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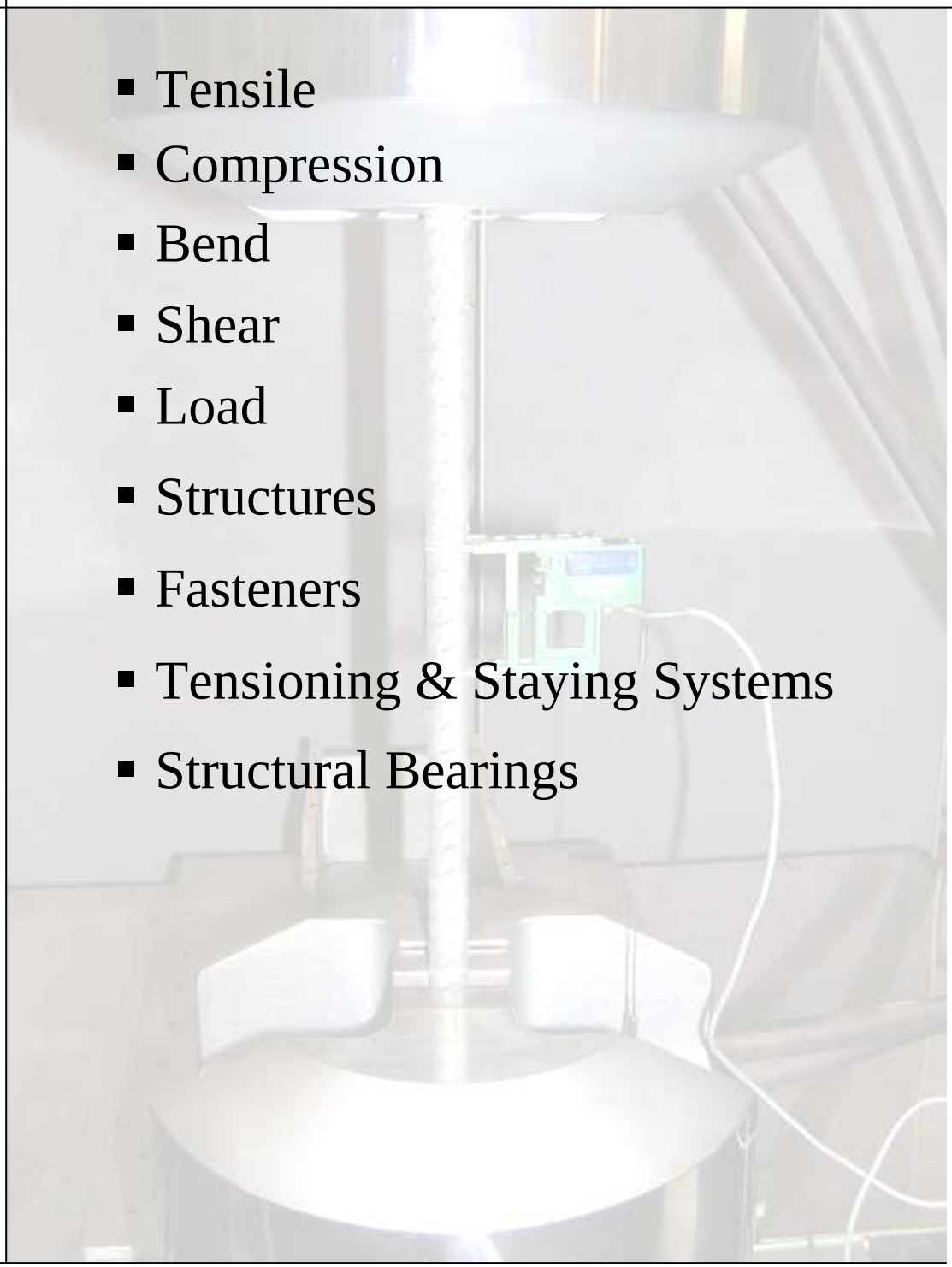
Mechanical Testing



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IN CONFIDENCE TO THE CLIENT

REPORT NO: MT-11/362-B

TESTING OF A NBS CLASS B TEMPORARY FENCE SYSTEM

CLIENT: NEW BRIDGE SERVICES
5 FERNWREN DRIVE
BERWICK VIC 3806

DATE OF TESTING: JULY 13TH –JULY 26TH 2011

DATE OF REPORT: FEBRUARY 17TH 2012

TEST SYNOPSIS:

Temporary fence panels, a number of plastic covered concrete foot blocks and composite rubber/synthetic foot blocks, clamping fixtures and bracing members were delivered to the MTS laboratory for testing. Upon arrival at the laboratory the test items were inspected and the following fence identification details were supplied by the client and recorded as:

Panel Type: *Class B*

Panel Size: *2.4m wide x 2.1m high*

Fence Frame: *Nominal 32mm OD diameter x 2.2mm wall thickness*

Back Braces: *Nominal 32mm OD diameter x 2.2mm wall thickness*

Internal Wire: *150mm x60mm x 4mm diameter wire, rectangular pattern.*

FIG.1
FENCE TEST PANEL SET-UP
(INSET CONCRETE FOOT BLOCK)

Concrete Foot Blocks:

Weighing nominally 34kg each. L=570mm W=220mm x D=150mm.

Composite Foot Blocks:

Weighing nominally 23kg each. L=750mm x W=200mm x D=130mm.

At the request of the client, tests were to be conducted to determine the performance attributes of individual and assembled fences in accordance with AS 4687-2007 TEMPORARY FENCING AND HOARDINGS.

The following tests were conducted in accordance with Section 4:

- Simulated Climbing Test
- Impact Test
- Infill Aperture Test
- Wind Force Overturning Test

FENCE ASSEMBLY:

The fence panels were assembled in accordance with the clients written instructions. Prior to testing the tubular back braces were modified to provide a positive interlocking connection to the underside of the block footings. This was done to prevent slip and improve the fence's stability and wind load performance. With this in mind, the test results as reported herein are strictly specific to the modified brace version of the fence system.

TEST PREPARATION:

Temporary fence panels were prepared for testing in both single panel and continuous panel configurations. Continuous panel testing was conducted on a three panel assembly with the middle panel being the focus of the testing. The temporary fencing was assembled using the supplied clamping fixtures and in accordance with the manufactures assembly guidelines.

FIG.2
CLIMBING TEST

SIMULATED CLIMBING TEST:

Simulated climbing tests were conducted on a three panel assembly by pulling the top rail of the fence panel vertically downward. A stiffened 400mm lever-arm attached to the centre of the fence panel was used to apply the load (See Fig.2). The downward force was continuously applied until an applied load of 65kg had been achieved. This test load was maintained for a period of 3 minutes.

FIG.3
IMPACT TEST

IMPACT TEST:

Impact testing was conducted by swinging a pendulum mass into the mesh infill of a braced, single fence panel (see Fig.3). Four test locations, as described in Fig.2 of AS 4687-2007 were selected and tests were conducted at an impact energy level of 150 joules. A visual inspection for damage to the fence panels, mesh infill, and infill/post connection points was conducted after each impact.

FOOTHOLD TEST:

(a) Aperture Width

Aperture width testing was conducted by attempting to pass a 76mm x 76mm test block through a mesh aperture. Measurement of a single mesh aperture was also conducted to determine that the opening was less than the specified dimensional limit of 75mm.

FIG.4
INFILL DOWNWARD TEST

(b) Infill Downward Load Test

To test that the infill mesh had sufficient stiffness to resist an attempt to climb the fence, a downward load of 100kg was applied at one of the rectangular shaped openings (see Fig.4). This load was maintained for 60 seconds at which point the downward deflection of the infill material was recorded.

SIMULATED WIND LOAD TEST:

Wind load testing was conducted by applying a lateral overturning load to the centre of the panel. The test load was steadily increased until the footing blocks were observed to have completely lifted from the ground, rendering the fence unstable. At this point the applied test load was maintained and the peak test load recorded. Wind load testing was conducted on unbraced panels as well as panels incorporating a back brace with a combination of single and double block support scenarios.

TEST OBSERVATIONS:

SIMULATED CLIMBING

The fence panels were visually inspected for signs of deformation and failure after completion of the test. No visible sign of permanent deformation or structural failure was observed in the panel or mesh upon completion of testing. The fence panel successfully supported a 65kg test load without overturning.

IMPACT TESTING

A single fence panel using concrete and rubber footings and with no bracing, overturned after an impact collision of 150 joules was applied.

A single fence panel assembled as above with the addition of a single, interlocking back brace revealed the following observations after an impact collision of 150 joules was applied:

- No penetration of the mesh.
- No failure between the mesh and post/rail connections.
- No visible sign of cracking.
- No overturning due to impact.
- Maximum dynamic deflection recorded was **58mm** which is less than the specified 300mm.

FOOTHOLD APERTURE TESTS

(a) Aperture Width

The infill aperture horizontal width was measured to be **60mm**, less than the specified maximum of 75mm. A test block measuring 76mm x 76mm could not be passed through the rectangular shaped mesh infill.

(b) Infill Downward Load Test

Infill downward load test resulted in a deflection of **6mm**, less than the specified permissible maximum of 35mm.

SIMULATED WIND LOAD TESTING

Simulated wind load testing was conducted on various temporary fence panel erection scenarios including:

1. Panels with single back braces fitted with single and multiple stacked footings.
2. Panels with two (2) back braces fitted with single and multiple stacked footings.

In each case the tested panels resisted the simulated wind loads without failure of the fence's structural frame work or infill material.

Testing was conducted to the point where the fence panels were on the verge of tipping. The tipping force was recorded as the peak force and is presented along with the calculated equivalent wind speed for each test in Appendix A.

SUMMARY:

Unbraced Panels

The test results confirm that an unbraced, NBS Class B Temporary Fence panel, as described and reported herein, meets the minimum requirements as specified in Section 4 of AS 4687-2007 TEMPORARY FENCING AND HOARDINGS for:

- Simulated Climbing Test
- Infill Aperture Width Test
- Infill Downward Load Test

A single, unbraced panel with concrete filled, plastic covered and composite rubber footings overturned upon an impact collision of 150 joules.

Braced Panels

The impact test results confirm that a NBS Class B Temporary Fence panel with footings, one interlocking back brace with one footing meets the impact test requirements as specified in Section 4 of AS 4687-2007 TEMPORARY FENCING AND HOARDINGS.

The wind test results confirm that an uncovered NBS Class B Temporary Fence panel fitted with footings, one interlocking back brace and a single footing meets the minimum wind speed requirement for Region A & D as specified in Section 4 of AS 4687-2007 TEMPORARY FENCING AND HOARDINGS.

The wind test results confirm that two (2) uncovered NBS Class B Temporary Fence panels fitted with footings, one interlocking back brace and a single footing meets the minimum wind speed requirement for Region A to C as specified in Section 4 of AS 4687-2007 TEMPORARY FENCING AND HOARDINGS.

The wind test results confirm that one (1) shade-cloth covered NBS Class B Temporary Fence panel fitted with footings, one (1) interlocking back brace and four (4) footings per brace, meets the minimum wind speed requirement for Region A as specified in Section 4 of AS 4687-2007 TEMPORARY FENCING AND HOARDINGS.

Notes:

1) Melbourne Testing Services Pty Ltd shall not be liable for loss, cost, damages or expenses incurred by the client or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Melbourne Testing Services Pty Ltd be liable for consequential damages including, but not limited to, lost profit, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested.
2) This report is specific to the temporary fence panels described herein, in their state at the time of testing. It should not be taken as a statement that all similar temporary fence panel assemblies or components of temporary fence panel assemblies in all states of repair, would also perform in a similar manner to items described herein.
3) MTS shall take no responsibility for the procurement and authenticity of the temporary fencing as described herein.
4) MTS shall take no responsibility for the onsite installation procedures used for the temporary fencing described herein.
5) It remains the responsibility of the client to ensure that the temporary fence panels tested are representative of the entire product batch.
6) The test results reported herein are specific to the fences systems performance where the system uses interlocking braces which provide positive connection to the foot blocks. MTS shall take no responsibility for the onsite installation and performance of NBS fences where the system is erected other than as specifically described herein.
7) Wind speed calculations based on AS/NZS 1170.2 2002 with an importance level of 1, terrain category of 2 and topographic multiplier of 1.
8) MTS shall take no responsibility for the performance of temporary fencing as described herein where back braces used with footings are not an interlocking type or capable of securing the footing to the back brace.

ROD WILKIE
AUTHORISED SIGNATORY

APPENDIX A

Fence Assembly Scenario	Infill Type (mm)	Bracing Condition (per panel)	Number of Blocks (per brace)	Test Load (kN)	Calculated Wind Speed Capacity (m/s)	Conformance with AS 4687	Australian Wind Region
New Bridge Single Panel	Rectangular Mesh	None	N/A	0.19	**15.4**	Pass	A
		1 back brace	1	0.52	**25.3**	Pass	A to D
	With Shade Cloth	1 back brace	4	1.10	**18.9**	Pass	A & B

TABLE A1.
WIND LOAD TEST DATA FOR
SINGLE CLASS B PANELS

Fence Assembly Scenario	Infill Type (mm)	Bracing Condition (per panel)	Number of Blocks (per brace)	Test Load (kN)	Calculated Wind Speed Capacity (m/s)	Conformance with AS 4687	Australian Wind Region
New Bridge Double Panel	Rectangular Mesh	1 back brace	1	0.71	**21.4**	Pass	A to C
		1 back brace	2	0.76	**22.0**	Pass	A to C

TABLE A2.
WIND LOAD ANALYSIS FOR
TWO (2) UNCOVERED CLASS B FENCE PANELS

Fence Assembly Scenario	Infill Type (mm)	Bracing Condition (per panel)	Number of Blocks (per brace)	Test Load (kN)	Calculated Wind Speed Capacity (m/s)	Conformance with AS 4687	Australian Wind Region
New Bridge Triple Panel	Rectangular Mesh	1 back brace	1	0.91	**19.0**	Pass	A & B
		1 back brace	2	0.95	**19.4**	Pass	A to B

TABLE A3.
WIND LOAD ANALYSIS FOR
THREE (3) UNCOVERED CLASS B FENCE PANELS

Fence Assembly Scenario	Infill Type (mm)	Bracing Condition (per panel)	Number of Blocks (per brace)	Test Load (kN)	Calculated Wind Speed Capacity (m/s)	Conformance with AS 4687	Australian Wind Region
New Bridge Four Panel	Rectangular Mesh	1 back brace	1	1.10	**17.3**	Pass	A
		1 back brace	2	1.14	**17.6**	Pass	A

TABLE A4.
WIND LOAD ANALYSIS FOR
FOUR (4) UNCOVERED CLASS B FENCE PANELS