

Date: 27 March 2006

Project: Review testing of adjustable steel props to derive Working Load Capacity

Preliminary:

Testing of the props was carried out by Technocraft Industries (India) Ltd (Tube Division) — Murbad - 421401 Mumbai. Testing was carried out during November and December 2006. The props testing procedure was based on BS EN 1065:1999. Evaluation of the results is in accordance with AS 3610—1995/Amdt 1/2003-01-23 — Formwork for concrete.

The props were tested with the base plate on an inclined plane and with the load applied eccentrically through a ball joint as detailed in BS EN 1065, Clause 10.2.3 and Figure 8(a) and Figure 9.

1. Maximum load results:

Prop designation	Height Closed m	Height Mid-height m	Height Extended m	Max load Closed kg	Max load Mid-height kg	Max load Extended kg
THP-0	1.07	1.45	1.82	11,500	10,600	7,830
TPH-1	1.75	2.44	3.12	10,350	7,700	4,250
THP-2	1.98	2.67	3.35	8,900	5,860	4,110
THP-3	2.59	3.27	3.95	6,240	3,660	2,210
THP-4	3.20	4.04	4.87	5,180	2,900	1,590

Table 1

One prop of each size only was tested; hence there are no averages applicable to the results obtained.

Tube specified mechanical properties:

Material Grade = S 235 GT
 Yield strength = 235 MPa min.
 Tensile stress = 340 – 520 MPa
 Elongation = 24% min.

40 NB tube — inner tube — Control Unit No: 582

Date: 01-12-2006

Sample No.	Tensile strength MPa	Yield stress MPa
1	390	285
2	<u>388</u>	<u>290</u>
Mean value	389	287.5

Calculation of reduction factor for actual material compared with minimum specified properties.

Reduction factor = $287.5/235 = 1.22$

Adjusted load results:

Prop designation	Max load Closed kg	Adjusted load Closed kg	Max load Mid-height kg	Adjusted load Mid-height kg	Max load Extended kg	Adjusted load Extended kg
THP-0	11,500	9,426	10,600	8,689	7,830	6,418
TPH-1	10,350	8,730	7,700	6,311	4,250	3,484
THP-2	8,900	7,295	5,860	4,803	4,110	3,369
THP-3	6,240	5,115	3,660	3,000	2,210	1,811
THP-4	5,180	4,246	2,900	2,377	1,590	1,030

Table 2

Derivation of Working Load Capacity for prop assembly:

Reference: AS 3610—1995/Amdt 1/2003-01-23, Clause A4.4.4

Working Load Capacity \leq Adjusted load / $1.5k_{d1}$

For steel $k_{d1} = 1.0$

AS 3610, Table 2 — coefficient of variation for steel columns = 0.15

AS 3610, Table 1 — Sampling factor (k_s) for coefficient of variation for steel columns and a sample size of 1 = 1.9

Working Load Capacity \leq Adjusted load / $1.5 \times 1.9 =$ Adjusted load / 2.85

Working Load Capacity Table:

Prop designation	Adjusted load Closed	WLC Closed	Adjusted load Mid-height	WLC Mid-height	Adjusted load Extended	WLC Extended
THP-0	9,426 kg	3,307 kg 32.4 kN	8,689 kg	3,049 29.9 kN	6,418 kg	2,252 22.1 kN
TPH-1	8,730 kg	3,063 30.0 kN	6,311 kg	2,214 21.7 kN	3,484 kg	1,222 12.0 kN
THP-2	7,295 kg	2,560 25.1 kN	4,803 kg	1,685 16.5 kN	3,369 kg	1,182 11.6 kN
THP-3	5,115 kg	1,975 19.4 kN	3,000 kg	1,053 10.3 kN	1,811 kg	635 6.2 kN
THP-4	4,246 kg	1,490 14.6 kN	2,377 kg	834 8.2 kN	1,030 kg	361 3.5 kN

Table 3

2. Test of pin and its supports:

Tests were carried out in accordance with BS EN 1065, Clause 10.3 for a prop with an open thread as illustrated in BS EN 1065, Figure 11 (a).

Prop designation	Maximum load kN	Remarks
THP-0	118	Nut & pin deformed
TPH-1	117.2	Nut & pin deformed
THP-3	122	Nut broken & pin deformed
THP-4	115	Nut broken & pin deformed
Mean value	118	

Table 4

Pin specified mechanical properties:

Yield strength = 235 MPa min.

Tensile strength = 340 — 470 MPa

Elongation = 22% min.

Prop designation.	Tensile strength MPa	Yield stress MPa
THP-0	376	281
THP-1	376	281
THP-3	376	281
THP-4	<u>376</u>	<u>281</u>
Mean value	376	281

Calculation of reduction factor for actual material compared with minimum specified properties.

Reduction factor = $281/235 = 1.20$

Pin adjusted maximum load mean value from Table 4 = 118 kN

Adjusted load = $118 / 1.20 = 98.3$ kN

Derivation of Working Load Capacity for prop pin and its supports:

Reference: AS 3610—1995/Amdt 1/2003-01-23, Clause A4.4.4

Working Load Capacity \leq Maximum load / $1.5k_s k_{dt}$

For steel $k_{dt} = 1.0$

AS 3610, Table 2 — coefficient of variation for steel flexural members = 0.10

AS 3610, Table 1 — Sampling factor (k_s) for coefficient of variation for steel columns and a sample size of 4 = 1.4

Working Load Capacity \leq Adjusted maximum load / $1.5 \times 1.4 =$ Adjusted maximum load / 2.10

Hence, the Working load Capacity = $118 / 2.10 = 56.2$ kN

Maximum Working Load Capacity for prop assemblies is for:

THP-0 prop in the closed position = 32.4 kN

The pin and its supports has a Working Load Capacity = 56.2 kN, giving a factor of 1.73 times the maximum Working Load Capacity of a prop assembly.

Conclusion:

The pin and its supports have sufficient strength to support the greatest Working Load Capacity of the prop assemblies.

3. Serviceability test of prop nut:

This test is to establish that the nut material is capable of withstanding numerous blows by a hammer, typically applied in the field to adjust the final height of the prop when loaded with formwork.

From a sample size of 1,000 pieces, 10 nuts were tested, all of which passed without failure

Evaluation of test results detailed in the test report described above by:



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