

Mechanical Testing

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IN CONFIDENCE TO THE CLIENT

REPORT NO: 21-1146-B

AS 1576.5:2021 LOAD TESTING & GEOMETRY ASSESSMENT OF A PREFABRICATED TRESTLE SCAFFOLD – SKU 5270

CLIENT: **GRIPPS GLOBAL PTY LTD**
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DATE OF TEST: DECEMBER 9TH 2021 TO FEBRUARY 3RD 2022
DATE OF REPORT: FEBRUARY 28TH 2022

TEST SYNOPSIS:

An adjustable height frame trestle scaffold assembly was delivered to the Melbourne Testing Services (MTS) laboratory for testing (see Fig. 1). At the request of the client, testing was to be conducted to determine the conformity of the trestle with the performance requirements of AS 1576.5:2021 SCAFFOLDING, PART 5; PREFABRICATED TRESTLES AND TRESTLE LADDER SCAFFOLDS. As per the client's request, inspection and testing was to be conducted in accordance with the following AS 1576.5:2021 procedures:

- SECTION 3.3: OPERATIONAL REQUIREMENTS; TRESTLE SCAFFOLDS
- CLAUSE 4.2.2.1(A): STRENGTH
- MODIFIED STIFFNESS TESTING PROCEDURE

No assessment for edge protection or stability to was to be undertaken. In addition to the aforementioned performance tests, dimensional checks were also conducted to determine the trestle's geometrical properties.

IDENTIFICATION & GEOMETRICAL PROPERTIES:

Prior to testing the trestle units were measured and assessed for AS 1576.5 dimensional requirements. The details were recorded as follows:

Identification:	SKU 5270
Materials/Condition:	Steel, Red Powder Coat
Sample Markings:	'Adjust A Trestle 250kg SWL'
Minimum Working Height:	1,200 mm (nom.)
Maximum Working Height:	1,800 mm (nom.)
Platform Bearing Width:	940 mm
Height Adjustment Increment:	150 mm
Client's Nominated Capacity:	250 kilograms (kg.) Safe Working Load (SWL)



FIG. 1
SCAFFOLD TRESTLE
TEST ITEM

GEOMETRY ASSESSMENT; OPERATIONAL REQUIREMENTS; TRESTLE SCAFFOLDS:

- CLAUSE 3.3.1: The maximum working height of the trestle was less than 2 m. **PASS**
- CLAUSE 3.3.2(a) & (b): The pin incorporated a positive fixing to avoid disturbance due to vibration or shock. The pin diameter was 10 mm; this is greater than the minimum allowable 8 mm. **PASS**
- CLAUSE 3.3.3(b): The platform width was measure to be 940 mm; this is greater than the minimum width specified in AS 1576.5 TABLE 3.1 for a Medium Duty designation. **PASS**
- CLAUSE 3.3.3(d): An end stop with a height of 35 mm was welded to the end of the platform carrying member; this is greater than the minimum allowable 30 mm. **PASS**
- CLAUSE 3.3.3(e): The surface of the working platform was observed to the nominally 1 level. **PASS**

STRENGTH TEST:

Test Procedure:

Strength testing was conducted on the 15th of December 2021 at the MTS laboratory in accordance with AS 1576.5 APPENDIX A. The trestle was tested at its fully extended design height, with the height adjustment mechanism fully engaged. The specimen was placed in a calibrated test frame and inclined 1°30' out-of-plumb. Rigid bearing pads measuring 75 mm were positioned as per AS 1576.5 FIGURE A.1 on top of the platform support member for the application of vertical compressive test loads (see Fig. 2).

As per the procedure in APPENDIX A.5.3, prior to testing, a settling load commensurate to 25% of the Working Load was to be applied for 60 seconds and removed. A pre-load of 100 N was then to be applied to the test item to establish a zero point. The test load was then to be progressively increased to the required load and continuously applied for five (5) minutes. The test load was then reduced to 100 N and the permanent deformation was recorded. This process was repeated for each of the three (3) required tests; Working Load (P_w), Design Load (P_D) and Minimum Strength Load (P_M). Testing was to be conducted on three (3) repeat test samples, as required by CLAUSE A.5.1.



FIG. 2
STRENGTH TEST SET-UP

Upon completion to the AS 1576.5:2021 Strength Testing procedure described above, using the same test set-up, one (1) Ultimate Load Test was undertaken to determine the maximum capacity of an individual unit.

Test Load Computations:

The test loads were computed in accordance with AS 1576.5-2021 CLAUSE A.4 & A.5.1, whereby two-thirds of the total imposed action for each adjoining bay were applied. Testing was undertaken using both the client's target SWL capacity of 250 kg and medium duty rating to calculate the duty live load (Q) as follows:

Mass of one (1) Extruded Aluminium Alloy Non-Modular Scaffold Plank (2.8 m span) = 9.86 kg

Mass of four (4) Planks (2.8 m span) = 39.4 kg = 0.39 kN

Component Weight (G_i) = $G_d = 2(\frac{2}{3} \times 0.39 \text{ kN}) = \mathbf{0.52 \text{ kN}}$

Test Load Computations (cont.):Calculated for Supplied SWL (250 kg):

$$\text{Duty Live Load } (Q) = 2\left(\frac{2}{3} \times 250 \text{ kg}\right) = 333 \text{ kg} = \mathbf{3.27 \text{ kN}}$$

$$\text{Working Load } (P_w) = (G_d - G_t) + Q = (0.52 - 0.52) + 3.27 = \mathbf{3.27 \text{ kN}}$$

$$\text{Design Load } (P_D) = 1.5(G_d + Q) - G_t = 1.5(0.52 + 3.27) - 0.52 = \mathbf{5.12 \text{ kN}}$$

$$\text{Minimum Strength Load } (P_M) = 2(G_d + Q) - G_t = 2(0.52 + 3.27) - 0.52 = \mathbf{7.01 \text{ kN}}$$

Calculated for Medium Duty (4.4 kN):

$$\text{Duty Live Load } (Q) = 2\left(\frac{2}{3} \times 4.4 \text{ kN}\right) = \mathbf{5.87 \text{ kN}}$$

$$\text{Working Load } (P_w) = (G_d - G_t) + Q = (0.52 - 0.52) + 5.87 = \mathbf{5.87 \text{ kN}}$$

$$\text{Design Load } (P_D) = 1.5(G_d + Q) - G_t = 1.5(0.52 + 5.87) - 0.52 = \mathbf{9.02 \text{ kN}}$$

$$\text{Minimum Strength Load } (P_M) = 2(G_d + Q) - G_t = 2(0.52 + 5.87) - 0.52 = \mathbf{12.21 \text{ kN}}$$

Test Results:Safe Working Load of 250 kg:

The trestle scaffold supported the applied working load of **3.27 kN**, the design load of **5.12 kN** and the strength load of **7.01 kN** with no visible signs of excessive deformation or structural damage. Post-test visual examination of the trestle did not reveal any obvious evidence of permanent deformation, cracking or other indications of failure. For each of the three (3) tested samples, the deflection under load was recorded to be less than the allowable 5 mm (L/180) when subjected to each of the three (3) test loads (see Table 1). Upon removal of the test loads, the residual deflection was observed to be less than the allowable 1 mm.

The tested 'Adjust A Trestle 250kg SWL' trestle scaffold has therefore met the requirements for strength testing in accordance with AS 1576.5:2021 STRENGTH TEST for a Safe Working Load of 250 kg.

Test Description		Applied Load (kN)	Deflection Under Load (mm)				Residual Deflection (mm)			
			#1	#2	#3	Average	#1	#2	#3	Average
Working Load Test	P_{w250}	3.27	0.6	1.0	0.6	0.7	0.1	0.3	0.1	0.2
Design Load Test	P_{D250}	5.12	0.8	1.4	0.9	1.0	0.1	0.6	0.2	0.3
Strength Load Test	P_{M250}	7.01	1.1	2.1	1.2	1.5	0.2	0.8	0.2	0.4

TABLE 1
STRENGTH TEST DATA (SWL 250 KG)

Medium Duty Rating 4.4 kN:

Upon completion of testing for a SWL of 250 kg, the strength test was repeated for Medium Duty requirements. The trestle scaffold supported the applied working load of **5.87 kN**, the design load of **9.02 kN** and the strength load of **12.21 kN** with no obvious visible signs of excessive deformation or structural damage. Post-test visual examination of the trestle did not reveal any visible evidence of permanent deformation, cracking or other indications of failure. For each of the three (3) tested samples, the deflection under load was recorded to be less than the allowable 5 mm (L/180) when subjected to each of the three (3) test loads (see Table 2). Upon removal of the test loads, the residual deflection was observed to be less than the allowable 1 mm.

The tested 'Adjust A Trestle 250kg SWL' trestle scaffold has therefore met the requirements for strength testing in accordance with AS 1576.5:2021 STRENGTH TEST for a Medium Duty rating of 4.4 kN.

Test Description		Applied Load (kN)	Deflection Under Load (mm)				Residual Deflection (mm)			
			#1	#2	#3	Average	#1	#2	#3	Average
Working Load Test	$P_{w4.4}$	5.87	0.8	0.1	0.8	0.6	0.0	0.1	0.0	0.0
Design Load Test	$P_{D4.4}$	9.02	1.2	1.5	1.3	1.3	0.0	0.1	0.0	0.0
Strength Load Test	$P_{M4.4}$	12.21	1.7	2.8	1.8	2.1	0.1	0.4	0.1	0.2

TABLE 2
STRENGTH TEST DATA (MEDIUM DUTY 4.4 kN)

ULTIMATE LOAD TEST:

Upon completion of the strength test, one (1) scaffold trestle sample was to be tested for the determination of ultimate load capacity. As can be seen from Figure 3, the trestle supported the test load without collapse, achieving a peak load of **41.3 kN** (≈ 4.2 t), prior to termination of the test. Lateral displacement (slipping) of the trestle feet was observed at approximately 20 kN. The Factor of Safety (FOS) computed against the maximum applied force is calculated to be nominally ≈ 16.5 times the 250 kg SWL rating and ≈ 9.5 times the Medium Duty rating.

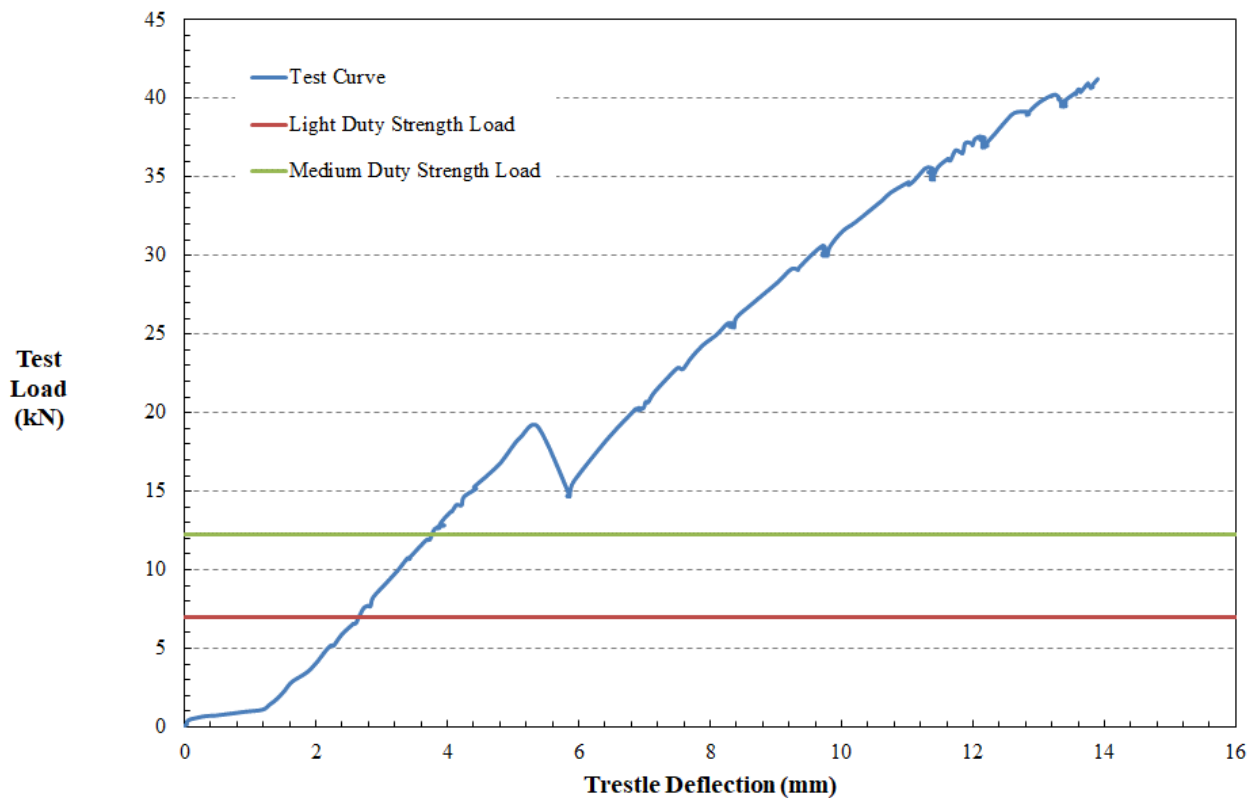


FIG. 3
ULTIMATE LOAD TEST DATA CURVE

MODIFIED STIFFNESS TEST:

As per the client's specific request, a variation to the stiffness test procedure specified in AS 1576.5:2021 APPENDIX B was to be undertaken as a "MODIFIED STIFFNESS TEST".

A pair of fully extended, 1.8 metre high scaffold trestles were positioned 2.5 metres apart, with the working platform width fully planked using extruded aluminium alloy scaffold planks. Both trestles were fixed at each foot to a rigid horizontal foundation. Using 10 kg steel weights, a total mass of 120 kg was applied uniformly over the planked-out surface area (see Fig. 4).



FIG. 4
"MODIFIED STIFFNESS TEST"
LATERAL TEST ARRANGEMENT

A horizontal test load of **500 N** was applied progressively to one (1) trestle at a height of 1.8 metres using a calibrated load measuring device, in both the longitudinal and lateral directions and maintained for a minimum period of 30 seconds. The corresponding net displacement was recorded from a fixed datum point. This procedure was repeated, loading longitudinally and laterally to the platform bearing member.

Test Results:

The total net deflection of the trestle under load was recorded as follows:

Longitudinal= 16 mm (<20 mm)

Lateral= 19 mm (<20 mm)

TEST SUMMARY:

Results from testing confirm that the TECHNIQUE TOOLS ADJUSTABLE BRICKLAYER'S TRESTLE SCAFFOLD 1,200 – 1,800 MM SKU 5270 has passed the requirements for strength properties for both Light Duty and Medium Duty ratings for a WLL of **250kg** and **4.4 kN** (450kg) in accordance with AS 1576.5:2021 CLAUSE 4.2.2.1(a).

Horizontal displacement test results from the modified stiffness tests were found to be less than 20 mm.

Notes:

1. Melbourne Testing Services (MTS) 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 MTS 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. It remains the responsibility of the client to ensure that the samples tested are representative of the entire product batch.
3. MTS shall take no responsibility for the procurement and authenticity of the test product as described herein.
4. This report is specific to the test items in their state at the time of testing. It should not be taken as a statement that all products in all states of repair, would also perform in the same manner.
5. MTS shall take no responsibility for the installation procedures used for the test items as described herein.
6. MTS shall take no responsibility for the interpretation or misinterpretation of the procedures or calculation methods as provided herein or for the appropriateness or validity of the test procedures for the test items described and reported herein.
7. MTS shall take no responsibility for the appropriateness or validity of the client's nominated WLL in all circumstances.
8. Testing was conducted in accordance with Appendix A of AS 1576.5:2021. It should not be assumed that the tested product complies with all relevant section of this standard or any other applicable standard.



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