



**PAVUS, a.s.**

Order number:

514027 / Z220140066

## **SUITABILITY EVALUATION OF SUSPENSION SYSTEM BASED ON TEST RESULTS**

for product

**Fixing system for distribution of building services,  
water, heating, electro and air-conditioning**

performed based on  
Test report No. Pr-13-2.138 dated 2013-12-09

**Sponsor: SOLIDA spol. s r.o.**  
Semanínská 213  
560 20 Česká Třebová  
Czech Republic

**Test method:**

**ČSN EN 1363-1 » Fire resistance tests – Part 1: General requirements «**

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# 1 INTRODUCTION

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Suitability evaluation of suspension system based on test results for Fixing system for distribution of building services, water, heating, electro and air-conditioning was carried out based on order from company SOLIDA spol. s r.o.

Suitability evaluation of fixing system based on test results was issued based on these documents:

- [1] ČSN EN 1363-1 Fire resistance tests – Part 1: General requirements
- [2] Test report of fire resistance No. Pr-13-2.138, dated 2013-12-09, issued by PAVUS, a.s., ATL No. 1026

The subject of tests was specimens of load-bearing steel products and fixing distribution tracks products with hanging load.

## 2 TECHNICAL PRODUCT DESCRIPTION

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The subject of evaluation is various types of load-bearing cantilevers and beams which are anchored to ceiling or wall. Individual set is loaded in accordance with the description mentioned in part 2.1. Company SOLIDA spol. s r.o. is the manufacturer of assessed elements.

### 2.1 Description of individual sets

**Static loaded load-bearing and fixing specimens of suspension tracks** (specimen identification according to sponsor)

**S15** – cantilever with dimension 27 x 18 mm, thickness 1.25 mm and length 200 mm anchored to supporting construction through wall panel Ytong by 2 pieces of threaded rods M8, large washers and nuts; on the cantilever there is hanging double-threaded sleeve with outer diameter 48 – 53 mm with fastening head with thread M8; sleeve is attached to cantilever by screw sets M8 x 20 and insets 27 x 18 + 28 x 30 mm; loaded by 3 kg distributed along the cantilever length; set marking 20131003-1 (according to drawing documentation); each part of set is galvanized

**S16** – cantilever type ST with dimension 41 x 41 mm, thickness 1.25 mm and length 300 mm anchored to supporting construction through wall panel Ytong by 2 pieces of threaded rods M8, large washers and nuts; loaded by 5 kg from anchoring point (base) to approximately  $\frac{3}{4}$  of cantilever length; set marking 20131003-2 (according to drawing documentation); each part of set is galvanized

**S17** – cantilever with dimension 28 x 30 mm, thickness 1.75 mm and length 300 mm anchored to supporting construction through wall panel Ytong by 2 pieces of threaded rods M8, large washers and nuts; on the cantilever there is hanging double-threaded sleeve with outer diameter 87 – 92 mm with fastening head with thread M8; sleeve is attached to cantilever by screw sets M8 x 20 and insets 27 x 18 + 28 x 30 mm; loaded by 5 kg from anchoring point (base) to approximately  $\frac{1}{2}$  of cantilever length; set marking 20131003-3 (according to drawing documentation); each part of set is galvanized

**S18** – cantilever with dimension 27 x 18 mm, thickness 1.25 mm and length 500 mm inserted and mounted to saddle hitch 27 x 18 mm by 2 pieces of screws M10; saddle hitch anchored to supporting construction through wall panel Ytong by 2 pieces of threaded rods M8, large washers and nuts; on the cantilever there is attached double-threaded sleeve with outer diameter 31 – 38 mm with fastening head with thread M8;



sleeve is attached to cantilever by screw sets M8 x 20 and insets 27 x 18 + 28 x 30 mm; loaded by 3 kg near anchoring point (base of saddle cantilever hitch); set marking 20131003-4 (according to drawing documentation); each part of set is galvanized

**S19** – cantilever with dimension 38 x 40 mm, thickness 2.0 mm and length 300 mm anchored to supporting construction through wall panel Ytong by 2 pieces of threaded rods M8, large washers and nuts; loaded by 5 kg from anchoring point (base) to approximately ½ of cantilever length; set marking 20131003-5 (according to drawing documentation); each part of set is galvanized

**S20** – beam type ST with dimension 41 x 62 mm, thickness 2.5 mm and length 510 mm inserted and mounted to saddle hitch 41 x 62 mm by 2 pieces of bolts M10; saddle hitch anchored to supporting construction through wall panel Ytong by 2 pieces of threaded rods M8, large washers and nuts; loaded by 5 kg from anchoring point (base of saddle cantilever hitch) to approximately ½ of beam length; set marking 20131003-6 (according to drawing documentation); each part of set is galvanized

**S21** – beam type ST with dimension 41 x 41 mm, thickness 2.5 mm and length 510 mm inserted and mounted to saddle hitch MASIV ST 41 x 41 mm by 2 pieces of bolts M10; saddle hitch anchored to supporting construction through wall panel Ytong by 2 pieces of threaded rods M8, large washers and nuts; beam ST is equipped by support of length 35 mm and saddle hitch; support anchored to supporting construction through wall panel Ytong by 1 piece of threaded rod M8, large washer and nut and anchored to beam by saddle hitch and 1 piece of bolt M10, washer and nut under angle 45°; on the beam there is attached double-threaded sleeve MASIV with outer diameter 102 – 116 mm with fastening head with thread M12; sleeve is attached approximately in ¾ of beam length by screw and insert ST 12 x 40 mm; loaded by 5 kg from anchoring point (base of saddle cantilever hitch) to approximately ½ of beam length and loaded by 5 kg in the point of sleeve MAVIS; total load 10 kg; set marking 20131003-7 (according to drawing documentation); each part of set is galvanized

**S22a b** – 1 piece of specimen (No. S22a) beam with dimension 28 x 30 mm, thickness 1.75 mm and length 500 mm at distance 80 mm from the ceiling and 1 piece of specimen (No. S22b) beam type ST with dimension 41 x 21 mm, thickness 1.5 mm and length 500 mm horizontally above each other with spacing 420 mm; hanging and fixing on its ends on the common threaded rods M10 by washers, nuts, contra-nuts and HK claw 28 x 30 mm to beam (No. 22a) and to HK claw 40 x 60 mm to beam ST (No. S22b); threaded rods anchored to supporting construction through load-bearing reinforced concrete ceiling panel by large washers and nuts M10; loaded by 3 kg in the ½ beam length (No. 22a) and loaded by 5 kg in the ½ beam length (No. 22b); set marking 20131003-9 (according to drawing documentation); each part of set is galvanized

**S23a b** – 1 piece of specimen (No. S23a) beam type ST with dimension 41 x 41 mm, thickness 2.5 mm and length 500 mm at distance 80 mm from the ceiling and 1 piece of specimen (No. S23b) beam type ST with dimension 41 x 21 mm, thickness 2.5 mm and length 500 mm horizontally above each other with spacing 350 mm; hanging and fixing on its ends on the common threaded rods M10 by washers, nuts, contra-nuts and HK claw 40 x 60 mm to beam (No. 23a) and to HK claw 40 x 60 mm to beam ST (No. S23b); threaded rods anchored to supporting construction through load-bearing reinforced concrete ceiling panel by large washers and nuts M10; loaded by 5 kg in the ½ beam length (No. 23a) and loaded by 5 kg in the ½ beam length (No. 23b); set marking 20131003-8 (according to drawing documentation); each part of set is galvanized



### 3 TEST RESULTS OF FIRE RESISTANCE

#### 3.1 Test reports

Name of the lab Address Accreditation No.	Name of sponsor	Test report number Date of issue	Test method
PAVUS, a. s. Veselí nad Lužnicí ATL No. 1026	<b>SOLIDA spol. s r.o.</b> Semanínská 213 560 20 Česká Třebová Czech republic	Pr-13-2.138 2013-12-09	ČSN EN 1363-1

#### 3.2 Stress conditions and test results

Test method Test report number Date of issue	Parameter	
ČSN EN 1363-1 Pr-13-2.138 2013-12-09	Thermal exposure Loading	Nominal time / temperature curve Each set loaded individually – see 2.1

Testing sets of ceiling load-bearing and fixing specimens are attached to load-bearing ceiling panels from reinforced concrete of thickness 180 mm. Panels are protected from the bottom side by fire protection Sibrál of thickness 12 mm, in the point of anchoring there is no protection. Ceiling panels are coupled to each other to prevent difference deflection of neighbouring specimens.

Testing sets of wall load-bearing and fixing specimens are attached to side wall from light concrete wall blocks Ytong of thickness 250 mm and front additional wall from Ytong blocks. Penetrations of tracks and cables from different suppliers are sealed by mineral wool Rockwool.

Loading of load-bearing and fixing specimens is performed by steel blocks. Dimension, load, position and fixing of steel blocks is in accordance with sponsor, specification is mentioned in chap. 2.1.

#### 3.3 Test results

Expression of test results by test report of fire resistance No. Pr-13-2.138.

Neither during the test nor during cooling phase, no collapse of tested load-bearing and fixing specimens with loading happened. Internal perimeter rubber seals of sleeves got burned.

Due to the tested type of specimens which don't have fire separating and insulation function, there was observed behaviour criterion "**functionality**" of individual load-bearing and fixing specimens with loads. For test evaluation there was arranged definition of functionality with sponsor – this definition was modified in accordance with possibility of application on testing of type specimen as follows:

**Functionality** – criterion is the time period during which test specimen keeps its functionality without its damage, its potential deformation and its disruption

### 3.3.1 Evaluated sets tested for 90 minutes

Elements anchored to wall			
Set name	Description of set	Time duration of test (period during which there wasn't visible deformation)	Loading
<b><u>S15</u></b>	cantilever with dimension 27 x 18 mm, thickness 1.25 mm and length 200 mm	<b>90 minutes</b>	load 3 kg - along the whole cantilever length
<b><u>S16</u></b>	cantilever type ST with dimension 41 x 41 mm, thickness 1.25 mm and length 300 mm	<b>90 minutes</b>	load 5 kg – from anchoring point (base) to approximately $\frac{3}{4}$ cantilever length
<b><u>S17</u></b>	cantilever with dimension 28 x 30 mm, thickness 1.75 mm and length 300 mm	<b>90 minutes</b>	load 5 kg – from anchoring point (base) to approximately $\frac{1}{2}$ cantilever length
<b><u>S18</u></b>	cantilever with dimension 27 x 18 mm, thickness 1.25 mm and length 500 mm	<b>90 minutes</b>	load 3 kg – near anchoring point (base of saddle cantilever hitch)
<b><u>S19</u></b>	cantilever with dimension 38 x 40 mm, thickness 2.0 mm and length 300 mm	<b>90 minutes</b>	load 5 kg – from anchoring point (base) to approximately $\frac{1}{2}$ cantilever length
<b><u>S20</u></b>	beam type ST with dimension 41 x 62 mm, thickness 2.5 mm and length 510 mm	<b>90 minutes</b>	load 5 kg – from anchoring point (base) to approximately $\frac{1}{2}$ cantilever length
<b><u>S21</u></b>	beam type ST with dimension 41 x 41 mm, thickness 2.5 mm and length 510 mm	<b>30 minutes</b>	load 5 kg – from anchoring point (base) to approximately $\frac{1}{2}$ cantilever length; load 5 kg – in the sleeve MASIV;  total load 10 kg

Elements anchoring to ceiling			
Set name	Description of set	Time duration of test (period during which there wasn't visible deformation)	Loading
<b><u>S22a b</u></b>	1 piece of specimen (No. S22a) of beam with dimension 28 x 30 mm, thickness 1.75 mm and length 500 mm at distance 80 mm from the ceiling and 1 piece of specimen (No. S22b) of beam type ST with dimension 41 x 21 mm, thickness 1.5 mm and length 500 mm	<b>90 minutes</b>	load 3 kg – in $\frac{1}{2}$ of beam length (No. S22a) load 5 kg – in $\frac{1}{2}$ of beam length (No. S22b)
<b><u>S23a b</u></b>	1 piece of specimen (No. S23a) of beam type ST with dimension 41 x 41 mm, thickness 2.5 mm and length 500 mm at distance 80 mm from the ceiling and 1 piece of specimen (No. S23b) of beam type ST with dimension 41 x 21 mm, thickness 2.5 mm and length 500 mm	<b>90 minutes</b>	load 5 kg – in $\frac{1}{2}$ of beam length (No. S23a) load 5 kg – in $\frac{1}{2}$ of beam length (No. S23b)



## 5 FIELD OF APPLICATION

- 5.1 Evaluation of suspension elements is linked to anchoring into concrete or masonry. Fixing elements for anchoring into concrete or masonry shall have separately demonstrated load-bearing capacity under fire situation for 90 minutes or 30 minutes respectively.
- 5.2 Decrease in length of explanation doesn't have negative influence on test results.
- 5.3 Test results for greater lever arm are valid for shorter lever arm too.
- 5.4 Load induced during tests for each sets could be decreased, it shall not be increased.
- 5.5 Changes in load distribution of individual sets shall not produce greater bending moments compared to the tests.
- 5.6 Valid for double-threaded sleeves with outer diameter from (31 – 38) mm to (102 – 116) mm
- 5.7 In case of any changes in construction compared to the tested one, it is possible to proceed in accordance with ČSN EN 1993-1-1 Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings and ČSN EN 1993-1-2 Eurocode 3: Design of steel structures - Part 1-2: General rules - Structural fire design
- Degree of utilisation in changed steel cross-section of construction shall not be greater than degree of utilisation achieved in cross-section of construction under fire resistance test
  - Deformation of modified steel construction shall not be greater than deformation on construction achieved under fire resistance test
- 5.8 For fire resistance determination of sets (i.e. load-bearing elements and service installation – building services, water, heating, electro and air-conditioning) is necessary to test the whole system (i.e. sets of load-bearing elements with given service installation - building services, water, heating, electro and air-conditioning, etc.) in accordance with the relevant test regulations.

Prepared by:

Reviewed by:

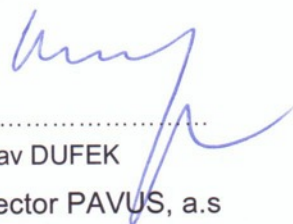
Approved by:



Jana BUCHTOVÁ



Zdeňka STARÁ



Jaroslav DUFEK

Managing director PAVUS, a.s



Prague, dated 2014-02-19

**PAVUS, a.s.**  
Prosecká 412/74, 190 00 Praha 9  
IČ: 60193174; DIČ: CZ60193174  
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