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Testing Office for Stability
of Temporary Structures

TEST REPORT No. 1272-2003 Aeng

Report on acceptance test of a barrier construction

1. General Informations

- | | |
|--|---|
| 1.1. Plant/Testing Object: | „Nordic Crash Barriers“
mobil Aluminium-Block-Barrieres
Width: 1250mm, Length: 1150mm, Height: 1185mm |
| 1.2. Operator/Applicant: | Nordic Staging ApS
Odinsvej 26
4100 Ringsted
Denmark |
| 1.3. Manufacturer: | see Point 1.2. |
| 1.4. Construction, Static calculation: | Ingenieurbüro Dr. Roland Ondra GmbH
Richthofenstr. 5
86343 Königsbrunn
Germany |
| 1.5. Testing Report Documentation
No.: 1272-2003 B: | TÜV Thüringen e.V.
Testing Office for Stability of Temporary Structures
Rudolstädter Straße 41
07745 Jena
Germany |
| 1.6. Year of Construction: | 2003 |
| 1.7. Identification: | none |
| 1.8. Testing Place: | Jena, Testing Ground TEAG |
| 1.9. Testing Date: | May 19-20, 2003 |
| 1.10. Testing scope: | Constructional part |
| 1.11. Testing basic rules: | <ul style="list-style-type: none">- Guidelines about the Construction and the Function of Temporary structures (Richtlinien über den Bau und Betrieb von Fliegenden Bauten) (FIBauR, Anhang § 74 Thür. BauO)- DIN 4112 Temporary Structures: Code of practise for design and construction (Fliegende Bauten)- DIN 4113 Construction of aluminium (Aluminiumkonstruktionen)- VdTÜV Instruction Sheet (Merkblatt) 1507 |

This barriers are not temporary structures for which an inspection according to the German building law is required. But the construction will be tested here based on this relevant rules.

2. Documents submitted:

2.1. The test of the construction was based on the following documents presented:

2.1.1. Static calculation appropriate testing report of documentation (see point 1.4.)

2.1.2. Reference drawings:

No. of drawing	Name of drawing	Date
1	Barriere, Absperrung aus Aluminium	March 21, 2003
2	Barriere, Detail A, Detail E	March 21, 2003
3	Barriere, Abstützung, Detail G	March 21, 2003
without No.	Barriere, Grundriß, Ansicht, Schnitt	no date

These drawings were also proved in inspection of the documentation (No. 1272-2003B). Divergent drawings would need a re-inspection.

2.2. Further technical documents:

Welders Approval Test Certificate acc. to EN 287 for Gynter Christensen, Scandinavian State Cons, Odinsvej 26, 4100 Ringsted (Denmark) by Force Technology, April 14, 2003, valid to March 26, 2005.

Pre-Welding-Procedure-Specification pWPS acc. to EN 287 for Scandinavian State Cons, Odinsvej 26, 4100 Ringsted (Denmark) by Force Dantest Cert, April 14, 2003.

Acceptance test certificate 3.1.B according to EN 10204 for materials.

3. Testing Result:

3.1. Manufacturing check:

The hereby proved construction are portable and folding block-barriers with a ground base of 1.15m x 1.25m and a total height of 1.20m.

Each barrier segment is stable in itself, but it is planned to connect the segments in a row for the purpose of blocking over long distances.

One barrier segment contains a bottom frame (made of hollow section 60/40/3 and hollow section 40/40/3) and a barrier frame (made of hollow section 40/25/3). The bottom frame stands completely onto underground. Bottom frame and barrier frame are connected by a screw and this screw is simultaneously the connection to the next barrier element. The barrier frame is additional supported by two diagonal struts on the blocked side of barrier. This struts are made of hollow section 50/25/3, the top-bar of the barrier segment is made of tube \varnothing 50/3.

For an optional supervising the crowd there is a step (approx. 50cm x 20cm and 40cm high) between the diagonal struts. The step is screwed to the struts and fold out onto the barrier frame.

For manufacturing check, 4 barrier segments were presented in ready produced and erected state. Wall thickness was checked at random by ultrasonic-measurement (DM4). In this, **conformity with the technical documentation** was stated.

3.2. Loading tests:

In the course of the acceptance inspection, the barrier elements were subjected to a test series, in which maximum loads, in part clearly exceeding the standards taken as a basis (see point 1.11.), were applied to the completely mounted barrier elements. In this test, the reaction of the framework was observed and conclusions were drawn concerning to their future use.

Participants at acceptance test series, May 19-20, 2003:

Mr. Aunsberg	Nordic Staging ApS
Mr. Grönbeck	Nordic Staging ApS
Mr. Sieber	WEA, forklift-truckdriver
Mr. Thoß	TÜV Thüringen e.V.
Mr. Müller	TÜV Thüringen e.V.

3.2.1. Test assembly (see Enclosure 6.2.):

The test series comprised 4 completely assembled barrier elements. If required, the segments were connected in row or tested as single elements. Putting test loads in form of crane weights on the upper surface of the barriers (500 kg), the maximum live load required in the standard DIN 4112, point 4.2.1.2. could be registered almost exactly for the respective surface. With a forklift truck and two fastening belts, the horizontal passenger load was given onto the top-bar. This force was controlled by a measuring instrument installed between the fastening belt and the truck. The two fastening belts balanced the difference in altitude between coupling of forklift truck and top-bar of barrier. Measured force can be accepted as horizontal-active. (see Enclosure 6.2., picture No. 117-1754).

After that, a series of 22 tests was performed with different load combinations, supports and directions of tension. The tests included single elements and the barrier-row too, it was tested the full supported and the slanting supported and the corner-supported cases. (see Enclosure 6.3., Sheet of Measure)

3.2.2. Major findings from test series:

At tests no. 8 and 16, the barrier was 3,5- and 4-time overloaded according to the based DIN 4112 point 4.2.2.1. Test no. 9 shows, that at lightly vertical loaded barrier (2 persons), nearly the 3-time maximum horizontal load according to DIN 4112 is needed, to overturn the structure. Also the cases corner supported and slanting supported bearing (see Enclosure 6.3. Sheet of Measure; tests No. 11 to 14 and 17 to 21, pictures No. 117-1759, 117-1763 and 117-1766, 117-1767) under maximum load performed without significant reactions.

At test no. 22 a horizontal lengthwise load was applied onto the barriers. The construction, which is only screwed in the bottom frame between the elements, shows a vertical V-shape and app. 3cm wide gap between the top-bars of barriers (see pictures No. 117-1771).

Further, a load test with 280 kg of the step (see point 3.1.) was performed without significant reactions. This test is not considered in the Sheet of measure.

After test series obviously heavy duty elements were subjected to an thorough visual check and to dye penetration tests. The load-bearing structure and welded seams carried the loads without suffering detectable damage, visible cracks or permanent deformations.

3.2.3. Conclusions:

The gap between the barriers was caused by an improbable load for the structure in its planned application. Nevertheless it is recommended, make a tensile-fixed connection also between the top-bars of barrier elements, to certain avoid the risk of any injuries.(see Requirement 4.3.)

From static and constructive point of view there are no reservations against the planned use of the barrier construction.

Enclosure 6.3. to Test Report No. 1272-2003Aeng

1272-2003 mobile barriers, Sheet of Measure

test no.	supporting case	vertical-load [kN] (crane weights)				horizontal-force [kN] (forklift truck)		notice
		onto barrier 1	onto barrier 2	onto barrier 3	onto barrier 4	H-force	in point no.: angle [°]	
1	a	5,00	5,00	5,00	0	1,65	2	0
2	a	5,00	5,00	5,00	0	1,65	4	0
3	a	5,00	5,00	5,00	0	2,15	6	0
4	a	5,00	5,00	5,00	0	1,95	8	0
5	a	5,00	5,00	5,00	0	2,00	1	0
6	a	0	5,00	5,00	0	2,55	1	0
7	a	0	0	5,00	0	1,90	1	0
8	a	5,00	0	0	0	3,50	1	0
9	a	2,00 (2 pers)	0	0	0	2,80	1	0
10	a	0	0	0	0	0,85	1	0
11	b	5,00	5,00	0	0	2,30	1	0
12	b	5,00	5,00	0	0	2,05	8	0
13	b	5,00	5,00	0	0	1,85	5	0
14	b	5,00	5,00	0	0	2,35	5	180
15	a	5,00	5,00	0	0	2,85	4	0
16	a	5,00	5,00	0	0	4,15	2	0
17	c	5,00	5,00	0	0	2,70	2	0
18	c	5,00	5,00	0	0	3,05	2	60
19	c	5,00	5,00	0	0	2,45	4	90
20	c	5,00	5,00	0	0	2,00	1	140
21	c	5,00	5,00	0	0	3,50	1	0
22	a	5,00	0	0	0	not measured	8	270

explanation to supporting cases: a... barriers (single segments or in row) stands full and direct onto underground (test ground is concrete)
 b...only axes A & B (see enclosure 6.1.) are underpinned by wood planks (thickness=4cm)
 c...only 4 corner nodes of single barrier are underpinned by wood planks (thickness=4cm)



4. Requirements:

- 4.1. When mounting the structure, it must always be guaranteed that all temporary connections (screws between bottom frame and barrier frame) will be installed immediately.
- 4.2. The bottom frame should stand always full supported onto underground. If this is not possible, for example crossing railways, curbstones etc. the regarding element must be underpinned.
- 4.3. It is recommended, make an tensile-fixed connection also between the top-bars of barrier elements, to certain avoid the risk of any injuries.
- 4.4. When the system is used in wintertime, snow and ice has to be removed immediately to avoid the risk of sliding.
- 4.5. All advises and terms of mounting should summarize in a short and clear operators instruction.

5. Summary:

On the basis of the documents submitted and the inspections carried out, and under observance all the requirements, the use of the barrier elements for the purpose of blocking people in anyone length is supported. The reproduction of this report is only permitted in complete.

6. Enclosures:

- 6.1. Pictures No.: 117-1753; 117-1754; 117-1757; 117-1759;
117-1763; 117-1766; 117-1767; 117-1771
- 6.2. Load test series, Test Assembly (see point 3.2.)
- 6.3. Load test series, Sheet of Measure (see point 3.2.)

The acceptance test is closed.

TÜV Thüringen e.V.
Inspecting Department for Stress Analysis
and Temporary Structure

Place/Date

Jena, May 26, 2003

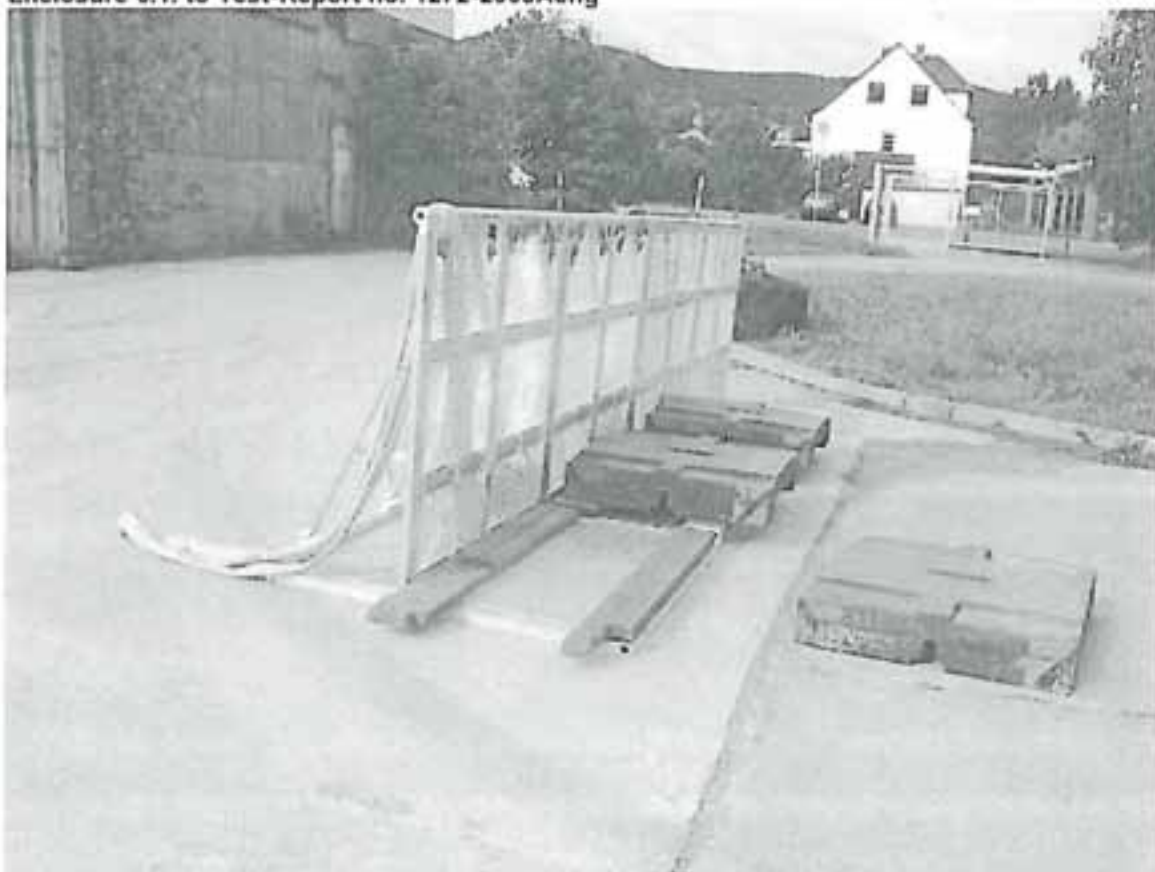
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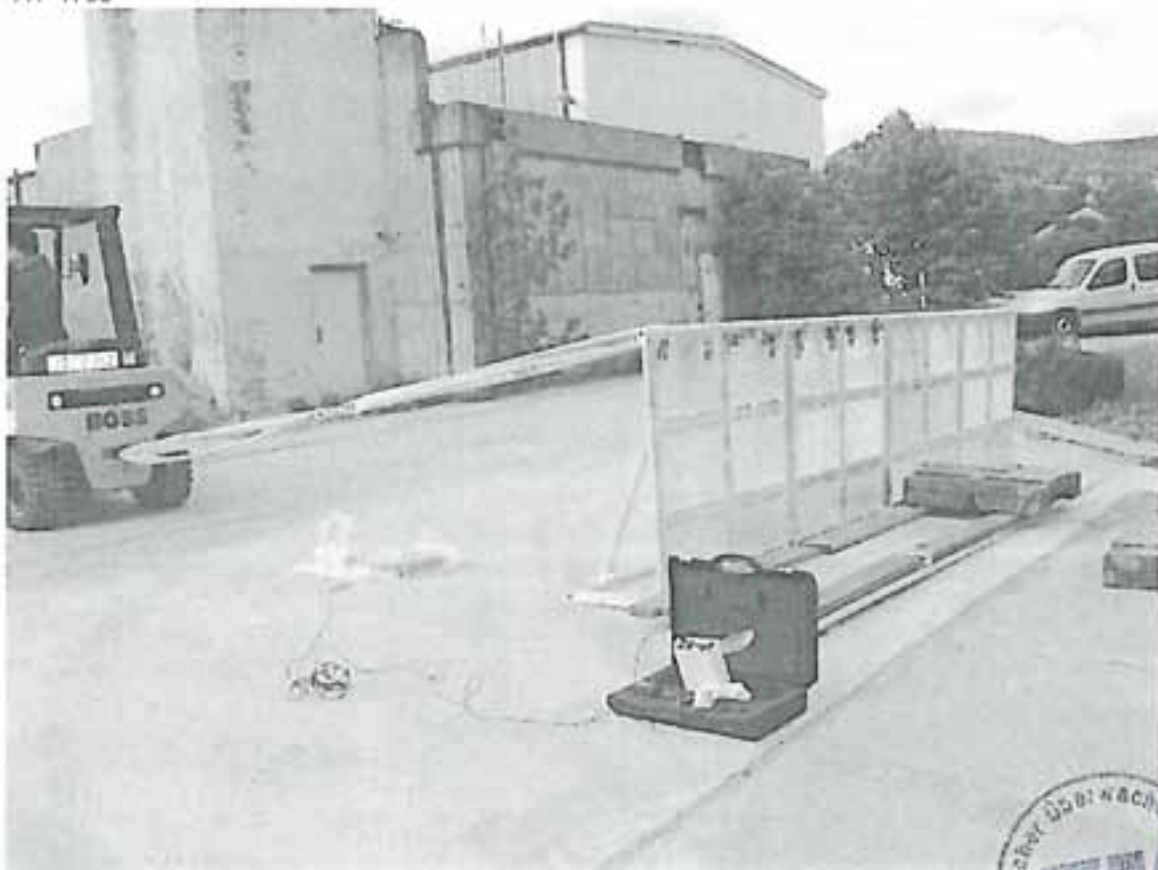
Dipl.-Ing. C. Müller



Enclosure 6.1. to Test-Report no. 1272-2003Aeng



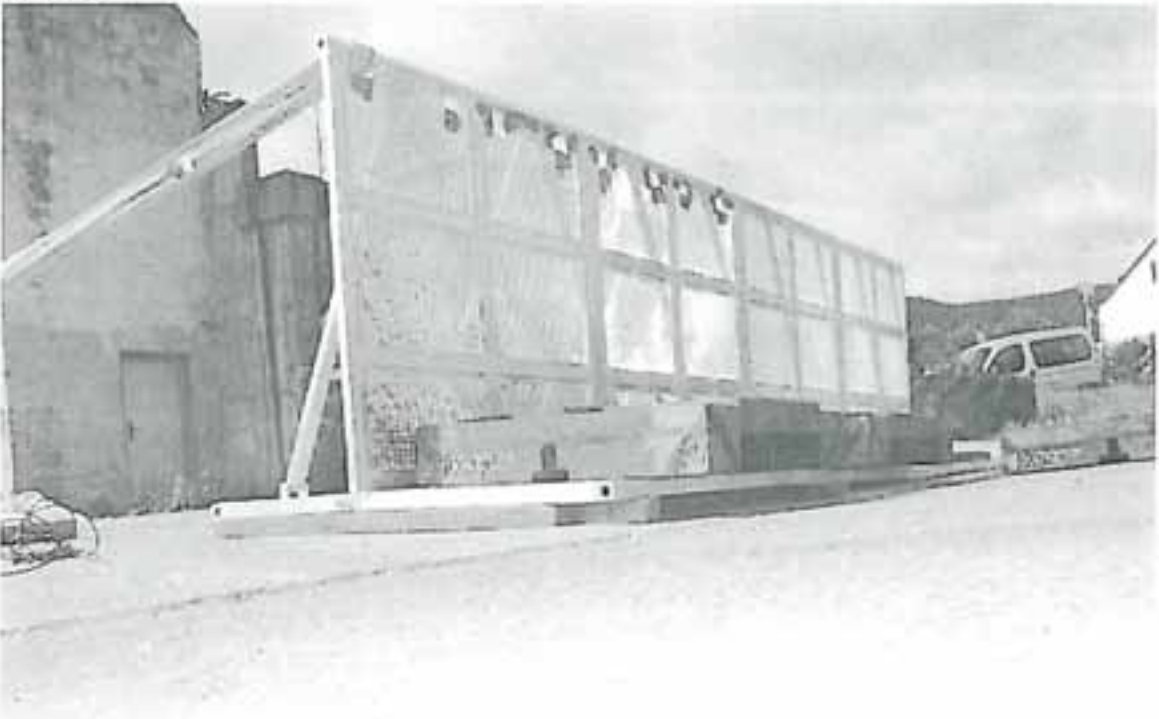
117-1753



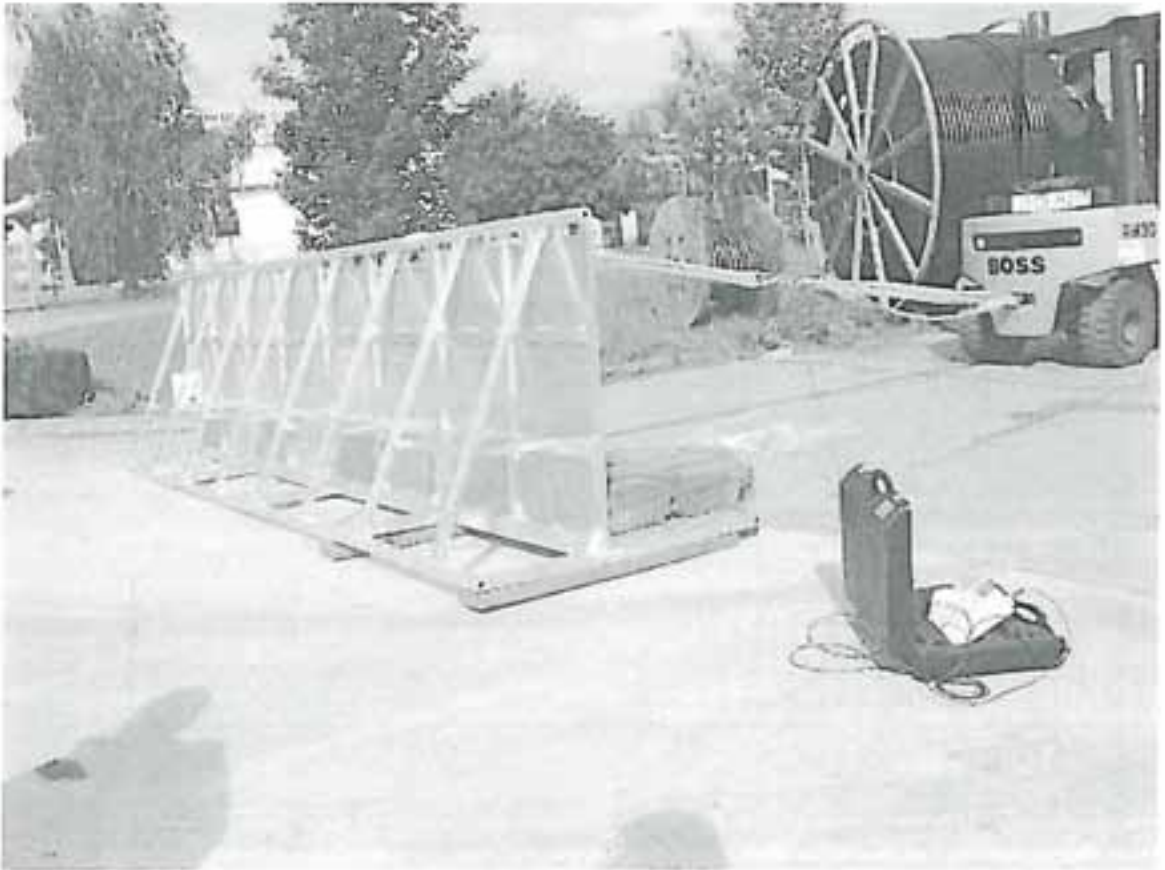
117-1754



117-1757



117-1759



117-1763



117-1766



117-1767



117-1771



Enclosure 6.2. to Test Report No. 1272-2003Aeng

