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Member of EOTA

European Technical Approval ETA-12/0421

[Original version in English Language]

<i>Trade Name</i>		Ty Unnos Box Beams
<i>Holder of Approval</i>		Coed Cymru The Old Sawmill Tregynon Newtown Powys SY16 3PL
<i>Generic Type and Use of Construction Product</i>		Wood based Box Members for Structural Purposes
<i>Validity:</i>	<i>From</i>	09-11-2012
	<i>To</i>	08-11-2017
<i>Manufacturing Plant(s)</i>		Coed Cymru The Old Sawmill Tregynon Newtown Powys SY16 3PL
<i>This Approval contains</i>		17 pages including 3 Annexes



European Organisation for Technical Approvals

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 products¹, modified by Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;

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/EC⁴;

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 This European Technical Approval may be withdrawn by BM TRADA Certification, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.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

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

Ty Unnos Box Beams are rectangular, hollow structural members manufactured from Welsh grown Sitka Spruce or Douglas Fir softwood graded to C16 strength class, or greater, in accordance with EN 14081 and EN338.

The concept of the product is to take relatively small dimensional timber and by incorporating it into an engineered wood product, to create useful structural members. Ty Unnos Box Beams consist of four main engineered components, two acting as flanges and two as webs. (See Annex A) The two flanges are formed from timbers of the same cross-section, finger-jointed to the required length. The webs are also formed from finger jointed timbers of the same cross-section, but are generally less deep than the flange. To obtain the depths required, the finger-jointed timbers are tongued and grooved along their long edge, then glued together edgewise.(See Annex 1).

The web and flange components are then glued together with structural adhesives, to form the Ty Unnos Box Beams. Only structural adhesives that comply with the Type II specification defined in EN301 or Type II of EN15425 are permitted.

This assessment covers Box Members (beams and / or columns) within the following size limitations:

- Overall width: 180 to 350mm
- Overall depth: 180 to 500mm
- Minimum void width or depth: 100mm
- Minimum web or flange thickness: 40mm

Ty Unnos Box Beams have been assessed as axial / flexural members for use in Service Class 1 and 2 conditions as defined in EN 1995-1-1 (EC5)

This ETA considers all configurations within the size limitations given above. It has been confirmed that the properties of configurations within these limitations can be derived by calculation in accordance with EC5, using the approach given in Annex 2.

1.2 Intended use

Ty Unnos Box Beams are intended for use as load bearing components in building structures, for example beams, columns and frame components.

The use of members is limited to service classes 1 and 2 conditions as defined in EN 1995-1-1 (Eurocode 5). Under these conditions, the moisture content of the timber does not exceed 20%. The joists may be taken to have a service life of 50 years⁵, provided that there is no mechanical damage or insect attack. The elements have not been assessed for use in seismic areas.

⁵ An 'assumed intended working life' means that it is expected that, when an assessment following the ETA provisions is made, and when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the essential requirements.

2 CHARACTERISTICS OF THE PRODUCT AND METHODS OF VERIFICATION

The characteristics of Ty Unnos Box Beams in the range covered by this ETA are summarised in table 2.1.

Table 2.1 – Relevant product characteristics appraised in this ETA

	Characteristic of construction product	Corresponding ID* paragraph for works		Product characteristic	ETAG clause for	
					Verification	Assessment
1	Mechanical resistance and stability	4.2	Provisions concerning works or parts of them	4.1.1 Mechanical resistance and stiffness	5.1.1	6.1.1
				4.1.2 Creep and duration of load	5.1.2	6.1.2
				4.1.3 Dimensional stability	5.1.3	6.1.3
				4.1.4 Seismic Actions	5.1.4	6.1.4
2	Safety in case of fire	4.2.3.3.1	Limitation of the generation of fire and smoke within the room. Limitations of spread of smoke beyond the room of origin.	4.2.1. Reaction to fire	5.2.1	6.2.1
		4.2.3.4.2		4.2.2 Fire resistance	5.2.2	6.2.2
3	Hygiene, health and environment	3.3.1.1	Air quality	4.1 Release of dangerous substances	5.3.1	6.3
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	4.6 Thermal resistance	5.6.1	6.6
Aspects of durability, serviceability and identification				4.7 Durability	5.7.1	6.7.1
				Serviceability	5.7.2	6.7.1
				Identification	5.7.3	6.7.2

* 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 box members.

2.1.1 Mechanical Resistance and Stiffness

It has been shown through design assisted by testing that characteristic values for Ty Unnos webs and flanges may be taken as those of C16 timber, as these were found to be conservative. These are given in Annex 1 table A1.2.

These values may be used to calculate the bending and shear strength capacities of the box members using the method given in Annex 2.

2.1.2 End Bearing Capacity

End bearing capacity may be derived by calculation in accordance with section 6.1.5 of EC5. However testing has demonstrated that better values can be achieved in practice and this value is declared as the end bearing capacity in Annex 1.

2.1.3 Creep and Duration of Load

Creep and Duration of load factors shall be taken from EC5 section 2.3.3, using the modification factors k_{mod} and k_{def} respectively. The limiting deflections shall be verified against the values given in section 7.2 of EC5 and the relevant national Annex.

2.1.4 Dimensional Stability

Nominal dimensions and permissible deviations are given in Annex 1.

2.1.5 Seismic Evaluations

Ty Unnos box beams are for use in non-dissipative or low dissipative structures.

2.2 Safety in Case of Fire (ER2)

The following aspects of performance are relevant to ER2.

2.2.1 Reaction to Fire

The members consist of materials classified to have reaction to fire class D - s2,d0 for timber flange and web.

2.2.2 Resistance to Fire

No performance determined. 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)

2.3.2 Content and/or Release of Dangerous Substances

Based on the declaration of the manufacturer, Ty Unnos box beams do not contain harmful or dangerous substances as defined under European Directive 76/769/EEC. The assessed adhesives meet the requirements of EN 301.

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)

No performance determined⁶.

2.7 Aspects of Durability, Serviceability and Identification

2.7.1 Durability

Ty Unnos Box Beams may be used in Service Classes 1 and 2 as defined in EC5, and Use Classes 1 and 2 as specified in EN 335-1 where the moisture content of timbers will not exceed 20% and the risks of fungal decay are low. The product may be exposed to weathering for short periods of time during installation; however excessive wetting shall be avoided.

The box beams will not withstand fungal attack, as Sitka Spruce is classified as not durable and home-grown Douglas Fir is classified as slightly durable according to EN 350-1. However, fungal attack requires a moisture content above that expected in Service Class 1 or 2 conditions. The resistance of both timber species can be significantly improved by the applications of timber preservative, but preservative treatment has not been assessed in this ETA.

Durability may also be reduced by attack from insects such as Longhorn beetle, dry wood termites and common furniture beetle in regions where these may be found and where conditions are conducive to attack.

2.7.2 Serviceability

2.7.2.1 Dimensional Stability

The dimensions of the timber components will change due to variations in moisture content between installation and in service conditions throughout its service life. It is recommended that Ty Unnos Box Beams shall be fabricated and installed with timber having a target moisture content of 12%. This ensures that the difference in moisture content from installation and in-service does not exceed 5-7%.

2.7.2.1 Unacceptable Deformation

Unacceptable deformation is addressed under 2.1.

⁶ Performance in relation to energy economy and heat retention would be determined for the complete structural element including any associated finishes.

2.7.3 Identification

The beams shall be identified by the Web bearing the mark of the manufacturer of the beam and the CE mark as described in clause 4.

2 EVALUATION AND ATTESTATION OF CONFORMITY AND CE MARKING

3.1 System of Attestation of Conformity

The system of attestation of conformity 1 applies to Coed Cymru Ty Unnos Box Beams. (See clause 8.1 in section III of ETAG 011).

This system of attestation of conformity provides the following:

Tasks for the Manufacturer:

1. Factory Production Control
2. Testing of samples taken at the factory in accordance with a prescribed test plan

Tasks for the Approved Body:

1. Initial type-testing of the product;
2. Initial inspection of factory and of factory production control;
3. 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

3.2.1.1 *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 having a FPC system that complies with EN ISO 9001 and which address 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.

3.2.1.2 *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 box beams shall be assessed.

For box members a visual assessment shall include checks which are detailed in a prescribed test plan, which is part of the factory production control.

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 box members for at least 5 years.

3.2.2 Tasks of the Approved Body

3.2.2.1 *Initial Type Testing*

Initial type testing has been undertaken under the responsibility of BM TRADA to verify that the approval holder is able to manufacture products in conformity with this ETA.

The initial type testing has been limited to calculation assisted by testing.

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.

3.2.2.2 *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.

3.2.2.3 *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.

2 CE MARKING AND INFORMATION

The CE mark shall be affixed:

- On the Ty Unnos Box 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 first 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 box member.

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

3.7 Manufacturing

The Coed Cymru Ty Unnos Box Beams shall be manufactured in the factory in accordance with the provisions of this European Technical Approval and the agreed control plan.

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.

3.8 Installation

Refer to Annex 3 for installation instructions.

3.9 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

4 RECOMMENDATIONS

4.7 Packaging, Transport and Storage

Ty Unnos Box Beams shall be protected against harmful wetting during transport and storage. The box members will arrive on site with a typical flange moisture content of 16%.

The members must not be lifted or stored in such a way as to cause damage. On site the members should be stored out of ground contact.

Ty Unnos Box Beams shall be stored to minimize changes in moisture content, caused by the weather, by storing under cover but permit free passage of air.

They should be protected from excessive sun, rain or moisture. Site storage is intended to be temporary, prior to erection. The fabrication and delivery of beams should therefore be arranged to minimize the storage time, both at the fabricator's premises and on site.

Coed Cymru recommends that the members should be wrapped in protective plastic covering, to protect them from short-term exposure to inclement weather.

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

Any members damaged during storage or transport must be discarded. Only sound members should be installed.

ANNEX 1:

DESCRIPTION OF PRODUCT(S)

Figure A1 Cross-section of the Coed Cymru Ty Unnos Box Beam

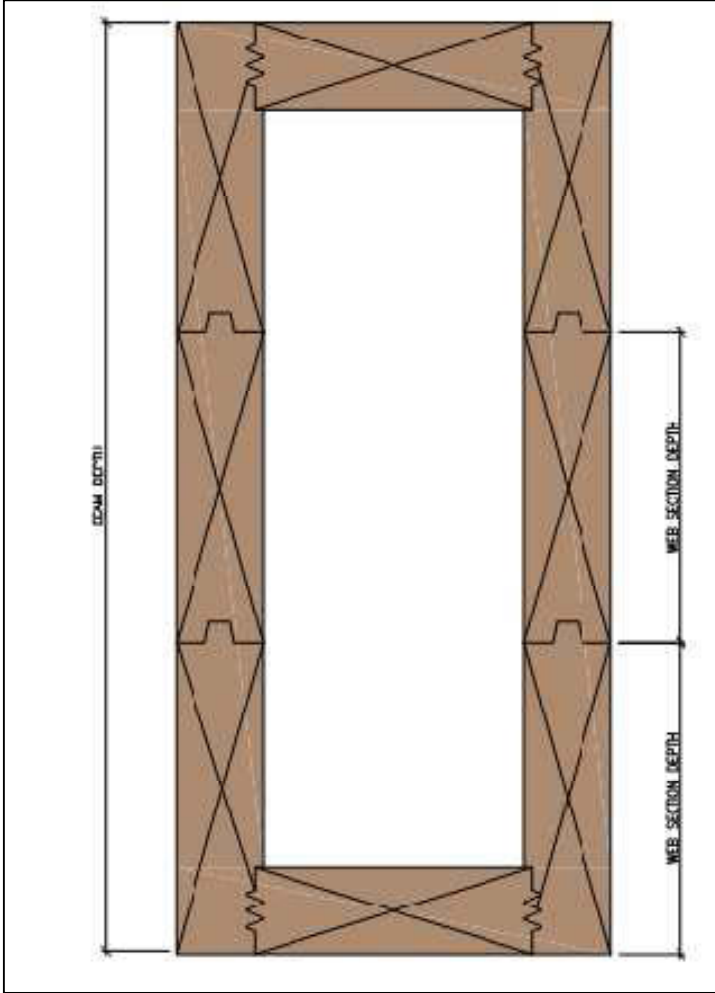
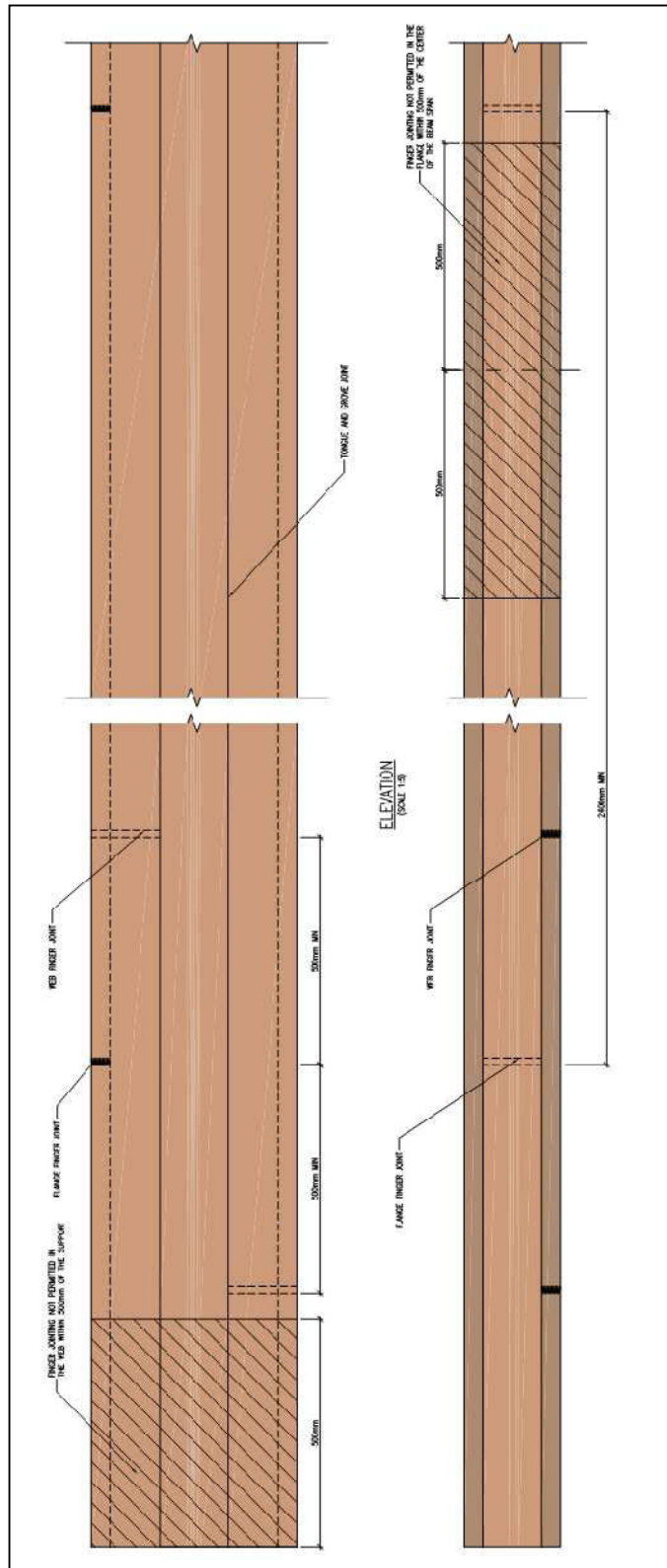


Figure A2 Plan View of the Coed Cymru Ty Unnos Box Beam



The webs and flanges for Ty Unnos Box Beams are produced from planed-all-round (PAR) softwood timber, which is of strength class C16 and has been finger-jointed in accordance with EN 385. Individual lamellae shall not be less than 40mm wide and 45mm deep.

Finger joints as assessed as part of this ETA were created using profiles of geometry 15x3.8x 0.42mm in accordance with table 1 of EN 385.

Table A1.2 Characteristic properties for member webs / flanges to be used in calculations taken from EN 338 for strength class C16

Flange Properties (All Joist Series)		
Bending Strength - parallel to grain (N/mm ²)	$f_{m,k}$	16
Tensile Strength - parallel to grain (N/mm ²)	$f_{t,0,k}$	10
Compression Strength - parallel to grain (N/mm ²)	$f_{c,0,k}$	17
Compression Strength - perpendicular to grain (N/mm ²)	$f_{c,90,k}$	2.2
Shear Strength - parallel to grain (N/mm ²)	$f_{v,k}$	3.2
Bending Stiffness - parallel to grain – mean (N/mm ²)	E_{mean}	8000
Bending Stiffness - parallel to grain – min (N/mm ²)	$E_{0.05}$	5400
Density – mean (kg/m ³)	ρ_{mean}	310

End bearing stress	300mm deep box beam value at test (N/mm²)
$\sigma_{f,c,90,max}$	3.40
Note: The end bearing stress is determined on a bearing length of 45mm	

Ty Unnos Box Beams are manufactured following documented factory production control systems.

Quality control procedures include checks on web, flange and adhesive materials for specification and moisture content, dimensional checks before and after preparation, verification of adhesive spread, fit of component parts and curing temperature. Manufacturing tolerances are given in Table A1.4. Regular tests are undertaken to monitor adhesive bond on all connections, shear strength and the strength of completed joists. The aim of the FPC should always be to ensure that adhesive bonds are stronger than the C16 timber.

Table A1.4 Manufacturing Tolerances (from EN336)

Member Dimension	Tolerance (mm)
Overall member Length	-0 + 3.0
Overall member Depth (target size 180 to 500mm)	-2.0 +4.0
Flange / Web Thickness	-1.0 +3.0
Flange / Web depth	-2.0 +4.0

ANNEX 2:

METHOD FOR DERIVATION OF MECHANICAL PROPERTIES BY CALCULATION

Table A2.1 Characteristic strength and stiffness properties of Ty Unnos Box Beams shall be derived using the following method, as supplied by the ETA holder and verified by BM TRADA.

Extrapolation of web depths beyond range 180-500mm is not permitted.

2.0 Calculation of Structural Capacity Procedure

The box beams are rectangular timber hollow sections jointed with tongue and groove joints at the corners and in the web. The beams can also be jointed along their length with finger joints in the separate sections.

2.1 Ultimate Limit State

There are four capacities which define the structural capacity of the Tÿ Unnos box beams; moment, shear, axial and bearing. All four of these capacities can be calculated from methodologies in BS EN 1995-1-1:2004. Where the methods require the use of design capacities these should be derived from the characteristic capacities according to the requirements in section 3.0 of BS EN 1995-1-1:2004. For this purpose the relevant service class and load duration should be used and the box beams should be considered as solid timber.

2.1.1 *Moment Capacity*

The moment characteristic capacities should be analysed to the methodology set out in BS EN 1995-1-1:2004 section 9.1.1 Glued Thin Webbed Beams. Equations 9.1, 9.2, 9.3, 9.4, 9.6 and 9.7 can be rearranged to give the allowable bending moments for six different failure criteria. The beams design moment capacity should be taken of the lesser of the six values.

2.1.2 *Shear Capacity*

The design shear capacity of each web of the beam can be calculated from equation 9.9 provided that the height of the web is less than 70 times the breadth of the web. This should be true for all Tÿ Unnos box beams. It should be noted that this equation calculates the capacity per web and therefore for all Tÿ Unnos box beams the result can be doubled to give the total shear capacity. A k_{cr} value of 0.67 should be used for all shear calculations as per the UK National Annex to BS EN 1995.

2.1.3 Axial Capacity

The axial capacity of box beams in compression should be calculated in accordance with section 6.3.2 of BS EN 1995-1-1:2004. The equations in this section can be rearranged to calculate the axial capacity assuming no moment about either axis. It should then be verified that:

$$F/P_{cy} + My/M_{cy} + km(Mz/M_{cz}) < 1 \text{ And } F/P_{cy} + km(My/M_{cy}) + Mz/M_{cz} < 1$$

2.1.4 Bearing Capacity

The bearing capacity of the beams should be calculated according to section 6.1.5 of BS EN 1995-1-1:2004. The contact area should be taken as the full contact width including the flange timber. The value of $k_{c,90}$ should be the value for solid softwood timber and h should be taken as the overall depth of the box beam.

2.2 Serviceability Limit States

The stiffness of the box beams should be calculated from first principles using the appropriate modulus of elasticity and shear modulus as defined in BS EN 338. No account should be taken of any OSB flanges in the design of Tÿ Unnos box beams.

The stiffness should be used to calculate the member deflections from first principles for all relevant load cases. The deflections should be modified for service class and load duration as per section 2.2.3 of BS EN 1995-1-1:2004 and should be compared with the limits in section 7.2 of the same document.

2.3 Limitations

The design of the box beams can be adapted within the limitations of BS EN 1995 section 9.1 to provide a range of depths widths and wall thickness. The beams should always be constructed from C16 graded Welsh Sitka Spruce or Douglas Fir as per the timber specification. The central core of the box beam should not be less than 100mm in either direction. None of the walls should be less than 40mm thick. Therefore the minimum beam size is 180x180mm. the maximum permitted beam dimensions are 350mm wide by 500mm deep.

In order to produce beams larger than standard timber sizes a range of jointing options are available. The webs can be jointed along the length of the beam using a tongue and groove joint to increase the beam depth. The webs and flanges can be jointed across the length using finger joints to increase the length of the beam. The following limitations on figure jointing and tongue and groove jointing should be observed for all box beams.

- ✦ No tongue and groove joints are permitted in the flanges.
- ✦ No tongue and groove joints are permitted in beams less than 250mm deep.
- ✦ All web sections to be tongue and groove jointed must be at least 150mm deep.
- ✦ No finger joints are permitted in beams less than 2.4m long.
- ✦ No finger joint is permitted within 500mm of another finger joint in the same beam.
- ✦ No finger joints in the flanges are permitted within 500mm of the mid-span point.
- ✦ No finger joints in the webs are permitted within 500mm of the support.

ANNEX 3:

INSTALLATION INSTRUCTIONS

The technical manual of the manufacturer shall be followed; current examples of details are given below. The following points are especially critical.

1. Ty Unnos box members shall be installed on the basis of a specific structural design for each installation, using the load-bearing capacities given in Annex 2 of this ETA.
2. Actions at supports shall not exceed the bearing resistance given in Annex 2.
3. The members shall be installed by appropriately qualified personnel, following an installation plan and relevant construction details worked out for each individual building project. The installation plan shall be based on the manufacturer's general guide and provisions for installation.
4. The flanges must not be drilled, notched or material otherwise removed on site.
5. Significantly damaged box beams should not be used.
6. In common with similar timber based products, it is recommended that eye protection and dust masks be used when cutting.

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