BELGIAN BUILDING RESEARCH INSTITUTE

INSTITUTION RECOGNISED BY APPLICATION OF THE DECREE-LAW OF 30 JANUARY 1947

NOTIFICATION NUMBER 1136

All tests in this report are executed according to the ISO 9001 certified Quality management system of the BBRI.

Test Centre	B-1342 Limelette, avenue P. Holoffe 21	Tel.: +32 (0)2 655 77 11
Offices	B-1932 Sint-Stevens-Woluwe, Lozenberg 7	Tel.: +32 (0)2 716 42 11
Head Office	B-1000 Brussels, rue du Lombard 42	Tel.: +32 (0)2 502 66 90

TEST REPORT

Laboratory	GSFM	**O/References**	DE-GSFM-0027 GSFM-19-028-01/01 PAGE **1 / 8**

Requested by	SEMS METAL Kayseri OSB 12. Cad. No:31/A Melikgazi/Kayseri (Turkey)		
Date of the order	08.08.2019	**Samples registration**	S2019-48-008
		Date of reception of samples	22.10.2019
Date of issue of the report	19.02.2020		
Test carried out	5.2 Bending test of metal substructure profiles		
Reference	European Standard NBN EN 13964 "Suspended ceilings – Requirements and test methods" - June 2014		

Disclaimer

The laboratory is not responsible for the accuracy and completeness of the information provided by the customer and taken over in this report. The sampling was not carried out by the laboratory and thus the results of this report apply only to the sample as received by the laboratory. The equivalence between the tested product covered by this report and the commercialised product lies entirely under the responsibility of the requestor.

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- ☐ *No sample*
- ☒ *Sample(s) subjected to destructive test*
- ☐ *Sample(s) to be removed from our laboratories 30 calendar days after sending of the report, save in the case of a further written request.*

C.S.T.C. GSFM W.T.C.B.

Christophe Galloy
Project Manager

Ir. V. Detremmerie
Head of Laboratory

Digitally signed by Grozavu Ecaterina
Date: 2026.01.09 22:18:08 EET
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1 Introduction

On request of SEMS Metal, represented by Mr Emrah Kara, BBRI carried out some tests in order to measure the bending resistance of metal substructure profiles. The results of these tests are given in the present report.

2 Description of the samples

The samples have been delivered on 22.10.19 at the BBRI research centre in Limelette and registered under the registration number S2019-48-008. The samples are made by the applicant. Their composition and dimensions are given here below.

2.1 Description of the samples

The description of the samples is given by the requestor:

Mainrunner 3600: T24/15 System Premium Mainrunner 3600mm
Carrier 600 ;T24/15 System Premium cross tee 600mm

TECHNICAL DATA SHEET

Features

Applications
General

Mainrunner	Description	Length	Height (mm)	Width (mm)	Thickness (mm)	Pcs/Carton	1.2 M Hanger Spacing
							

Cross Tee	Description	Length	Height (mm)	Width (mm)	Thickness (mm)	Pcs/Carton	1.2 M Hanger Spacing
							

These components are integrated in the system "Deckon Premium metal ceilings/ lay-in systems".

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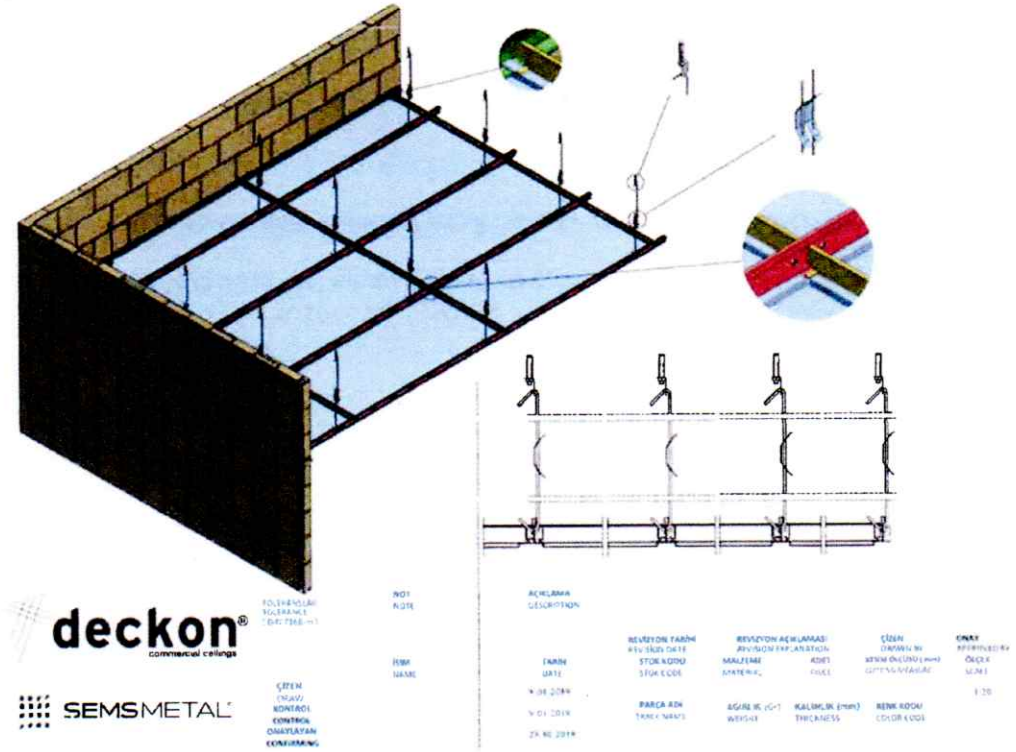

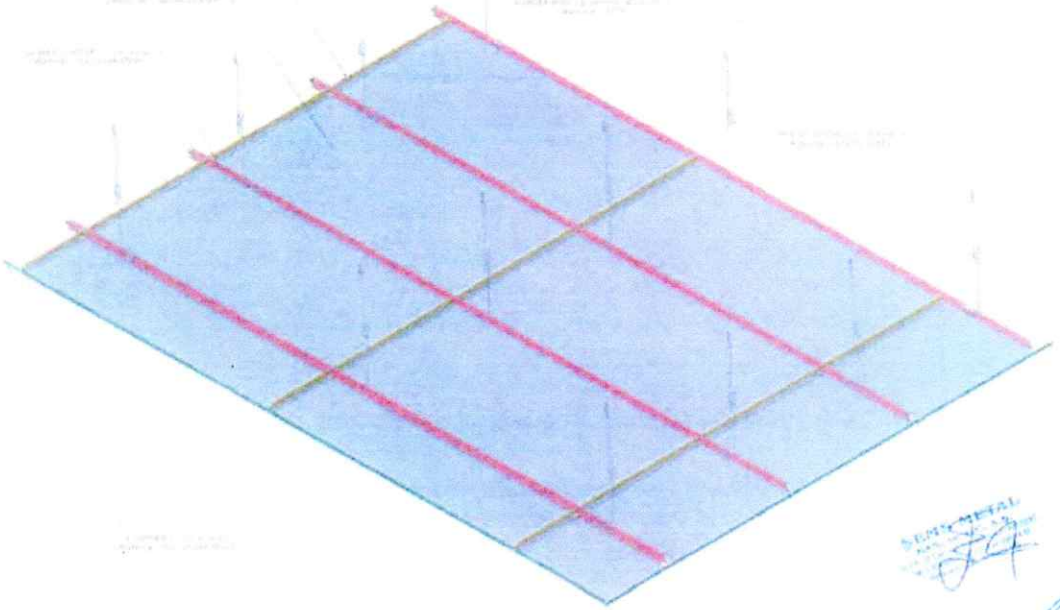

Fig. 1: Deckon Premium metal ceilings/ lay-in systems

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3 Description of the tests

According to NBN EN13964 June 2014

5.2 Bending test of metal substructure profiles

5.2.1 General

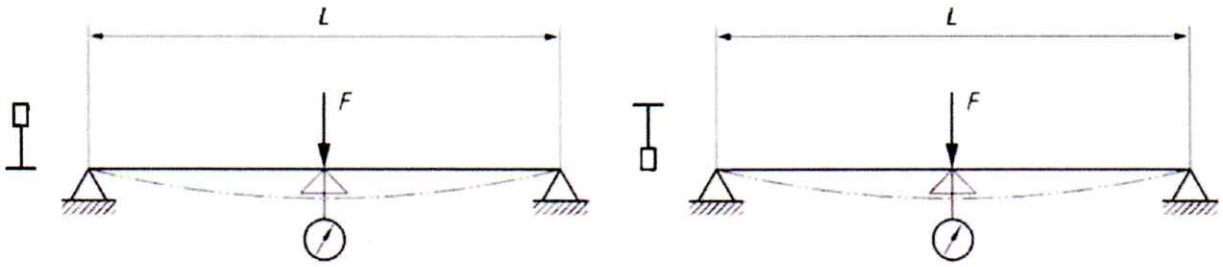
The load bearing capacity of metal structures shall be determined by the following tests on individual components at various spans and loads.
The bending test relates only to load bearing profiles. The profiles relevant for testing are those which carry the membrane elements and possible additional loads, and which transmit the load to the building structure.
The bending test gives characteristic data of the profiles for:

- bending stiffness *EI* in N·mm2,
- admissible bending moment adm*M* in N·m.

The deflection corresponding to the admissible load and/or admissible moment shall be classified in accordance with Table 6.
Where the membrane components are only supported by perimeter trims (e.g. angle or U-channel), these perimeter trims shall be tested according to Annex H.

5.2.2 Procedure for testing

For preliminary tests, each of 3 sections (i.e. 3 in positive and 3 in negative position) shall be tested as beams on two supports with a point load at mid-span at the maximum design span (max. *L*) moreover, at a minimum span of:
min *L* = max *L* / 2; for lengths shorter than 2,0 m, min *L* > 1,0 m (1)
Where perimeter channels are to be tested, a smaller span may be used if this results from the designed distance of the fixing elements (see Figure 14).



a) T-section in positive position

b) T-section in negative position

Key

F load

L span

Figure 14 — Principle of a bending test of a T-section

Test seven further sections under the conditions of the least favourable case involving the smallest bending moment. The complete test includes 3 samples in 2 positions with each 2 spans (meaning 12 single tests) for preliminary tests and 7 further samples.
The support conditions of the runner/channel shall be selected such that they are in accordance with the conditions in use. The loading point of the profile shall be secured against twisting.
All substructure profiles intended to be used for this test shall have all punching details required for their normal use.
Both the deflection at mid-span measured with gauges with an accuracy of 1/100 mm and at least up to a value equal to the

intended deflection class of Table 6 and the corresponding test load (F) shall be determined.
The load shall be temporarily relieved when the deflection reaches the designated class. After removing the load, the permanent deflection shall not exceed 0,2 mm. If this value is exceeded, the designated deflection and the corresponding load shall be reduced. This is to ensure that the load deformation curve is linearelastic.
The maximum load (F_u) and the corresponding maximum bending moment (M_u) shall be determined.

5.2.3 Assessment of results

The bending rigidity (EI) and the admissible bending moment adm$M$ shall be determined from at least 10 tests. The bending rigidity (EI) for a single span beam with a point load in the centre shall be calculated using the following formula:

$$EI = \overline{F}L^3/48 f_{max} \quad (2)$$

where

$\overline{F}$ is the average load of 10 individual tests corresponding to the deflection class, in N (see Table 6);

L is span of the specimen, in mm;

f_{max} is deflection at centre span, in mm;

E is elasticity modulus, in N/mm^2;

I is moment of inertia, in mm^4.

It is the linear part of the load-deflection-curve that is relevant for determining the bending rigidity. If the deflection value according to Table 6 is outside this range, the load shall be reduced appropriately.
The admissible bending moment results from two criteria:
The first one relates to the corresponding deflection value and shall be determined by:

$$\text{adm}\, M_f = \overline{M}_f = \overline{F}L/4 \quad (3a)$$

where

$\overline{M}_f$ is the average value of bending moment M_f

The second value of the admissible bending moment is related to the ultimate load F_u and shall be determined by:

$$\text{adm}\, M_u = M_u^{5\%}/\nu \quad (3b)$$

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$$M_u^{5\%} = \overline{M}_u - k_\sigma . s \qquad (4)$$

where

$\overline{M}_u$	is the average value of the bending moment M_u (Nmm) related to the ultimate load F_u;
k_σ	is a statistical factor (acceptance factor, see 5.4);
s	is the standard deviation, in Nmm;
$M_u^{5\%}$	is the 5 % fractile;
ν	is the safety factor = 2,5.

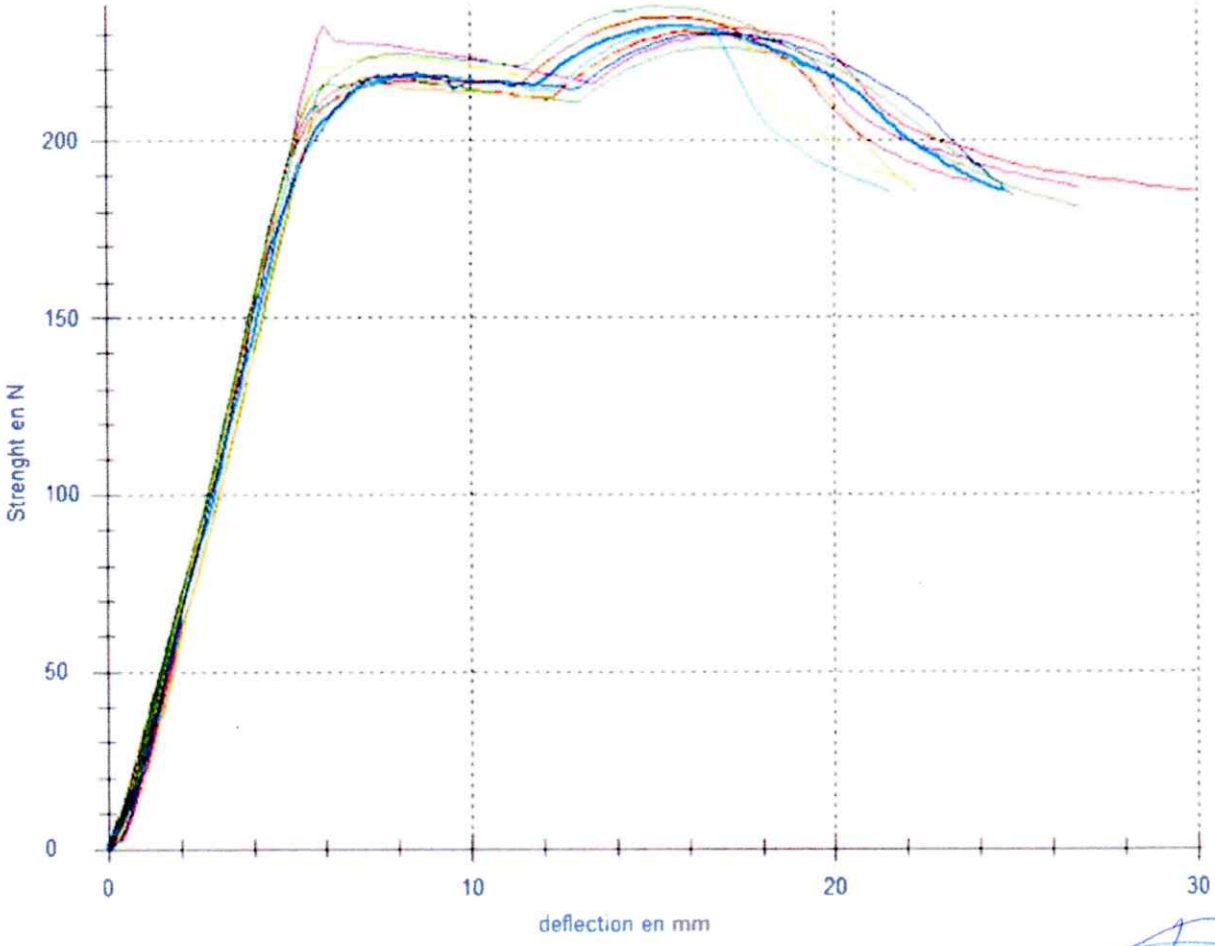
The lower value of admM_f and admM_u shall be used as the definitive value adm$M$.
If no deflection limit is determined (Class 3), the admissible moment is related to the ultimate load F_u according to Formula (3b).
In the case of other test configurations as described in 5.2.2 (e.g. continuous beams and/or uniformly distributed loads or several point loads) the formula to calculate EI and the bending moment M_f and M_u shall be changed according to the corresponding support and load conditions.

4 Results of the tests

4.1 Mainrunner 3600: T24/15 System Premium Mainrunner 3600mm

L	$\overline{F}$	Mfadm	Permanent deflection	Muadm	**Madm**	EI
(mm)	(N)	(Nm)		(Nm)	**(Nm)**	**(Nmm²)**
1000.00	65.99	16.50	< 0,2 mm	22.43	**16.50**	**6.87E+08**

Note: Length of this profile has been cutted to 1.8m for testing.



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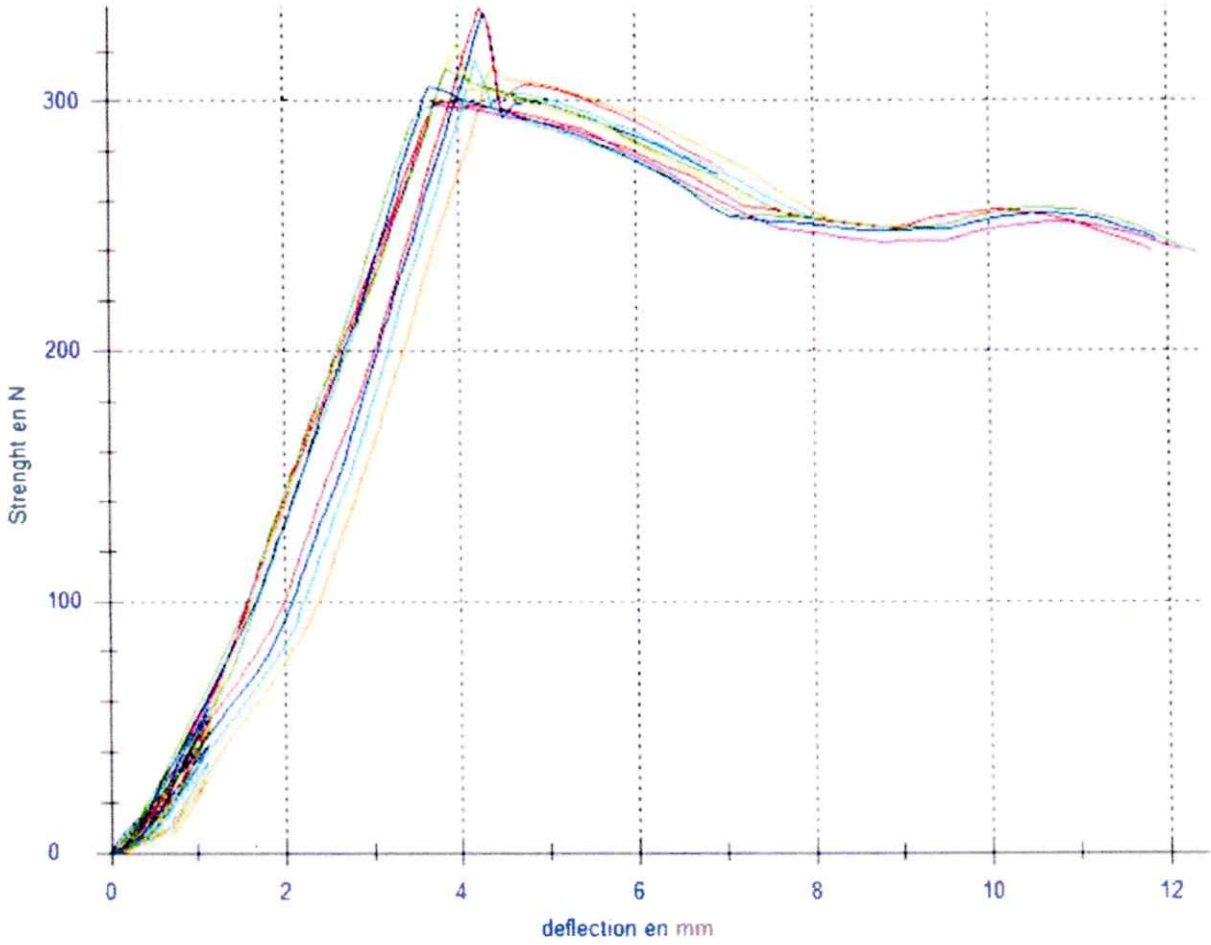
4.2 *Carrier 600; T24/15 System Premium cross tee 600mm*

L	$\overline{F}$	Mfadm	Permanent deflection	Muadm	Madm (1)	EI (1)
(mm)	(N)	(Nm)		(Nm)	**(Nm)**	**(Nmm^2)**
540.00	45.40	6.13	< 0,2 mm	14.98	**6.13**	**1.38E+08**

(1) : deviation from NBN EN 13964 regarding to the minimum length of the profile which has to be 1 meter minimum.



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