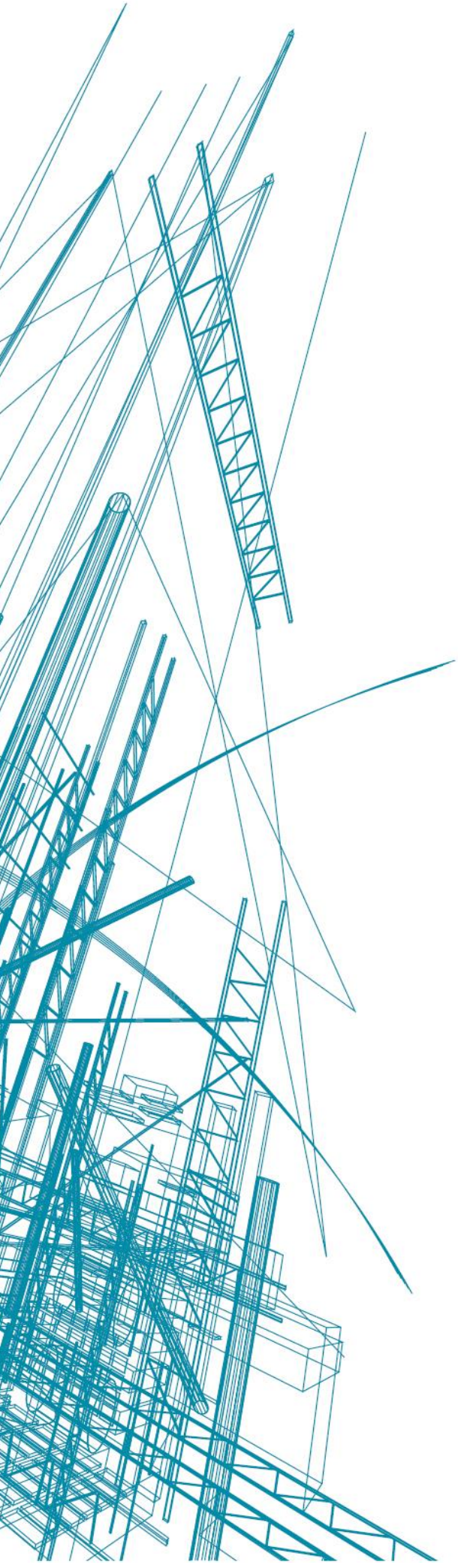


Test report

Resistance to dynamical wind loads according to EN 16002:2010 –Determination of the resistance to wind load of mechanically fastened flexible sheets for roof waterproofing.

Project number:	20140404001-2
Report date:	2014-05-02
Roof system:	Base: Technoelast FIX EPM + Cap: Technoelast EKP
Membrane type:	Base: Technoelast FIX EPM + Cap: Technoelast EKP
Fastener type:	Technoelast plastic tube Ø50mm Technoelast self drilling screw Ø4,8mm
Client:	LLC TechnoNicol Construction Systems Gilyarovskogo str. 47 page 5 129 110 Moscow
Contact:	Alexander Lychits

Chief of controlling and testing Fredrik Rundgren

1. Introduction

Constructech Sweden AB has, on request of the client, carried out wind load testing of the multi-layer Roof system Base: Technoelast FIX EPM, Cap: Technoelast EKP. The purpose of the test was to determine the wind load capacity of the mechanical fastened roof system according to EN-16002:2010 and define a characteristic load according to the standard.

The installation and welding has been carried out by the client in cooperation with Constructech's test engineer. The installation has been carried out according to the general installation guide for the membrane system.

2. Investigation – Wind load tester

The investigation of the resistance to dynamical wind loads has been performed according to EN 16002:2010 - Determination of the resistance to wind load of mechanically fastened flexible sheets for roof waterproofing.
The test result of the wind uplift test has been interpreted according to the European directive ETAG 006:2000/Amended:2007 - Guideline for the European Technical Approval of systems of mechanically fastened flexible roof waterproofing membranes.
Wind load tester size: 6,0 x 1,60m.
Pitch 0±2°

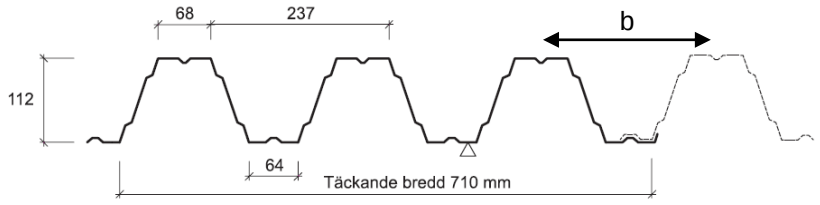
The wind load tester fulfills the requirements according to the standard.
The pressure load cells have been calibrated in line with Constructech's quality management routines. Last calibration performed 2014-03-10.

Wind load tester 6,0m x 1,60m

3. Test model

Test model dimensions: 6,0m x 1,60m

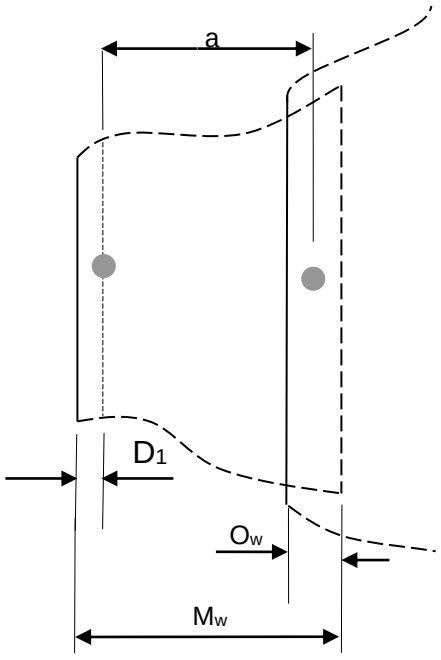
Substructure: Profiled steel deck Ruuki GA 108-65, thickness 0,85mm
Yield strength 350 N/mm^2



Thermal insulation: Mineral Wool, thickness 100mm

Roof system:

Membrane:	Base: Technoelast FIX EPM, Cap: Technoelast EKP
Membrane width (M_w):	1000,00
Bonding method:	Overlap base torched + Cap fully torched
Overlap width (O_w):	100,00
Measure (a):	900,00
Washer type:	Technoelast tube Ø50mm
Fastener type:	Technoelast self drilling screw Ø4,8mm
Fixing pattern, fixed in the overlap (D_1):	45,00
Distance between fasteners (b):	237,00



Temperature:
Temperature during test was between +20°C and +22°C.

A photo report of the build up and the failure mode is given in annex A.
A drawing of the test model is given in annex D.

4. Results

At the failure cycle of $W_{max\ 100\%}$(theoretical load) the test was stopped. According to EN-16002:2010 the approved test result is $W_{max\ 100\%}$ (theoretical load) for the fulfilled cycle prior the failed cycle, which results in:

W_{test} =	900 N

Failure mode

Below you will find a short description of the failure mode:

The hat of the tube washer was torn through the base layer at the peak load of cycle 11 (1000N)

The characteristic value is calculated according to the formula in annex C and the results for this test are as follows:

W_{test}	900 N
C_a	0,985
C_d	1,0
ΔW_{char}	886 N
W_{adm}	591 N

A graph of the loads in load cycle, W_{test} , is given in annex B
Note: ΔW_{char} is the characteristic value and not the design value, see annex C.
$W_{adm} = W_{char}/\gamma_m$ is the design value. (ETAG 006:2000/Amended:2007: γ_m=1,5)

Remark

The indicated test data are valid under test conditions only. A successful application under other than the reported test conditions are not proven with this test report.
It shall be emphasized that this investigation is only an indication at a given moment of the properties of the investigated material and does not provide information on the scope of the variations over course of time.

Strängnäs 2014-05-02

Constructech Sweden AB

Fredrik Rundgren

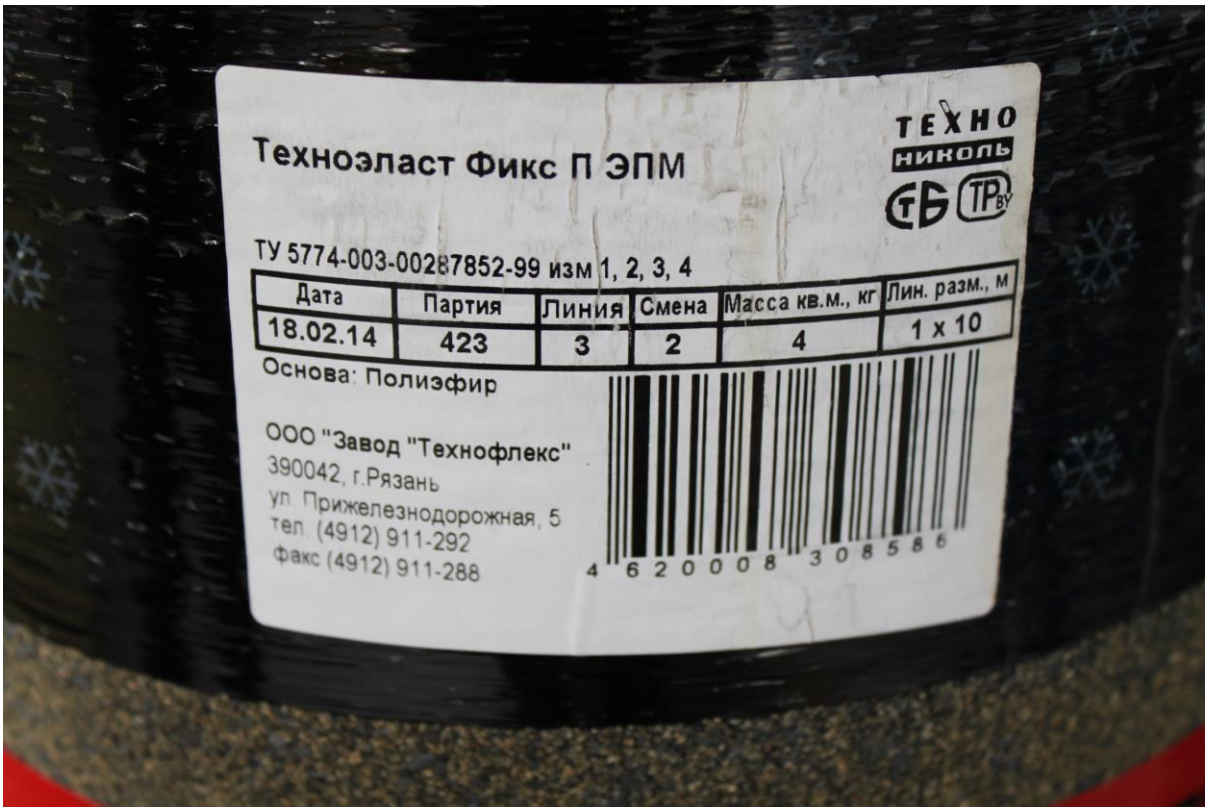
Constructech Sweden AB

Sofie Rundgren

Annex A

Pictures from test sample


ТЕХНОНИКОЛЬ
сторона для наплавления


Техноэласт Фикс П ЭПМ
ТЕХНО НИКОЛЬ
ТУ 5774-003-00287852-99 изм 1, 2, 3, 4
Дата
Партия
Линия
Смена
Масса кв.м., кг
Лин. разм., м
18.02.14
423
3
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1 х 10
Основа: Полиэфир
ООО "Завод "Технофлекс"
390042, г.Рязань
ул. Прижелезнодорожная, 5
тел. (4912) 911-292
Факс (4912) 911-288
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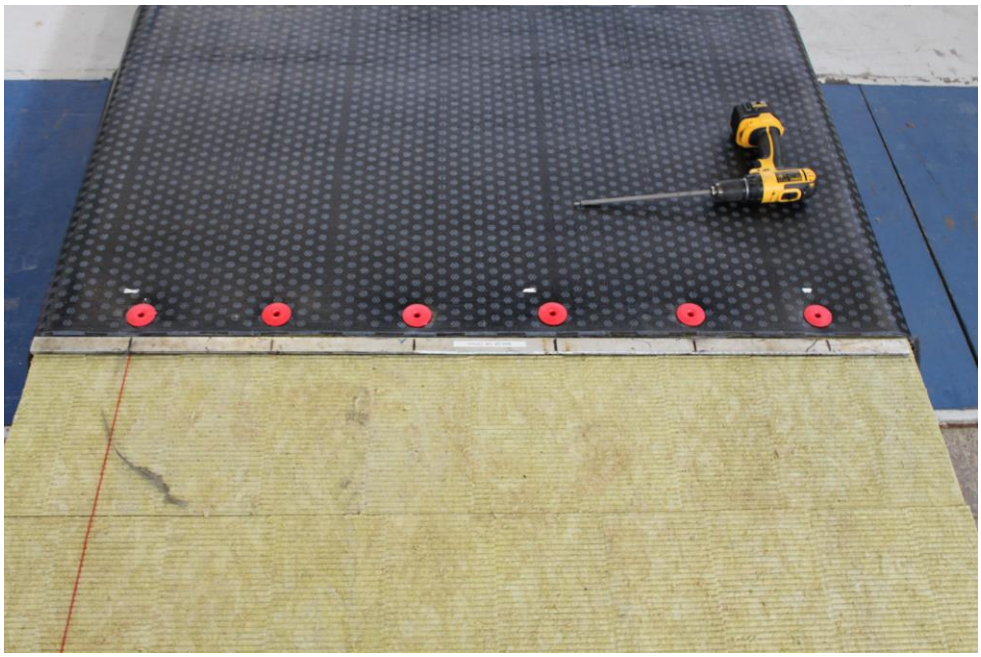
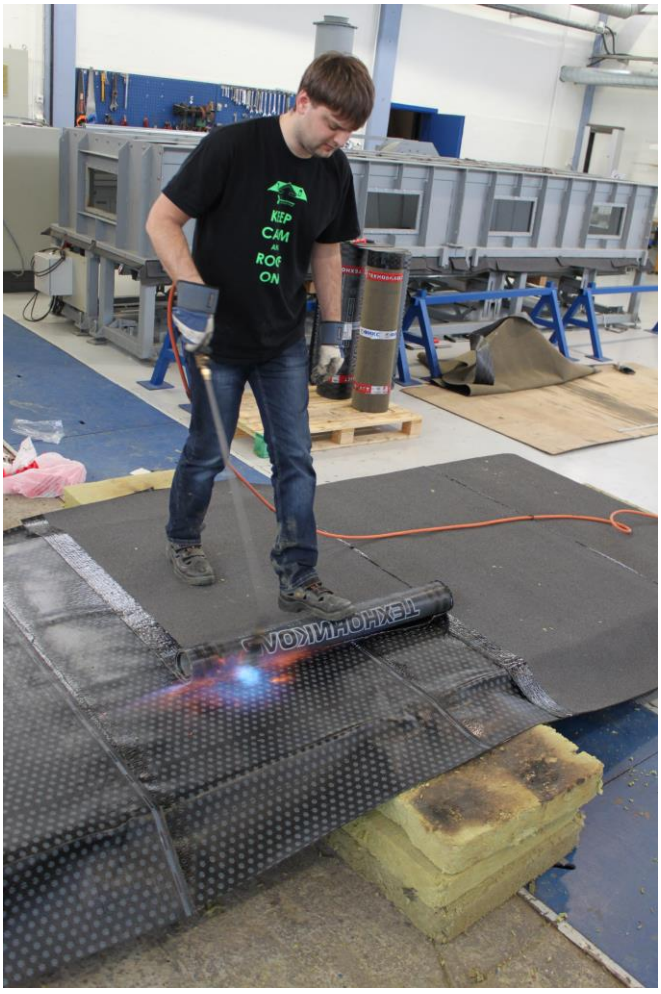
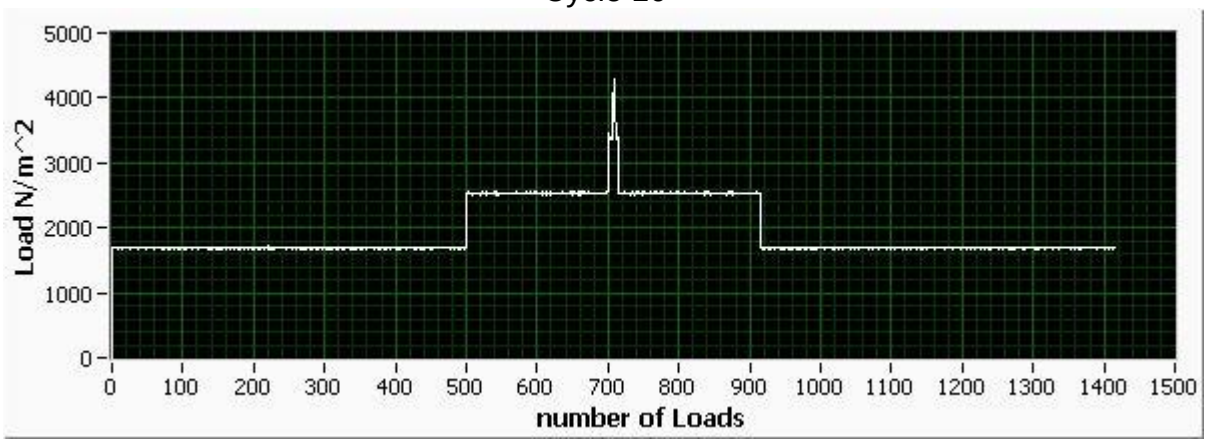



KEEP
CALM
&
ROOF
ON

Pictures from test sample
Description of failure

Annex B

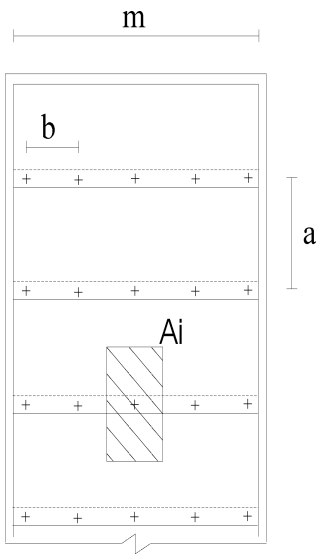
Graph over the loads in cycle W_{test}
Cycle 10



Load interval analysis

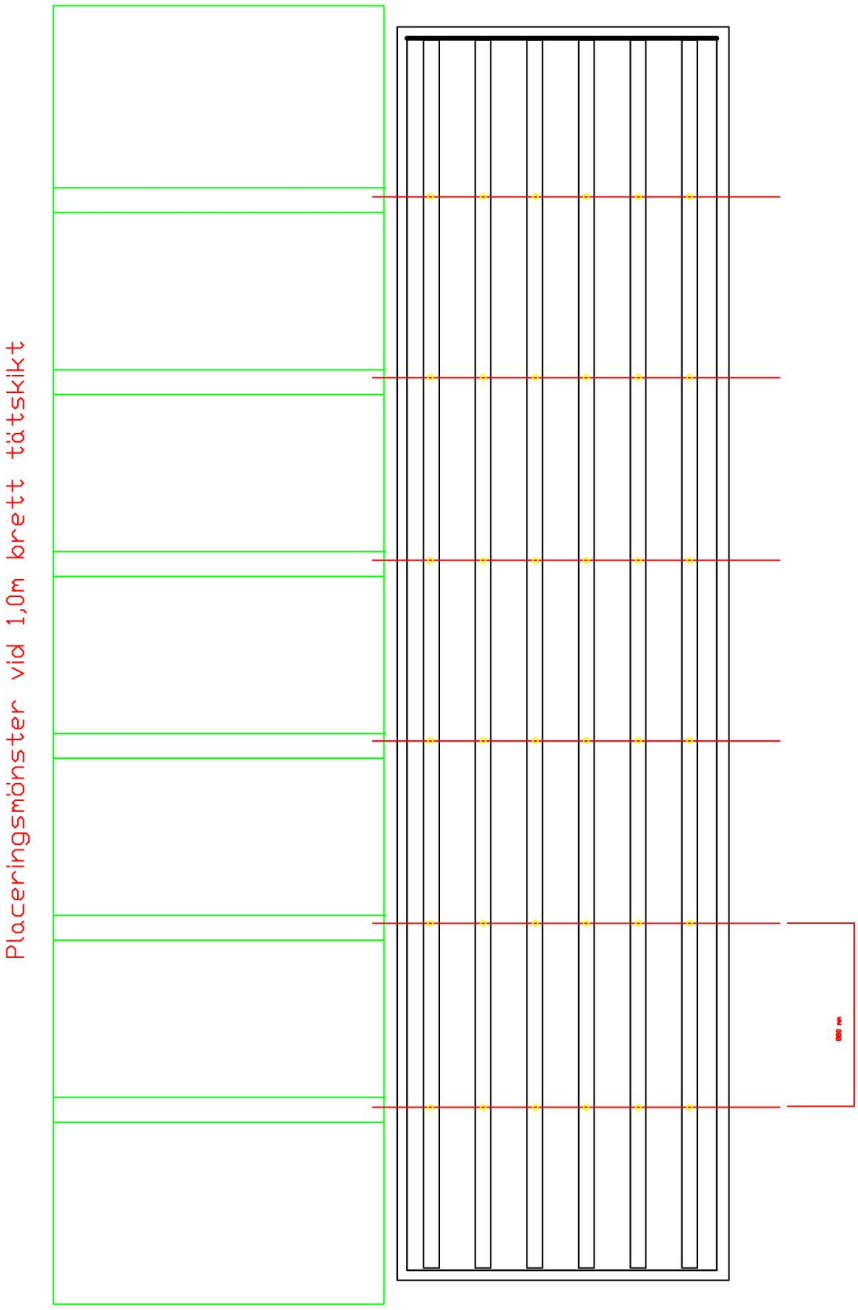
Annex C

$W_{test} = P_w \times A_i = (P_{lab} - P_{chamb.}) \times A_i$	
$W_{char} = W_{test} \times C_a \times C_d$	
$W_{adm} = W_{char}/\gamma_m$	
W_{test} =	maximum load in the cycle preceding the failure cycle
W_{char}=	characteristic load taking into account the correction factors C_a and C_d
W_{adm} =	admissible(design) load for the wind uplift resistance (N per fasteners)
C_a =	a geometric factor allowing for the difference between the deformation of the waterproof covering in the test and the real deformation for the membrane on a complete roof
C_d =	a statistical factor allowing for the reduction in the probability of failure of one fastener, due to the reduced number of fasteners in the test system
γ_m =	material correction factor (determined on national level)



Note: $W_{adm} = W_{char}/\gamma_m$ is the design value and shall be used when performing wind load calculations.

Annex D



Drawing of test sample