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Authorised
And notified according
To article 10 of the council
Directive of 21 December
1988 on the approximation of
the laws regulations and
administrative provision of
the member States
relating to construction
products (89/106/EEC)

Member of EOTA

European Technical Approval ETA-07/0032

Original version in English

Trade name	EASI-JOIST
Holder of approval	WOLF SYSTEMS LTD Shilton Industrial Estate Shilton, Coventry, CV7 9QL
Generic type and use of construction product	METAL WEB JOISTS FOR STRUCTURAL PURPOSES
Validity: from	05 May 2009
to	07-February 2012
Manufacturing plant(s)	Certified Fabricators are Listed on the BM TRADA Website
This Approval contains	*28 pages including 4 Annexes*

I. LEGAL BASIS AND GENERAL CONDITIONS

1 This European Technical Approval is issued by BM TRADA certification in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- Construction Product Regulations 1991 and the subsequent Construction Product (Amendment) Regulations 1994.
- Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC[4];
- Procedure for issuing ETA without an ETA Guideline in accordance with point 3.2 of the Common Procedural Rules, pursuant to Article 9(2) of the CPD).

2 BM TRADA Certification is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant(s). Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3 This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those recorded in a comprehensive list maintained by BM TRADA and copied to EOTA.

4 This European Technical Approval may be withdrawn by BM TRADA Certification, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of BM TRADA Certification. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6 The European Technical Approval is issued by the approval body in its official language. This version corresponds fully to the version circulated in EOTA. Translations into other languages have to be designated as such.

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1 Official Journal of the European Communities N°L 40, 11.2.1989, p. 12

2 Official Journal of the European Communities N°L 220, 30.8.1993, p. 1

3 Official Journal of the European Union N°L 284, 31.10.2003, p. 1

4 Official Journal of the European Communities N°L 17, 20.1.1994, p. 34

II. SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 DEFINITION OF PRODUCT AND INTENDED USE

1.1 Definition of the construction product

Metal-web joists are shallow parallel-chord trusses in which timber flanges are connected to each other by a system of triangulation provided by thin gauge steel webs. Each of these webs comprises two thin gauge steel members; one placed each side of the flanges. A typical joist is shown in elevation in figure 1.1a and in cross-section in figure 1.1b of Annex 1.

This ETA covers joists with depths ranging between 219mm and 417mm, with the depth of the flanges being 47mm and their widths ranging between 72mm and 147mm. Where necessary the flanges are end-jointed using punched metal plate fasteners (subsequently referred to as nail-plates) pressed into the top and bottom faces of the flanges.

This ETA provides the option for the flanges of the metal-web joists to be made of preservative treated timber. Timber treated with fire retardants is not covered by this ETA.
For timber that has been treated with preservatives, the treated timber and accompanying documentation shall comply with EN 351-1:2007 under the 98/8/EC Directive (as amended).

On elevation the webs are generally V-shaped with integral nail-plates at each end and at the root of the V-web as shown in figure 1.1c of Annex 1. These integral nail-plates are pressed into the sides of the flanges to form triangulated frameworks of the type shown in figure 1.1a of Annex 1. For joists or parts of joists under high load, double webs might be used whereby two webs are placed adjacent and parallel to each other on each side of the flanges as shown in figure 1.2 of Annex 1. It can be seen from figure 1.2 that half V-webs are used to make up a double web at the end of a joist, whilst in the middle of joists double webs are generally achieved by up turning alternate V-webs.

The nominal horizontal module of the steel V-webs range from 600mm to 750mm. In order to achieve joists of any length one of the strategies below is followed. It should be noted that none of these were assessed as part of the scope of this ETA and that the method used in figure 1.3c of Annex 1 is outside the scope of the CUAP:

A vierendeel bay is formed in the joist by fixing two short timber verticals between the flanges as shown in figure 1.3a of Annex 1. The distance between the timber verticals is not permitted to exceed the horizontal module of the steel V-web.

The metal-web triangulation is discontinued locally such that the final webs on opposite sides of the non-triangulated zone are parallel to each other as shown in figure 1.3b of Annex 1. The maximum extent of the non-triangulated zone along

either flange is half the horizontal module of the steel V-web. A timber vertical is positioned centrally as shown in figure 1.3c. The distance between the ends of the steel webs is not permitted to exceed the horizontal module of the steel webs.

1.2 Intended use

Metal-web joists are intended for use as a structural element in floor constructions in service classes 1 and 2 as defined in EN 1995-1-1 and in hazard classes 1 & 2 as defined in EN 335 Parts 1 and 2.

The provisions made in this European technical approval are based on an assumed working life of the metal web joists of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2 CHARACTERISTICS OF THE PRODUCT AND METHODS OF VERIFICATION.

The characteristics of easi-joist in the range covered by this ETA are summarised in table 3.1.

Metal-Web Joists are a variation of the Light Composite Wood Based Beams and Columns detailed in ETAG 011. This ETA is based on CUAP 03.04/09 Metal Web Joists.

Table 3.1 – Relevant product characteristics appraised in this ETA

Characteristic of construction product	**Corresponding ID* paragraph for works**		**Product characteristic**	**CUAP clause for**	
				Verifica-tion	**Assess-ment**
1- Mechanical resistance and stability	2.1.3 2.1.4	Collapse Inadmissible deformation	3.1.1 Mechanical resistance and stiffness	4.1.1	5.1.1
			3.1.2 Creep and duration of load	4.1.2	5.1.2
			3.1.3 Dimensional stability	4.1.3	5.1.3
			3.1.4 Seismic Actions	4.1.4	5.1.4
2- Safety in case of fire	4.2.2. 4.2.3	Load-bearing capacity of the construction, Limitation of Generation and spread of fire and smoke within the construction works	3.2.1. Reaction to fire	4.2.1	5.2.1
			3.2.2 Fire resistance	4.2.2	5.2.2
3- Hygiene, health and environment	3.3.1.1	Air quality	3.3.1 Wood preservatives 3.1 Release of dangerous substances	4.3. 4.3.1	5.3

Characteristic of construction product	Corresponding ID* paragraph for works		Product characteristic	CUAP clause for	
				Verifica-tion	Assess-ment
4- Safety in use	Not relevant				
5- Protection against noise	Not relevant				
6- Energy, economy and heat retention	4.2	Provisions concerning works or parts of them	3.6 Thermal bridging	4.6.1	5.6
Aspects of durability, serviceability and identification			3.7 Durability Serviceability Identification	 4.7.1 4.7.2 4.7.3	 5.7.1 5.7.1 5.7.2

*: ID = Interpretative Documents. CPD Articles 3 & 12 set out that ID's give concrete form to the Essential Requirements referred to in accordance with the preamble to the Appendix. The principle objective of the ID's is to establish the link between the Essential Requirements and the mandates the Commission gives to CEN & EOTA.

2.1 Mechanical Resistance and Stability (ER1)

The following aspects of performance are relevant to this essential requirement for the metal-web joists.

2.1.1 Mechanical resistance and stiffness

Mechanical properties for easi-joists are given in Annex 2.

2.1.2 Creep and duration of load

Creep and Duration of load factors for easi-joists are given in Annex 2.

2.1.3 Dimensional Stability

Nominal dimensions and permissible deviations are given in Annex 3.

2.1.4 Seismic Evaluations

No performance determined.

2.2 Safety in Case of Fire (ER2)

The following aspects of performance are relevant to ER2

2.2.1 Reaction to Fire

The metal webs are classified non-combustible in accordance with EC Decision 96/603/EC and fulfil the requirements of class A1 according to EN 13501-1: 2007. The timber flanges are classified as D-s2, d0.

2.2.2 Resistance to Fire

Fire retardant treated timber is not covered under this ETA. Performance in relation to resistance to fire would be determined for the complete structural element including any associated finishes.

2.3 Hygiene, Health & Environment (ER3)

2.3.1 Wood Preservatives

Wood preservatives applied to the timber components shall meet the requirements of the Biocide Products Directive 98/8/EC (as amended) and shall be specified according to EN 599-1:2007.

If a treatment is demanded this should be carried out by companies with capacity and skill in accordance with the regulations valid in the place of use.
In this case the treated timber component shall meet the requirements of EN 351-1:2007.

In service classes 1 and 2, where the moisture content of timbers will not exceed 20%, the risks of fungal decay are low and preservative treatment of timbers is not normally required. Should a preservative treatment be used:

(a) Double vacuum treatments with organic solvent-based preservatives, and boron diffusion, do not have a corrosive effect on metal fastenings in these conditions or in service class 3.

(b) In the situations where CCA preservatives are permitted, the requirements of Directive 2003/2/EC for the preservative to be adequately fixed before treated timber is marketed (intended to promote the safety of those handling it), will ensure it does not prevent a risk of corrosion to metal fastenings used with it. Provided the timbers are in the conditions of service class 1 or 2, the treatment does not have a corrosive effect on metal fastenings. [Note: CCA treatment will be subject to restricted use under the European Biocide Products Directive.]

(c) In the residential and domestic situations where arsenic-free aqueous copper preservatives are used in place of CCA preservatives, provided the treated timbers are given adequate time for the preservative to become fixed (normal good practice and considerations of practicability will achieve this), and provided the timbers are in the conditions of service class 1 or 2, the treatment does not have a corrosive effect on metal fastenings.

Preservative treatments that do not have a corrosive effect on the metal webs and do not have an impact on the mechanical properties of the timber may be used. A list of the current active ingredients present in wood preservatives is presented in annex 3.

(d) EN 15228 states that treatments with a penetration class not exceeding NP2 according to EN 351-1:2007 can be assumed not to have an effect on strength and stiffness. According to EN 351-1:2007 (Table 1) preservative treatments of class NP1 and NP2 have a maximum penetration of 3 mm, EN 336:2003 allows for -1 mm to +3 mm manufacturing tolerance without causing any reduction in the strength class, thus it is TRADA's opinion that providing preservatives of class NP1 or NP2 are used they will have no effect on the structural properties of the timber.

2.3.2 Release of Dangerous Substances

Based on the declaration of the manufacturer easi-joists do not contain harmful or dangerous substances as defined in the EU database.

Note: In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

2.4 Safety in Use (ER 4)

Not Relevant

2.5 Protection against Noise (ER 5)

Not Relevant

2.6 Energy Economy and Heat Retention (ER 6)

For thermal resistance no performance is determined.

2.6.1 Thermal Bridging

A metal-web joist shall be connected to the outer walls and other structures of a building in such a way that thermal bridges are avoided as far as possible. The effect of any condensation risk shall be considered as part of the overall construction.

2.7 Aspects of Durability, Serviceability and Identification

2.7.1 Durability

easi-joist metal web beams can be used in service classes 1 and 2 according to Eurocode 5 and in hazard classes 1 and 2 as specified in EN335.
The product may be exposed to the weather for a short time during installation.

Unless treated with a suitable timber preservative durability may be reduced by attack from wood boring insects such as long horn beetle, dry wood termites and Anobium, in areas where these are prevalent.

Untreated European redwood and whitewood and most commercial softwoods do not have a corrosive effect on metal fastenings. Douglas fir is more acidic, but its effect is mitigated by dry service conditions, and precautions against corrosive attack are not normally taken or necessary for service classes 1 or 2.

2.7.2 Serviceability

Unacceptable deformation is addressed under 2.1.

2.7.3 Identification

The beams are identified by the flanges bearing the mark of the manufacturer of the beam and the CE mark as described in clause 4.

3 EVALUATION AND ATTESTATION OF CONFORMITY AND CE-MARKING

3.1 System of attestation of conformity

The system of attestation of conformity 1 applies to metal web joists. (See Council Directive 89/106/EEC Annex III).

This system of attestation of conformity provides as follows:

a) Tasks for the manufacturer:

1 factory production control.
2 testing of samples taken at the factory in accordance with a prescribed test plan.

b) Tasks for the approved body:

3 initial type–testing of the product;
4 initial inspection of factory and of factory production control;
5 continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

Factory Production Control

The manufacturer shall establish, document and maintain a factory production control system to be endorsed by the notified body, which ensures that the products placed on the market conform to the performance characteristics stated, and that the products are correctly fabricated in accordance with the design.

The factory production control system shall consist of written procedures, regular inspections and tests / assessments to control raw materials and other incoming products / services, equipment, the production process and the finished product. The results of inspections, tests or assessments and subsequent actions shall be recorded. The action taken when control values or criteria are not met shall be recorded.

Manufacturers that have a FPC system that complies with EN ISO 9001 and addresses the requirements of an ETA are recognised as satisfying the FPC

requirements of the Directive. EC Guidance Paper B provides for a common basis of understanding factory production control, it is however not mandatory.

Factory Testing / Assessment

In this context, testing is taken to mean physical testing and/or visual examination of the product/process. Normally only properties related to the mechanical resistance and stability of the metal-web joists shall be assessed.

For metal-web joists a visual assessment shall include checks which are detailed in a prescribed test plan, which is part of the factory production control.
For timber treated with preservatives, the Factory Production control shall include procedures to verify the correct specification, purchase and incorporation of the preservative-treated wood to EN 351-1:2007, into the finished product.
A copy of the test plan is retained by BM TRADA.

All measuring and testing equipment shall be regularly calibrated and inspected according to the documented FPC system. Production records shall be kept for each batch of metal-web joists for at least 5 years.

3.2.2 Tasks of the approved body

Initial Type Testing

Initial type testing has been undertaken under the responsibility of BM TRADA in accordance with clause 4 of the CUAP to obtain minimum characteristic values for the web strength, member and joint stiffness for each metal-web joist type. The characteristic values obtained have been assessed as part of the ETA issuing procedure.

Table 7.2 Initial Type Testing. (Statistical evaluation carried out according to 5.1.1.)

Property	Test method	Minimum number of specimens	Requirement
Web strength	See Appendix D in CUAP 03.04/09.	See table D.1 in CUAP 03.04/09.	Characteristic value from the tests > value given in the ETA. Single test value > than 0.80 of ETA value is acceptable.
Member and joist stiffness	See Appendix E. in CUAP 03.04/09.	See table E.1 in CUAP 03.04/09.	Mean value from tests > value given in the ETA.

Whenever a change occurs in materials or production process which would significantly change the above characteristics, the tests or assessments shall be repeated for the appropriate characteristics.

Assessment of the factory production control system — initial inspection and continuous surveillance

An assessment of each production unit shall be carried out to demonstrate that the factory production control is in conformity with the ETA and any subsidiary information. This assessment shall be based on an initial inspection of the factory. Subsequently continuous surveillance of factory production control, including verification that tests are being carried out to the prescribed test plan, is necessary to ensure continuing conformity with the ETA.

It is recommended that surveillance inspections shall be conducted at least twice per year.

Certification of Conformity

When all the criteria of the Conformity Attestation are satisfied the approved certification body shall issue a Certificate of conformity for the product described within this ETA.

4 CE MARKING AND INFORMATION

The CE mark shall be affixed:

- on the metal web beam itself, or
- on an attached label, or
- on the packaging, or
- on the accompanying commercial documents.

According to the CE Guidance Paper D on CE marking, the required information to accompany the symbol "CE" is:

- identification number of the notified certification body (AoC System 1)
- the name or identifying mark of the producer and the registered address of the producer
- last two digits of the year in which the marking was affixed
- the number of the EC certificate of conformity (AoC System 1)
- number of the ETA, valid as indication to identify the characteristics of the metal web joist.

5 ASSUMPTIONS UNDER WHICH THE FITNESS OF THE PRODUCTS FOR THE INTENDED USE WAS FAVOURABLY ASSESSED

5.1 Manufacturing

The easi-joist metal web joists are manufactured in the factory in accordance with the provisions of this European Technical Approval as identified during inspection of the plant by the approved certification body.

Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to BM TRADA before the changes are introduced. BM TRADA will decide whether or not such changes

affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

5.2 Installation

easi-joist metal web joists shall be installed on the basis of a specific structural design for each installation, using the load bearing capacities given in annex 2.

The joists shall be installed by appropriately competent personnel, following an installation plan and relevant construction details worked out for each construction project. The installation plan shall be based on the manufacturers technical guidance documents and current examples are given in annex 5.

5.3 Responsibility of the manufacturer

It is the manufacturer's responsibility to ensure that the relevant information is given to specifiers and end users. This information may take the form of reproduction of the relevant parts of the European Technical Approval. In addition all installation data shall be shown clearly on the packaging and / or on an enclosed instruction sheet.

The minimum data required is:

- Clear designation of upper and lower flanges
- Minimum bearing length at the support
- Information on storage and lifting
- Identification of batch number of manufacture

6 RECOMMENDATIONS

6.1 Packaging, transport and storage

easi-joist metal web joists shall be protected against harmful wetting during transport and storage.

The joists must not be lifted or stored in such a way that bending around the weak axis may cause damage to the joists.
Beams should be stored either vertically (as they would be installed), or flat. Where stacked vertically bearers should be placed at node points and not within the bay of a beam.

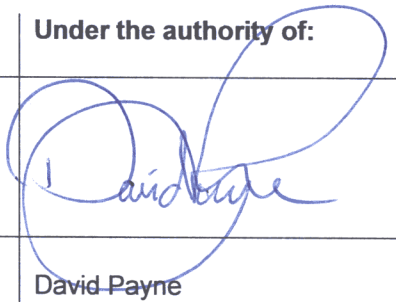
When loading or off-loading with a crane, slings should always be attached to the timber chords, and not to the metal webs to avoid buckling. Slings should be attached at panel points closest to the quarter points of the beams as shown below.

The manufacturer must ensure that the information of these provisions is given to those concerned.

6.2 Use

Joists damaged during storage or transport must be discarded. Only sound joists should be installed.

7 AUTHORISATION

	Issued by:	Under the authority of:
Signature:		
Name:	Pia Larsen	David Payne
Title:	Principal Engineer – Product Services	Product Certification Manager

8 ANNEX 1 - DESCRIPTION OF PRODUCT(S)

Figure 1.1a – Elevation on a metal-web joist

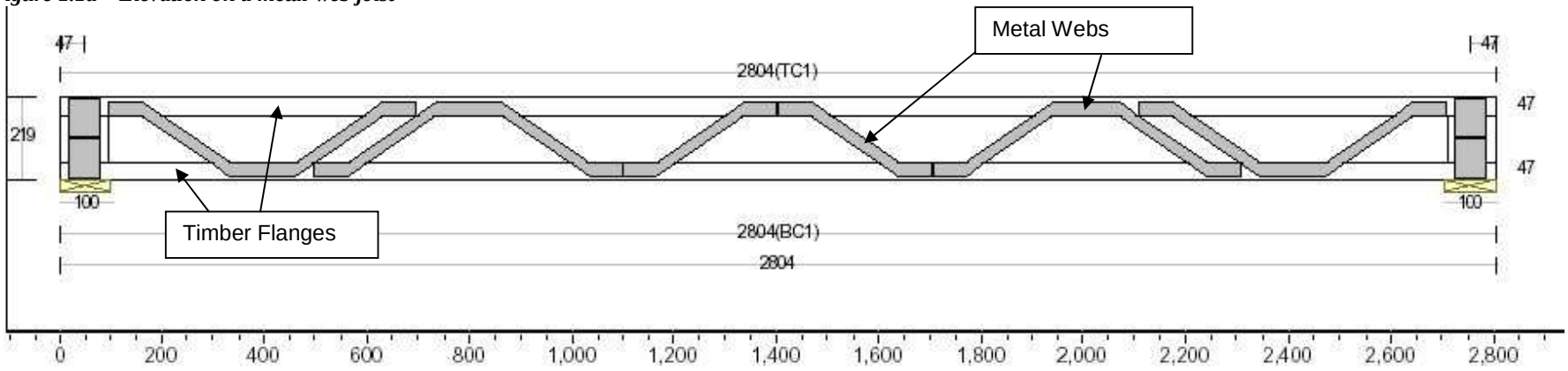


Figure 1.1b – Cross-section through a metal-web joist

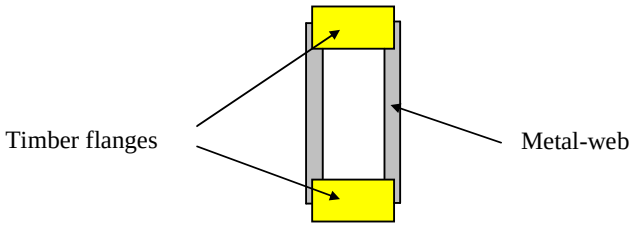


Figure 1.1c – Elevation on a single metal V-web

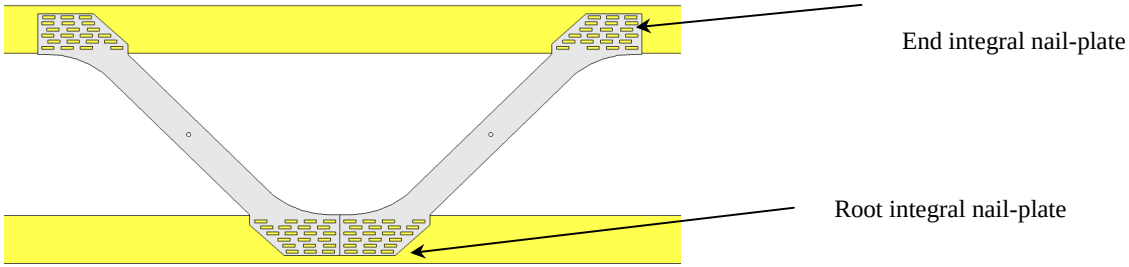


Figure 1.2 – Metal-web joist with double webs

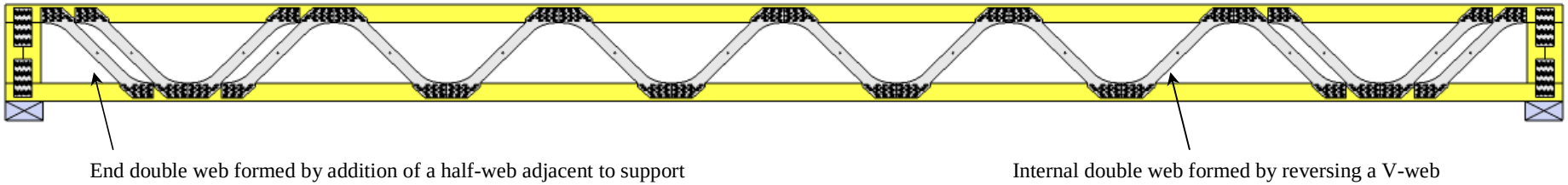


Figure 1.3a – Joist length achieved using a vierendeel bay

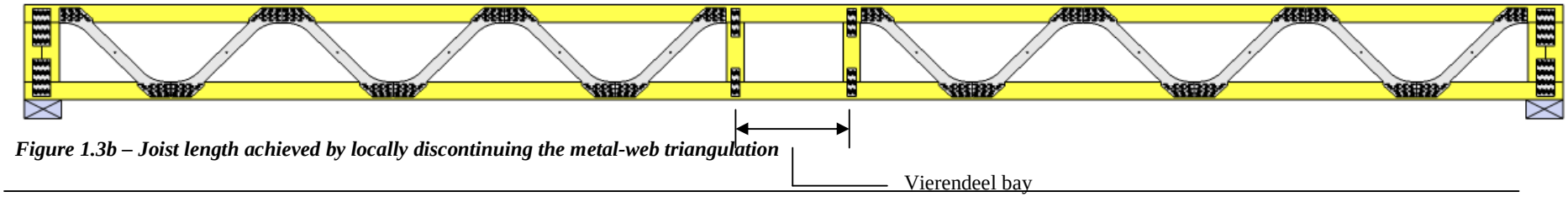


Figure 1.3b – Joist length achieved by locally discontinuing the metal-web triangulation

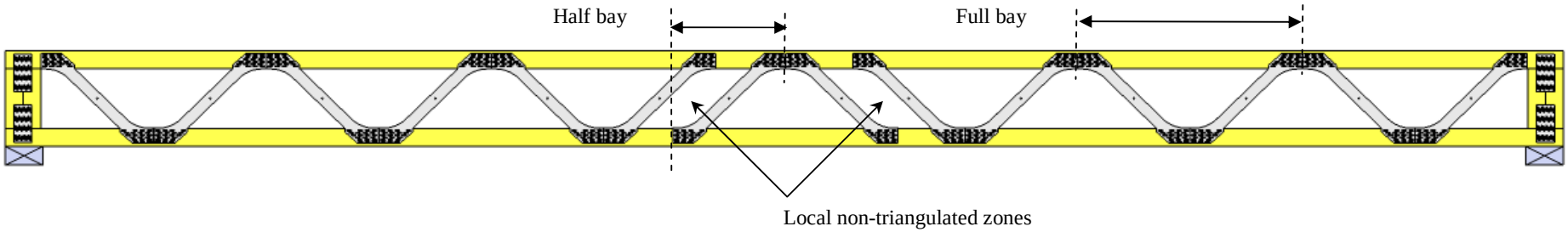
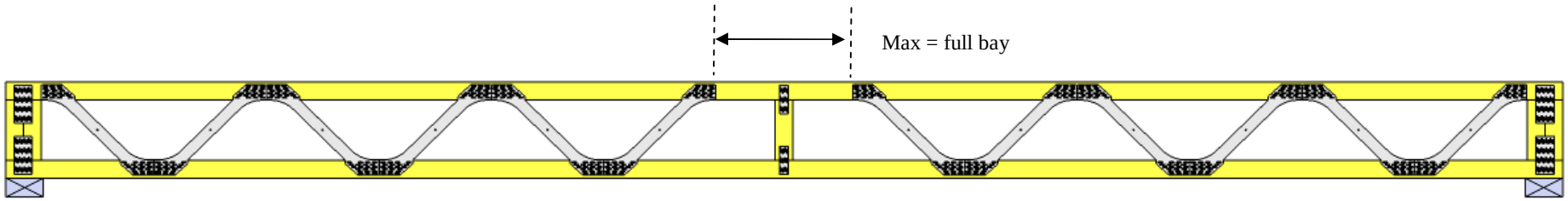


Figure 1.3c – Joist length achieved using one central column



ANNEX 2 – MECHANICAL PROPERTIES

Resistance and stiffness

Structural model

easi-joists are to be designed using a first order linear plane frame analysis applied to the simplified structural models illustrated in Figures A2.1 and A2.2, which is also described below.

Single Webs

The steel V-webs are to be assumed pinned to the flanges both at their ends and at the roof of the V-web. These pinned nodes are located on the flange centrelines and at any junction between webs and a flange there is a single pinned node located as illustrated in Figure A2.1. The system line for any web extends between adjacent top and bottom chord nodes as shown in Figure A2.1. Slip is to be based on a slip modulus, $k_{ser,sw}$, which is assumed to occur in the direction of the web system line at all these pinned nodes

Flange

The timber flanges are to be assumed to be continuous past the pinned web nodes, with their system lines being located on the flange centre lines.

Double Webs

At all junctions between a double web and a flange, a single pinned node is to be located on the flange centre lines as shown in Figure A2.2. The system line for any double web extends between adjacent top and bottom chord nodes as shown in Figure A2.2. Slip is to be based on a slip modulus, $k_{ser,dw}$, which is assumed to occur in the direction of the web system line at all these pinned nodes.

Figure A2.1 – Structural model for metal-web joists with single webs [NOT TO SCALE]

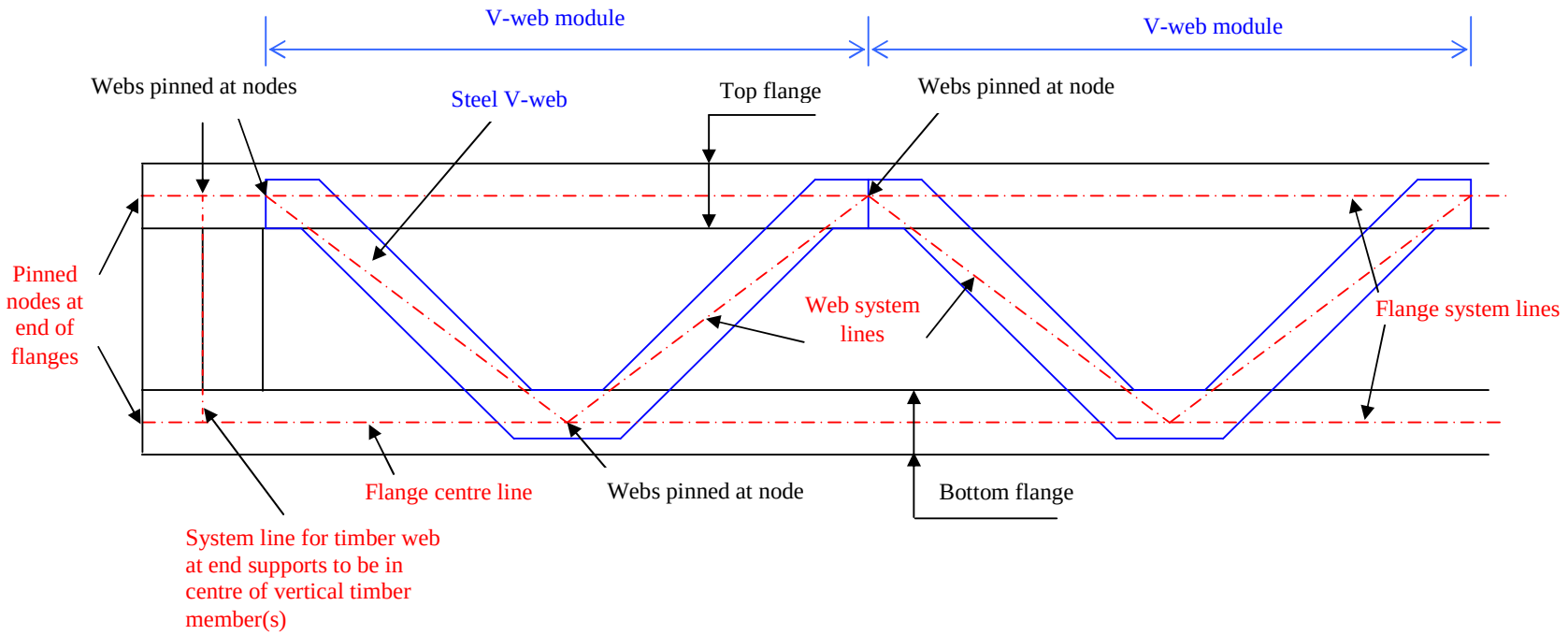
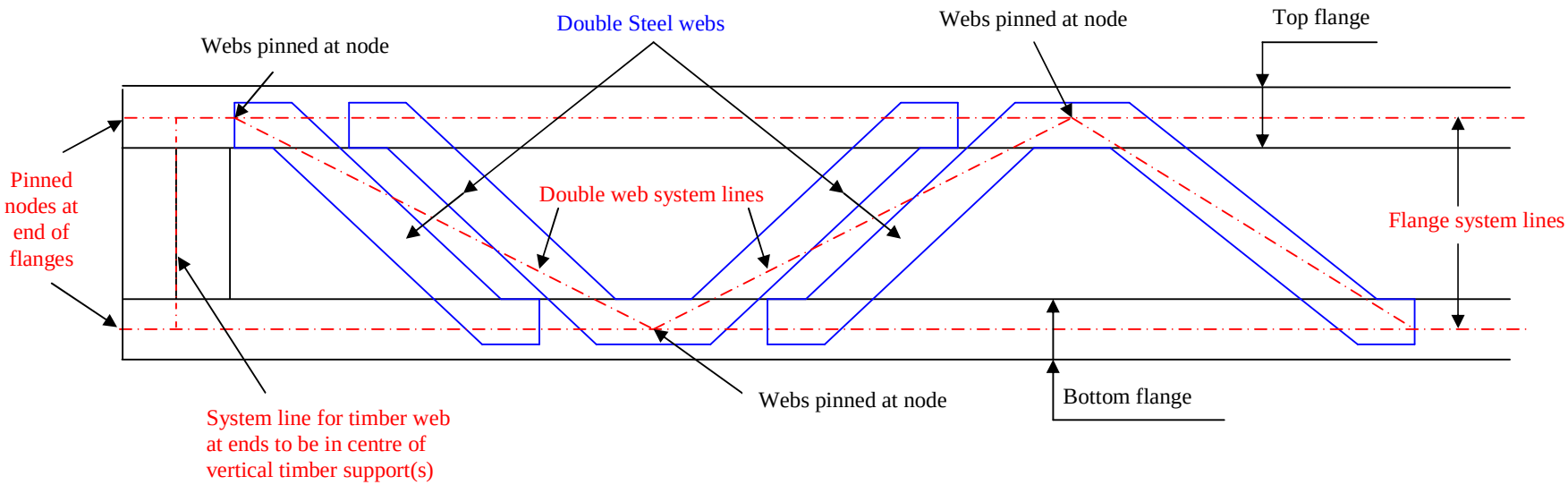


Figure A2.2 – Structural model for metal-web joists with double webs [NOT TO SCALE]



Strength of Flanges

The flanges are typically made of TR26 timber (UK strength class), which can be considered equivalent to C27 with regard to strength and density properties. The stiffness properties are slightly lower than those given for C27 Timber. Characteristic properties for TR26 material are listed in Table A.1.

If using flange material of a different strength class, characteristic strength, stiffness and density properties are to be taken from EN 338.

Table A1 Properties of TR26				
Bending parallel to grain	- characteristic	$f_{m,k}$	27	N/mm²
Bending stiffness	- characteristic	$E_{0.05}$	7400	N/mm²
	- mean	$E_{0,mean}$	11000	N/mm²
Shear parallel to grain	- characteristic	$F_{v,k}$	2.8	N/mm²
Tension parallel to grain	- characteristic	$F_{t,0,k}$	16	N/mm²
Compression parallel to grain	- characteristic	$F_{c,0,k}$	21	N/mm²
Compression perpendicular to grain	- characteristic	$F_{c,90,k}$	2.6	N/mm²
Density	- characteristic	ρ_k	370	kg/mm^3
	- mean	ρ_{mean}	450	kg/mm^3

Design values are to be calculated as

$$f_d = \frac{f_k \times \gamma_m}{k_{mod}}$$

Where γ_m = 1.3 and k_{mod} is to be taken from Table A.2.

Table A.2 – Values of k_{mod}	
Load – Duration Class[1]	Service Class 1 and 2[2]
Permanent action	0.60
Long term action	0.70
Medium term action	0.80
Short term action	0.90
Instantaneous action	1.10

Both flanges are subject to combined axial load (from the triangulated framework) and moment (from local bending between nodes). In the case of flanges subject to combined bending and tension, the design is to be carried out in accordance with section 6.2.3 of EN1995-1-1 and the relevant characteristic stresses. In the case of flanges subject to combined bending and compression, the design is to be carried out in accordance with section 6.3.2 of EN1995-1-1 and the relevant characteristic stresses.

The design of the punched metal plate fastener flange splice joints is be undertaken using section 8.8.5 of EN1995-1-1 and characteristic strength properties of a punched metal plate fastener, which have been derived in accordance with EN14545

1 Load – durations class are as defined in EN 1995-1-1, Table 2.1

2 Service class 1 & 2 as defined in EN 1995-1-1. Easi-joist are not considered suitable for Service Class 3 conditions.

Strength of webs

When designing – using the model described in section 1.1.1 of this annex - the characteristic web capacities listed in Table A.3 adjusted for density and modified to design values as described below are to be adhered to.

Table A.3 – Characteristic web capacities *

Web ID		WS200	WS250	WS300	WS400
Joist depth (mm)		219	254	304	417
Characteristic web capacities (axial) (kN)	Tension in single web at end support	13.78	14.19	12.64	11.80
	Tension in internal single web	9.58	10.34	8.82	8.69
	Compression in single web	16.29	14.09	14.76	11.69
	Tension in double webs	21.52	24.02	23.89	17.46
	Compression in double webs	26.03	23.01	23.66	17.26

* The tabled web capacities are specific to flange material with a characteristic density (ρ_k) of 370kg/m$^{3.}$ When using flange material of a different density the capacities are to be adjusted by using the factor $(\rho_{req}/370)^{0.5}$, where ρ_{req} is the characteristic density of the flange material used.

The characteristic web capacities are to be modified to design capacities as follows:

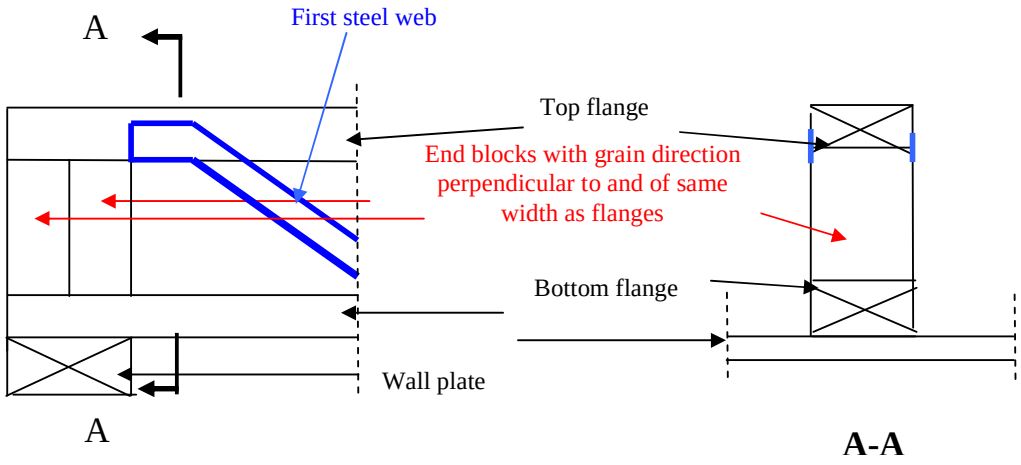
$$f_d = \frac{f_k \times \gamma_m}{k_{mod}}$$

Where γ_m = 1.3 and k_{mod} is to be taken from Table A2.2.

Bearing Strength

Full-flange-width timber end blocks with grain direction perpendicular to flanges are to be placed between the two flanges at support locations as shown in Figure A 2.3. The bearing strength at supports is therefore limited by crushing on the underside of the bottom flange and will be calculated using the procedures of section 6.1.5 of EN1995-1-1 and the relevant characteristic compression stress perpendicular to grain given in Table A2.1. The bearing strength of metal-web joists, being dependent on the properties of the timber flanges, will be evaluated for differing load-durations using the appropriate k_{mod} factor given in EN1995-1-1 for solid timber.

Figure A 2.3 – Typical general arrangement at supports



Stiffness of Beams

When considering serviceability of the easi-joists the design model described in section 1.1.1 of this annex is to be used. The stiffness modulus of the flanges are to be taken from table A 2.3 and are to be adjusted to final stiffness moduli as follows:

$$E_{fin} = \frac{E}{(1+k_{def})}$$

Where k_{def} is to be taken from Table A.4.

Table A.4 – Values of k_{def}	
Service Class 1[3]	0.60
Service Class 2	0.80

The stiffness modulus of the webs are to be taken as 205000 N/mm^2 and the slip modulus at web to flange joint are to be taken from Table A.5.

Table A.5 – Characteristic joint slip moduli - k_{ser}					
Joist depth (mm)		219	254	304	417
Characteristic slip modulus at web nodes (N/mm)	Single webs $k_{ser,sw}$	64500	50500	54000	20000
	Double webs $k_{ser,dw}$	75000	64000	56000	15500

3 Service class 1 & 2 as defined in EN 1995-1-1. easi-joist are not considered suitable for Service Class 3 conditions.

ANNEX 3 – ACCEPTABLE TIMBER PRESERVATIVE ACTIVE INGREDIENTS

It is assumed that the following active ingredient types, which are contained within commercial wood preservative products, do not have any effect on the mechanical properties of the timber, provided that they are used within the penetration limits specified in EN 351-1:2007 and they are applied with processes that do not exceed temperatures of 80º C.

For guidance on the choice of the appropriate treatment, reference should be made to either European Product Standards or to the appropriate national, regional or local standards.
Based on the current specifications of the web material, the following types of preservative ingredients can be used.

The Acceptable Active Ingredients:

1. Water based borate solutions;

2. Water based copper-chromium-based solutions containing either a borate, fluoride, phosphate or a arsenate;

3. Water based borate and guanylurea phosphate solutions;

4. Water based N-Didecyl-N-dipolyethoxyammonium borate, didecylpolyoxethylammonium borate solutions that may contain an organic insecticide;

5. Water based solutions of quaternary ammonium that may contain either IPBC, borates, azoles and some organic insecticides;

6. Azoles solutions based on water with borates or IPBC and organic insecticides;

ANNEX 4 – DIMENSIONAL STABILITY.

The dimensions of the timber flanges will change due to variations in moisture content between installation and in-service conditions throughout its service life. It is recommended that the easi-joists should be made and installed with flanges having a moisture content of maximum 20%. During the service life this could reduce to 8%, which means that the overall change in moisture content could be up to 12%. It is estimated that the dimensional change in flange depth will be in the region of 3% (1% change in dimension for every 4% change in moisture content).

For an easi-joist with two 47mm deep flanges the total change in beam depth will be a maximum of 2.8mm, which is considerably less than the moisture movement in conventional solid timber joists.

ANNEX 5 – INSTALLATION INSTRUCTIONS

The installation guide of the manufacturer shall be followed. The following points are especially critical.

1. Joists should be installed truly vertical and in the correct orientation.
2. easi-joists must not be notched, drilled or cut, without the express permission of the manufacturer.
3. Joists must be fully braced to ensure stability.

For further information refer to easi-joist manual.

ANNEX 6 – TECHNICAL DRAWINGS

The following are drawings of easi-joist webs.

Figure A6.1 –WS200 and W250 – Metal web for 219mm and 254mm deep easi-joists

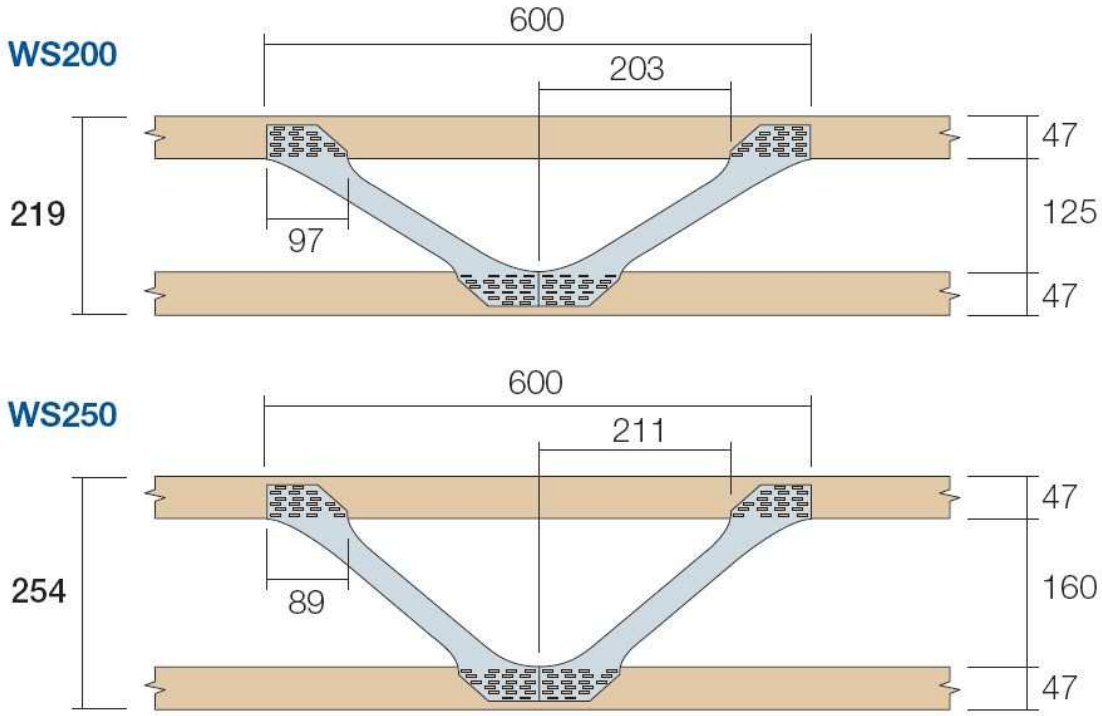


Figure A6.2 – WS300 and WS400 – Metal web for 304mm and 417mm deep easi-joists