod} = 0.8$ ) as defined in EC5; these can be modified by  $k_{mod}$ , see EC5.

[2] Where a single point load exceeds the tabulated value, either provide squash blocks as Detail F23 of the Technical Manual, or provide additional rim material.

When specifying rim materials, the Building Designer/Engineer needs to decide if the applied loads are to act as a uniformly distributed load, or a series of point loads.

The crushing or buckling of the OSB web material was found to be the critical failure factor throughout the entire JJI-Joist range.

\* Load figures established by test.

# Load figures established by calculation.

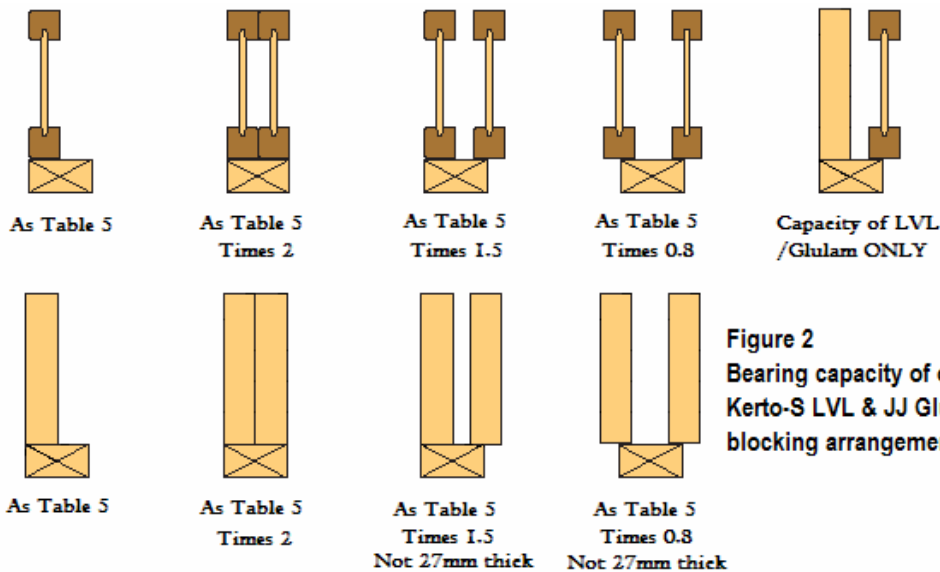
**\*Prime Cost Sum – A sum of money allowed in a quote or tender without specifying the exact material.**

Reference Number: TB 13 Rev F

Issued By : - Mark Tilston BA (Hons)

James Jones & Sons recommend the use of JJI-Joist rim and header joists within two storey detached dwellings (*not for party wall rim details*). Due to the profile of the I-section, special attention should be given to the detailing and fixing of the rim material within the overall structure; this is the responsibility of the Building Designer/Engineer (BD).

The bearing capacities shown in Table 1 can be multiplied by the factors shown in *figure 2* depending on the support condition identified.



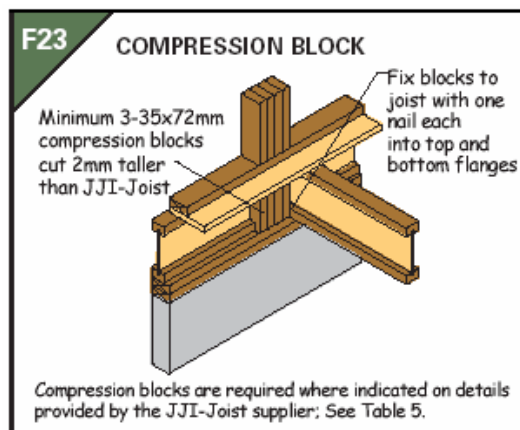
**Figure 2**  
 Bearing capacity of of various JJI-Joist, Kerto-S LVL & JJ Glulam rim, header & blocking arrangements

### **Squash Blocks**

Where a single point load on a JJI-Joist, Kerto S LVL or JJ Glulam Rim/Header joist exceeds the value shown in table 1, additional timber blocks can be placed directly below the incoming load. These 'Squash Blocks' directly transfer the load through the perimeter of the floor zone to the structure below. The number and specification of these blocks are the responsibility of the Building Designer; in most cases the block remains consistent with the multiply/cripple studs from above, see *Figure 3*. Alternative compression block details are acceptable, to the approval of the BD.

**Number & dimensions of squash blocks = number & dimensions of cripple studs above**

**Figure 3**  
 Multiple Cripple Studs & Squash Blocks

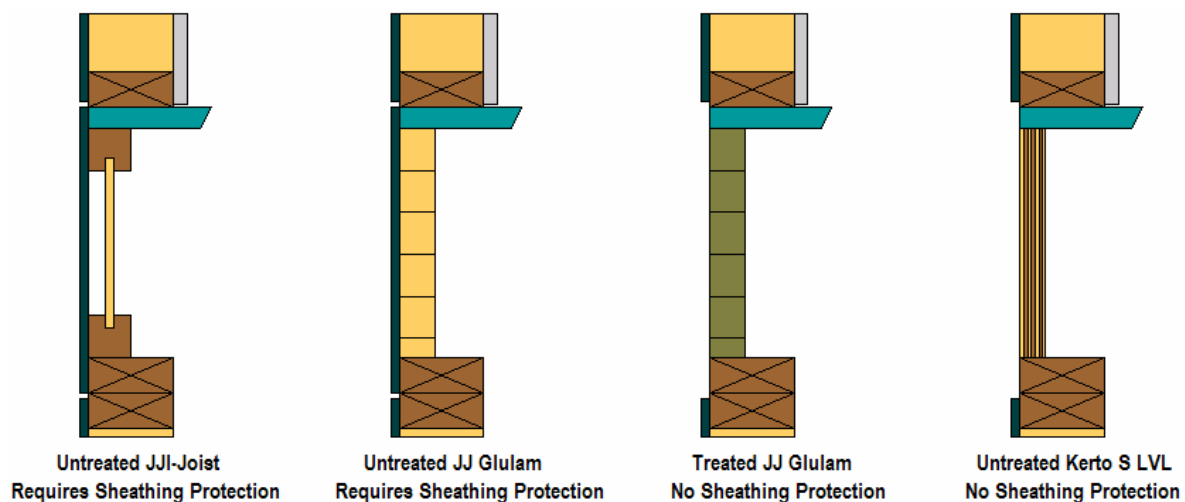


## Moisture Content

To reduce the movement and creep of rim joists when subjected to load, the moisture content of the rim material when installed should be close to that likely to be attained when in service; thus the correct detailing of the panel junctions & insulation is very important to ensure that the structure remains in a service class 1 or 2 environment (*12 – 15% average moisture content*).

## External Sheathing or Treatment

NHBC (*National House Building Council*) & TRADA (*Timber Research And Development Association*) guidelines state that all solid timber structural elements within the timber frame external kit should be treated, or protected from possible excessive moisture build-up/ingress from within the cavity. As the flange material of JJI-Joists and the laminates of Glulam are made from solid timber we therefore need to incorporate a treatment or protection within the rim material detail, see *figure 4*. The acceptable sheathing material and the type of treatment are to be in accordance with the relevant technical standards.



**Figure 4**  
**Rim Joist protection**

**The Effect of Holes on the Bearing Capacity of JJI, Kerto S LVL & JJ Glulam joists**

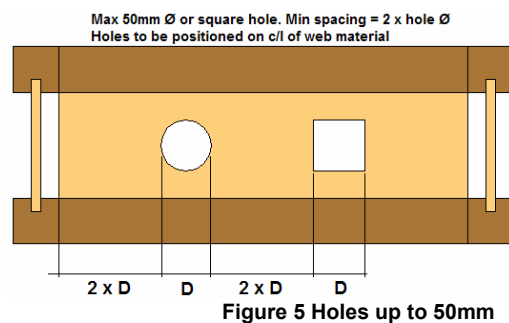
The drilling of holes into the OSB web material of JJI rim or blocking Joists, or into the cross sectional area of Kerto S LVL or JJ Glulam rim or blocking Joists, will reduce the compression capacity of the material. The scale of the reduction will depend on the size & frequency of the holes.

**No holes are to be formed directly below a concentrated point load unless confirmed by the Building Designer.**

**Load Bearing JJI-Joist Blocking Material**

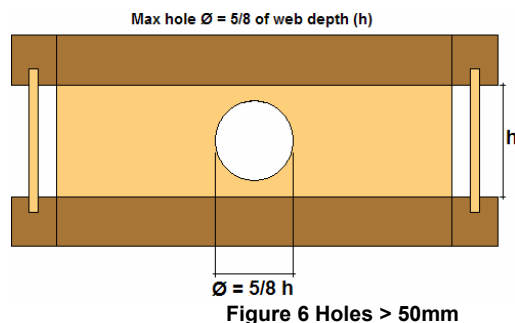
**Holes up to 50mm** – see Figure 5

Holes up to 50mm Ø or square may be formed in blocking material subject to a space twice the hole size being left between each hole. Reduce the compression capacity of the joist given in Table 1 by 1/3.



**Holes greater than 50mm** – see Figure 6

Only 1 hole greater than 50mm Ø & up to 5/8 of web depth may be formed in a single blocking piece. Reduce the compression capacity of the joist given in Table 1 by 1/3.



**JJI-Joist Rim/Header Material**

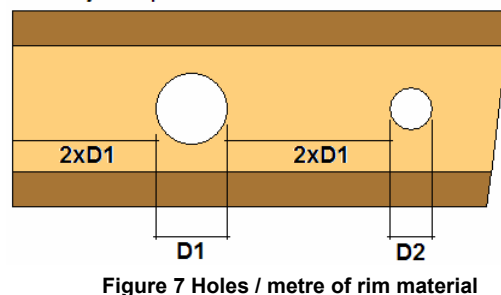
**Holes up to 50mm.**

Holes up to 50mm Ø – see blocking rules as above.

**Holes Greater than 50mm** – see Figure 7

Allowable hole size up to 5/8 depth of web material. A maximum of 2 holes per metre run of material; reduce compression capacity of joist given in Table 1 by the hole to length ratio, i.e.

Max hole 5/8 of web depth. Min spacing 2 x larger hole Ø. Max 2 holes / metre of rim material. Holes to be positioned on c/l of joist depth.



**Example A - (2no 125mm holes – JJI300)**

2 x 125mm (=250mm) holes in 1000mm run of joist  
 Percentage Reduction = 250/1000 x 100 = 25%  
 JJI300 = 17kN/m x 25% = 4.25kN/m  
 Capacity = 17 – 4.25 = 12.75kN/m

**Load Bearing Kerto S LVL & JJ Glulam Blocking Material**

**Holes up to 50mm** – see Figure 8

Holes up to 50mm Ø or square may be formed in blocking material subject to a space twice the hole size being left between each hole. Reduce the compression capacity of the joist given in Table 1 by 1/3.

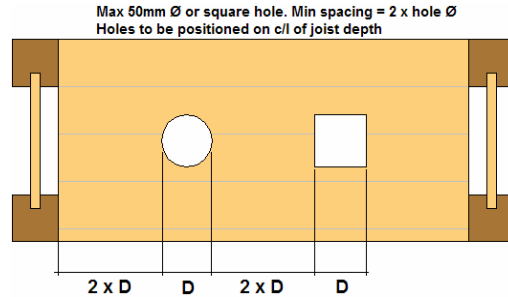


Figure 8 Holes up to 50mm

**Holes greater than 50mm** – see Figure 9

Only 1 hole greater than 50mm Ø & up to 5/8 block depth may be formed in a single blocking piece. Reduce the compression capacity of the joist given in Table 1 by 1/3.

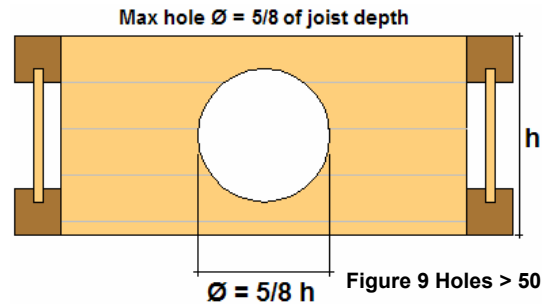


Figure 9 Holes > 50mm

**Kerto S LVL & JJ Glulam Rim/Header Material**

**Holes up to 50mm.**

Holes up to 50mm Ø – see blocking rules as above.

**Holes Greater than 50mm** – see Figure 10

Allowable hole size up to 5/8 of joist depth. A maximum of 2 holes per metre run of material. Reduce compression capacity of joist given in Table 1 by hole ratio to length i.e.

**Example A - (2no 125mm holes – 38mm JJ Glulam)**

2 x 125mm (=250mm) holes in 1000mm run of joist  
 Percentage Reduction =  $250/1000 \times 100 = 25\%$   
 38mm =  $53\text{kN/m} \times 25\% = 13.25\text{kN/m}$   
 Capacity =  $53 - 13.25 = 39.75\text{kN/m}$  ( $K_{mod}=0.8$ )

**Example B - (2no 75mm holes – 45mm JJ Glulam)**

2 x 75mm (=150mm) holes in 1000mm run of joist  
 Percentage Reduction =  $150/1000 \times 100 = 15\%$   
 45mm =  $63\text{kN/m} \times 15\% = 9.45\text{kN/m}$   
 Capacity =  $63 - 9.45 = 53.55\text{kN/m}$  ( $K_{mod}=0.8$ )

Max hole 5/8 of joist depth. Min spacing 2 x larger hole Ø.  
 Max 2 holes / metre of rim material. Holes to be positioned on c/l of joist depth.

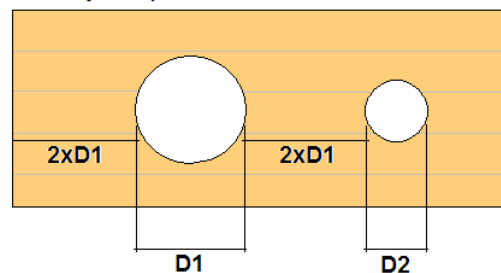


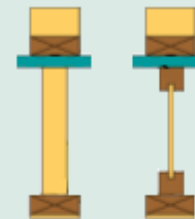
Figure 10 Holes / metre of rim material

**No holes are to be formed directly below a concentrated point load unless confirmed by the Building Designer.**

### Rim Joists Prime Cost Allowance

JJ&S TSD have published the following two tables, 2a & 2b, to account for some element of rim material *Primary Cost Sum\* (PC)* within your quotation. Please note that this is only a measure to allow for a material PC within the quotation, and in no way identifies or specifies rim materials deemed to satisfy the performance criteria required by the structure.

Wall Type & Thickness	JJI-Joist Floor Depth 195mm - 300mm			JJI-Joist Floor Depth 350mm - 450mm			The specification of all rim material is to be approved by the Building Designer or Contract Engineer
	Rim / Blocking Material			Rim / Blocking Material			
	JJI'A'	Kerto S	JJGlulam	JJI'C/D'	Kerto S	JJGlulam	
External Wall (Joists Perpendicular & Parallel - TB 29 pages 13, 14, 17 & 18)							
2 Storey	≤ 90mm	JJI'A'	27mm*	38mm	-	45mm	45mm
	≤ 140mm	JJI'A'	45mm	38mm	JJI'C/D'	45mm	45mm
3 Storey	≤ 90mm	-	27mm*	38mm	-	45mm	45mm
	≤ 140mm	-	45mm	38mm	-	45mm	45mm
4 Storey	≤ 90mm	-	45mm	38mm	-	45mm	45mm
	≤ 140mm	-	45mm	38mm	-	45mm	45mm
5 Storey	≤ 90mm	-	90mm†	90mm†	-	90mm†	90mm†
	≤ 140mm	-	90mm†	90mm†	-	90mm†	90mm†
Load Bearing Internal Walls / Blocking							
2 Storey	≤ 90mm	JJI'A'	45mm	38mm	JJI'C/D'	45mm	45mm
	≤ 140mm	JJI'A'	45mm	38mm	JJI'C/D'	45mm	45mm
3 Storey	≤ 90mm	-	45mm	38mm	-	45mm	45mm
	≤ 140mm	-	45mm	38mm	-	45mm	45mm
4 Storey	≤ 90mm	-	45mm	38mm	-	45mm	45mm
	≤ 140mm	-	45mm	38mm	-	45mm	45mm
5 Storey	≤ 90mm	-	90mm†	90mm†	-	90mm†	90mm†
	≤ 140mm	-	90mm†	90mm†	-	90mm†	90mm†



**Table 2a External Wall & Load Bearing Blocking Rim Material Allowance**

\* Fully supported rim joist design ONLY.      † Subject to Disproportionate Collapse criteria – see TB 29.

The specification of rim materials, and the arrangement of the various components to provide the required robust detailing with respect to load capacity, fire resistance, acoustic & thermal transfer, and where appropriate disproportionate collapse is the **responsibility of the Building Designer (BD)**. The rim materials shown in Table 2 are simply an indication of the PC sum to further the quotation; we refer you to TB 29 'JJI Floor Details For Use In Timber Frame Construction' for further explanation.

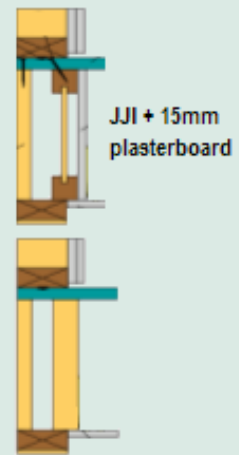
**\*Prime Cost Sum – A sum of money allowed in a quote or tender without specifying the exact material.**

Where rim joists are required to span over openings in the panel structure below, JJ&S TSD recommend that distributors incorporate as a PC sum a 2-ply 45mm Kerto S LVL or JJ Glulam beam, see figures 11 & 12. Special notification should be included within the quotation with the proviso that the Kerto/Glulam design is subject to approval by the BD.

A more common detail is to incorporate the beam opening within the design of the full length rim joist, see figure 13.



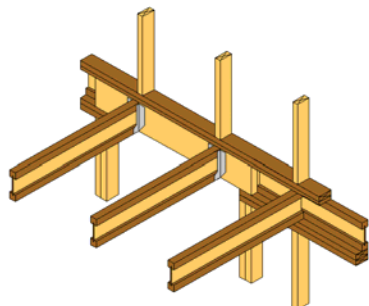
Wall Type & Thickness	JJI-Joist Floor Depth 135mm - 300mm			JJI-Joist Floor Depth 350mm - 450mm			The specification of all rim material is to be approved by the Building Designer or Contract Engineer
	Rim / Blocking Material			Rim / Blocking Material			
	JJI-Joist	Kerto S	JJGlulam	JJI-Joist	Kerto S	JJGlulam	
Party Wall (Joists Parallel - TB29 pages 16 & 20)							
2 Storey	≤ 90mm	JJI'A' +	27mm* or	38mm	JJI'C/D' +	45mm or	45mm
	Alternative	-	27+45mm	38+38mm	-	45+45mm	45+45mm
Alternative	≤ 140mm	JJI'A' +	45mm	38mm	JJI'C/D' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
3 Storey	≤ 90mm	JJI'A' +	27mm* or	38mm	JJI'C/D' +	45mm or	45mm
	Alternative	-	27+45mm	38+38mm	-	45+45mm	45+45mm
Alternative	≤ 140mm	JJI'A' +	45mm or	38mm	JJI'C/D' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
4 Storey	≤ 90mm	JJI'A' +	45mm or	38mm	JJI'C/D' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
Alternative	≤ 140mm	JJI'A' +	45mm or	38mm	JJI'C/D' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
5 Storey	≤ 90mm	-	90mm†	90mm†	-	90mm†	90mm†
	Alternative	JJI'A' +	90mm† or	90mm†	JJI'C/D' +	90mm† or	90mm†
Alternative	-	90+45mm†	90+38mm†	-	90+45mm†	90+45mm†	
Party Wall (Joists Perpendicular - TB29 pages 15 & 19)							
2 Storey	≤ 90mm	JJI'A' +	45mm or	38mm	JJI'C' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
Alternative	≤ 140mm	JJI'A' +	45mm or	38mm	JJI'C' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
3 Storey	≤ 90mm	JJI'A' +	45mm or	38mm	JJI'C' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
Alternative	≤ 140mm	JJI'A' +	45mm or	38mm	JJI'C' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
4 Storey	≤ 90mm	JJI'A' +	45mm or	38mm	JJI'C' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
Alternative	≤ 140mm	JJI'A' +	45mm or	38mm	JJI'C' +	45mm or	45mm
	Alternative	-	45+45mm	38+38mm	-	45+45mm	45+45mm
5 Storey	≤ 90mm	-	90mm†	90mm†	-	90mm†	90mm†
	Alternative	JJI'A' +	90mm† or	90mm†	JJI'C' +	90mm† or	90mm†
Alternative	-	90+45mm†	90+38mm†	-	90+45mm†	90+45mm†	



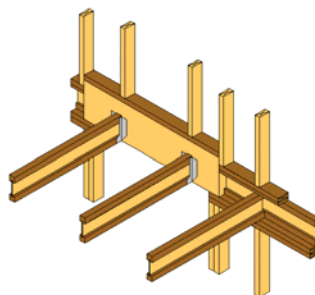
**Table 2b Party Wall Material Allowance**

\* Fully supported rim joist design ONLY.

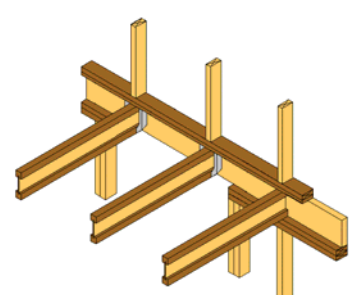
† Subject to Disproportionate Collapse criteria – see TB 29.



**Figure 11**  
Kerto S LVL or JJ Glulam beam within rim joist depth over opening in panel below



**Figure 12**  
Greater depth Kerto S LVL or JJ Glulam beam within timber frame panel above or below



**Figure 13**  
Rim joist design incorporating spanning beam element