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European Technical Assessment

ETA 15/0473
of 29/09/2015

Trade name of the construction product	Lett-Tak roof elements
Product family to which the construction product belongs	Light weight steel/wood load bearing prefabricated roof elements
Manufacturer	Lett-Tak Systemer AS Hegdalsveien 139 NO-3261 Larvik Norway Tel. + 47 33 13 28 00 E-mail: firmapost@lett-tak.no
Manufacturing plant	Lett-Tak Systemer AS Hegdalsveien 139 NO-3261 Larvik
This European Technical Assessment contains	11 pages including Annex A - C which form an integral part of this assessment. Annex C refers to confidential information which is not included in the European Technical Assessment when that assessment is publicly disseminated
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	EAD 340037-00-0204 Light weight steel/wood load bearing roof elements, edition July 2015

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1. Technical description of the product

Lett-Tak roof elements are load-bearing, light-weight roof elements based on two parallel, U-shaped galvanized steel sheets, wood members and plywood acting together as a structural, stressed-skin construction. Annex A shows the basic construction design. The main load-bearing, steel profiles are either nailed and glued or only nailed to load bearing wood flanges. The wood flanges and the plywood roof panels are glued together and work as a compression flange for the structural system.

The elements are delivered on site with a bitumen or PVC roofing membrane on top, thermal insulation inside, and a water vapour barrier underneath.

The elements are being produced and assembled in the factory with different types of ceilings, most frequently with 50 mm rock wool fire protection and corrugated steel ceiling sheets. Ceiling sheets may be perforated to achieve better acoustic absorption. Colour coated steel ceiling sheets are delivered on demand.

Standard element width is 2,4 m. The length of elements is custom made for each delivery with lengths up to 18 m. Annex A Table 2 shows the thickness and weight of standard elements. The element thickness is determined by span requirements and the structural design, as well as thermal insulation requirements.

Material and component specifications are shown in Annex A Table 1.

2. Specification of the intended use(s) in accordance with the applicable European Assessment Document (hereinafter EAD)

The intended use of Lett-Tak elements is flat or sloped roofs for buildings with normal, dry indoor climate and for use in service class 1 or 2 in accordance with EN 1995-1-1. For sloped roofs with outside drainage, the elements must be supplemented with a ventilated roofing system.

Lett-Tak roof elements are not intended for use over rooms with high moisture content, such as swimming pools, printing works etc., neither in buildings with positive-pressure ventilation systems.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the elements of 50 years. These provisions are based upon the current state of the art and the available knowledge and experience.

The indication given on the working life cannot be interpreted as a guarantee given by the product manufacturer, or his representative, nor by EOTA, nor by the Technical Assessment Body, but are to be regarded to the means of choosing the right products in relation to the expected economically reasonable working life of the works.

3. Performance of the product and references to the methods used for its assessment

3.1 General

The following table shows the characteristics for which the product performances are declared in [Annex B](#). The characteristics correspond to the Lett-Tak roof elements design specified in Annex A.

Basic works requirement		Product characteristic	Product performance
BWR 1	Mechanical resistance and stability	Load bearing capacities	See cl. 3.2, Annex B table 3 and Annex C
BWR 2	Safety in case of fire	Fire resistance	See cl. 3.3 and Annex B Table 4
		Reaction to fire	See cl. 3.3 and Annex A
BWR 3	Hygiene, health and the environment	Content and release of dangerous substances	See cl. 3.4
		Roof watertightness	See cl. 3.5
		Water vapour resistance	See cl. 3.1.6
BWR 4	Safety and accessibility in use	No performance declared	
BWR 5	Protection against noise	Airborne sound reduction index	See cl. 3.7 and Annex B Table 5
BWR 6	Energy economy and heat retention	Thermal resistance	See cl. 3.8 and Annex B Table 6
		Airtightness of element joints	See cl. 3.9 and Annex B Table 7
BWR 7	Sustainable use of natural resources	No performance declared	
Durability aspects		See cl. 3.10	

3.2 Load bearing capacities

Load bearing capacities are calculated by the manufacturer case by case according to the structural requirements for the specific works. The structural designs are made according to the version of the structural design method specified in [Annex C](#), which is filed by SINTEF and is an integral part of the technical assessment. The structural design method has been verified by full scale testing according to the EAD. Table 3 in [Annex B](#) shows typical spans depending on various snow loads for the most typical standard element designs.

3.3 Safety in case of fire

The resistance against fire from below depends on the ceiling construction, and is shown in Annex B Table 4. The declared fire resistances are based on fire tests equivalent to EN 1356-2 and calculations of temperature increase in the load bearing steel profiles.

Classification of reaction to fire according to EN 13501-1 for materials and components of the elements are shown in Annex A, based on CE-marking of the specific products.

3.4 Hygiene, health and environment

The material and components used in Lett-Tak roof elements are not regarded as emitting any particles, gases or radiation that have any negative effect on indoor climate in general, or to have any significant impact on health.

Leaching from the elements is assessed to have no negative impact on soil, ground water or drinking water.

3.5 Roof watertightness

The roofing materials are CE-marked according to EN 13707 or 13956 and pass the requirement for watertightness at 10 kPa pressure.

3.6 Water vapour resistance

The water vapour control layer is CE-marked according to EN 13984, and has a water vapour resistance $s_d > 50$ m.

3.7 Airborne sound reduction index

Weighted apparent sound reduction index based on tests according to EN ISO 10140-2 and classification according to EN ISO 717-1 are shown in Annex B Table 5 for some standard element designs.

3.8 Thermal resistance

Thermal transmittance (U-values) for standard element designs, calculated according to EN 6946, is shown in Annex B Table 6.

3.9 Airtightness of element joints

Airtightness of element joints tested according to EN 12114 is shown in Annex B Table 7.

3.10 Durability aspects

The structural steel components are hot-dip galvanized steel with zinc coating Z275MA according to EN 10027. The structural plywood is class EN 636-3 (Exterior) according to EN 13986 with water resistant phenolic glue. Corrosion protection of fasteners is specified in Annex A Table 1, and meet the requirements for durability according to EN 1995-1-1.

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to the Decision 2003/728/EC of the European Commission as amended, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is system 1.

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVPC system are laid down in the control plan deposited at SINTEF Byggforsk.

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By

SINTEF

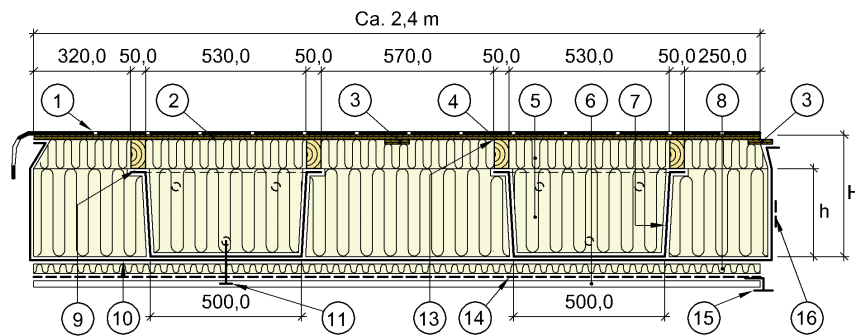
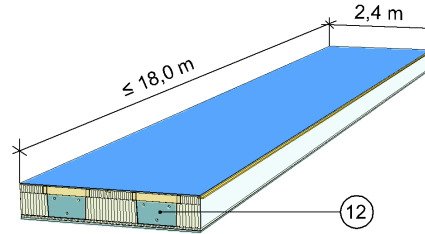


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The figure and cross-section and Table 1 shows the basic built up of the element and material specifications.

Table 2 shows standard element type designations, dimensions and weights.



Cross section. Measures in mm

Table 1
Lett-Tak roof elements. Material and component specifications

Material/Component		Specification	Reaction to fire classification
1	Roofing	Bitumen roof waterproofing sheet according to EN 13707 or PVC waterproofing sheet according to EN 13956. Euroclass B _{roof} (t2)	B _{roof} (t2)
2	Roof sheathing	15 – 19 mm structural spruce plywood type Exterior according to EN 13986. Thickness and material properties according to the individual structural element design, Euroclass D-s2,d0	D-s2, d0
3	Sheathing joint strip	15 mm structural spruce plywood strip type Exterior according to EN 13986 Euroclass D-s2,d0	D-s2, d0
4	Timber flanges	48 mm x 71, 96 or 121 mm structural timber C 24 or C 30 according to EN 14081-1 and EN 338, as specified in the individual structural element design. Euroclass D-s2,d0	D-s2, d0
5	Mineral wool	Mineral wool according to EN 13162, with maximum $\lambda_D = 0,037$ W/mK, Euroclass A1	A1
6	Steel ceiling sheets	TRP 20 steel corrugated ceiling sheet (alternatively perforated). Euroclass A1	A1
7	Load bearing steel profiles	0,9 – 2,0 mm thick galvanized steel profiles S350GD +Z275MA according to EN 10027. Steel thickness as specified in the individual structural element design. Euroclass A1	A1
8	Ceiling insulation	30 mm to 120 mm rockwool according to EN 13162, with $\lambda_D = 0,034$ W/mK, density 90 kg/m ³ . Euroclass A1	A1
9	Steel to wood connection	SikaForce Base 7736 structural polyurethane glue with hardener 7050, plus Gunnebo 32 x 2,5 mm galvanized steel nails according to EN 14592, spaced c/c 60 mm. Alternatively nails only, spaced c/c 30 mm. Euroclass F. Elements intended for use in service class 2 have nails with corrosion protection Fe/Zn 12c.	NPD
10	Water vapour control layer	0,20 mm polyethylene water vapour control layer type A according to EN 13984 with $s_d \geq 50$ m. Euroclass F	NPD
11	Ceiling screw	4,8 x 70 mm steel screw for ceiling installation. Euroclass A1,	A1
12	Steel gable ends	Galvanized steel end plate similar to pos. 7	A1
13	Plywood to wood connection	MUF structural glue, Type I, approved and certified according to EN 301,, installed with 11,1 x 22 – 44 mm galvanized staples, spaced 50 mm. Euroclass F.	NPD
14	Ceiling air barrier	Air barrier layer when specified Euroclass F	NPD
15	Ceiling profiles	Steel T-profile for ceiling edge. Euroclass A1	A1
16	Tape	Two-sided tape for connecting water vapour control layers. Euroclass F	NPD

Table 2
Standard element type designations, dimensions and self-weights

Element type ¹⁾ (h/t)	Timber flange dimension 48 mm x 71 mm		Timber flange dimension 48 mm x 96 mm		Timber flange dimension 48 mm x 121 mm	
	Total element height H ²⁾ (mm)	Self-weight ³⁾ kN / m ²	Total element height H ²⁾ (mm)	Self-weight ³⁾ kN / m ²	Total element height H ²⁾ (mm)	Self-weight ³⁾ kN / m ²
13/0,9	216	0,37	241	0,38	266	0,40
13/1,5	216	0,40	241	0,42	266	0,43
16/0,9	246	0,38	271	0,39	296	0,41
16/1,5	246	0,41	271	0,43	296	0,45
21/0,9	296	0,40	321	0,41	346	0,43
21/2,0	296	0,47	321	0,49	346	0,50
31/0,9	396	0,44	421	0,45	446	0,47
31/2,0	396	0,52	421	0,54	446	0,55
36/0,9	446	0,46	471	0,47	496	0,49
36/1,5	446	0,51	471	0,53	496	0,54
36/2,0	446	0,55	471	0,57	496	0,58
44/1,5	526	0,55	551	0,57	576	0,58
44/2,0	526	0,55	551	0,61	576	0,63

¹⁾ Standard element type designation is characterized by the height h in cm and the steel thickness t in mm

²⁾ Total height is without ceiling. The thickness of standard ceilings is 30 mm or 50 mm, which adds to the total element thickness.

³⁾ The values apply to elements with 50 mm ceiling insulation. Elements with 30 mm ceiling insulation have 0,03 kN/m² lower self-weight.

Lett-Tak roof elements	Annex B of ETA 15/0473 of 29.09.2015
Product performance	

Table 3

Examples of typical spans for some standard Lett-Tak roof elements designs with spruce plywood and nailed and glued connections between steel profiles and timber flanges. Service class 2 and short-term load duration class according to EN 1995-1-1.

Element type	Plywood t_p [mm]	Timber flanges h_w [mm]	Maximum span, meter			
			Snow load ¹⁾			
			2,5 kN/m ²	3,5 kN/m ²	4,5 kN/m ²	5,5 kN/m ²
13/ 0,9	15	96	8,10	7,00	5,95	4,95
16/ 1,5	15	96	10,05	9,40	8,45	7,75
21/ 2,0	15	96	11,90	11,05	9,90	9,10
31/ 2,0	15	96	14,55	13,20	11,90	10,90
36/ 2,0	15	96	15,80	14,05	12,65	11,60
44/ 2,0	15	96	17,65	15,45	13,95	12,80
31/ 2,0	19	96	15,25	14,35	13,00	11,95
36/ 2,0	19	96	16,55	15,55	14,00	12,80
44/ 2,0	19	96	18,55 ²⁾	17,15	15,45	14,20
31/ 2,0	19	121	15,85	14,90	13,45	12,30
36/ 2,0	19	121	17,15	15,95	14,35	13,20
44/ 2,0	19	121	19,10 ²⁾	17,55	15,85	14,55

¹⁾ Characteristic snow load on ground, s_k , according to EN 1991-1-3, with load shape coefficient 0,8

²⁾ Maximum span is approximately 18 m

Table 4

Fire resistance of standard Lett-Tak roof elements

Type of ceiling	Fire resistance
Without insulation	REI 15
With 30 mm rock wool	REI 30
With 50 mm rock wool	REI 60
With 50 mm + 50 mm rock wool	REI 90

Table 5

Weighted apparent sound reduction index, R_w , and weighted apparent sound reduction index plus spectrum adaption term for traffic noise, $R_w + C_{tr}$, for Lett-Tak roof elements with 20 mm TRP steel ceiling

Element type	Ceiling insulation	Ceiling sheets	R_w	$R_w + C_{tr}$
13	30 mm	Sheets with 15 % perforation	46 dB	38 dB
29		Sheets with 15 % perforation	52 dB	45 dB
29		Sheets without perforation	54 dB	46 dB
31 and 36	50 mm	Sheets without perforation	61 dB	61 dB

Table 6
Thermal transmittance, U-value, for Lett-Tak roof elements.

Element type	Timber flange dimension mm x mm	U-value, W/m ² K		
		Type of ceiling		
		With 30 mm mineral wool ¹⁾	With 50 mm mineral wool ¹⁾	With 70 mm mineral wool ¹⁾
21/1,1	48 x 71	0,18	0,16	0,15
	48 x 96	0,16	0,15	0,13
	48 x 121	0,15	0,13	0,12
31/1,1	48 x 71	0,15	0,14	0,13
	48 x 96	0,14	0,13	0,12
	48 x 121	0,13	0,12	0,11
31/1,5	48 x 71	0,16	0,15	0,13
	48 x 96	0,15	0,13	0,12
	48 x 121	0,13	0,12	0,12
36/1,1	48 x 71	0,14	0,13	0,12
	48 x 96	0,13	0,12	0,11
	48 x 121	0,12	0,11	0,11
36/1,5	48 x 71	0,15	0,14	0,13
	48 x 96	0,14	0,13	0,12
	48 x 121	0,13	0,12	0,11
36/2,0	48 x 71	0,17	0,15	0,13
	48 x 96	0,15	0,14	0,12
	48 x 121	0,14	0,13	0,12

¹⁾ Rock wool with thermal conductivity $\lambda_D = 0,034$ W/mK

Table 7
Air tightness of element joints

Solution	Air leakage per meter joint at 50 Pa pressure difference
Longitudinal joints	$\leq 0,1$ m ³ /h
Transversal joints - with loose overlap vapour barrier joints	$\leq 0,6$ m ³ /h
Transversal joints – with overlap vapour barrier joints clamped with plywood collar	$\leq 0,5$ m ³ /h

Lett-Tak roof elements	Annex C of ETA 15/0473 of 29.09.2015
Structural design method	

The structural capacity of Lett-Tak roof elements is calculated according to the document "Calculation of the load-bearing capacity of Lett-Tak – Description of calculation tools and principals". The structural design method is part of this European Technical Assessment, and the valid version is the version filed at SINTEF Building and infrastructure at any time.