

Materials Technology Ltd.

5 Rushington Court, Rushington Business Park,
Chapel Lane, Southampton SO40 9NA

Tel: +44 (0) 2380 580240

Fax: +44(0) 2380 661758

e-mail: info@mtechltd.co.uk

Web: www.mtechltd.co.uk

**Compressive testing of TRAFFIC-
LINE Cable Protection Ramp**

Mr Jonathan Pert,
MORAVIA (UK) Ltd,
Unit 9+10 Spring Mill Industrial Estate,
Avening Road,
Nailsworth,
Gloucestershire,
GL6 OBS

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Prepared by: Mr N Kenworthy

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1. Introduction

Moravia are a leading manufacturer and supplier of traffic solution products. Moravia have received some ad-hoc reports that their TRAFFIC-LINE Cable Protection Ramp products are developing cracks during routine service. Moravia have commissioned Materials Technology to undertake a programme of testing in order to evaluate the performance of the product when loaded in compression to the proof load (5T) and up to the failure point. This report details the work conducted by Materials Technology Ltd.

2. Samples

Moravia supplied Materials Technology with 3 identical sections of the TRAFFIC-LINE Cable Protection Ramp, the samples consisted of a hollow black rubber baseplate attached to yellow rubber covering lid. Figure 1 shows an example of the product.

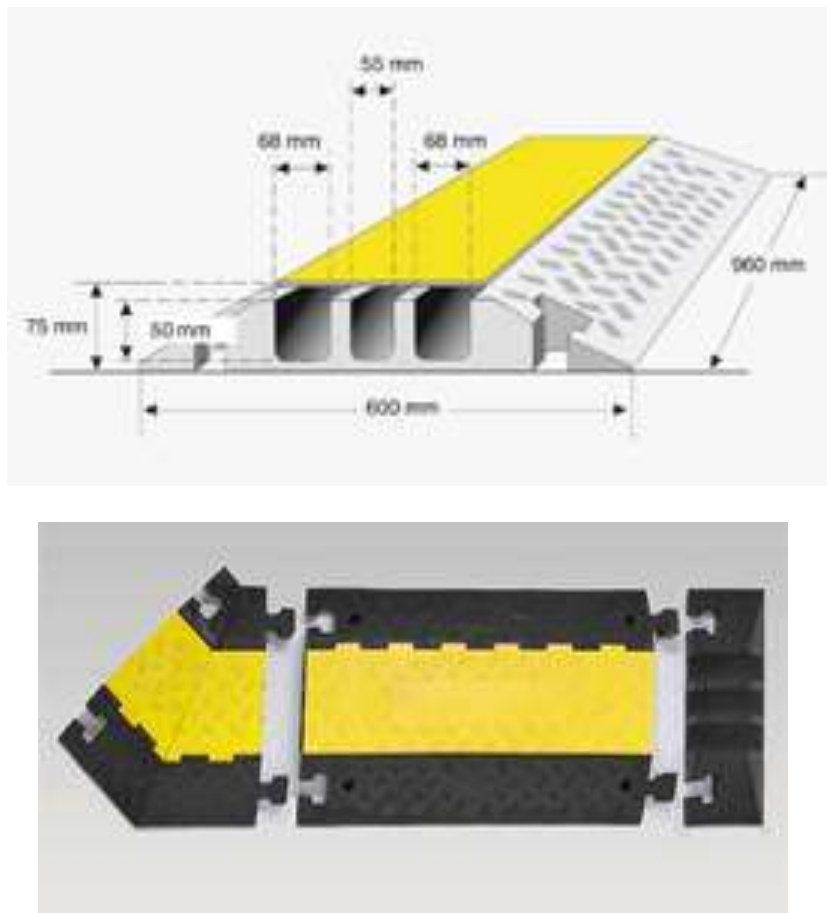


Figure 1: Example of product tested.

3. Methodology

The client requested simulation of a standard truck tyre using a 200mm² base plate for application of the load. Each sample was placed onto the flat steel baseplate of the compression test beneath a hydraulic ram. A 200mm² steel plate was placed centrally on the yellow lid region between the ram and the sample. The 200mm² plate was then gradually loaded up to a load of 5 tonnes (proof load) and was held for a minimum of 5 seconds. The

load was then removed and the sample was examined for any evidence of damage. The test was then repeated taking the load up to the failure point or a maximum loading of around 17 tonnes, whichever occurred first. Fig.2- 4 below shows the setup prior to a test.



Figure 2: Sample positioned on test bed of compression tester.



Figure 3: Steel plate located centrally on sample lid prior to testing.



Figure 4: Sample set up in compression testing.

The test was repeated for each sample and any damage observed was photographed and detailed below. Videos were also recorded for each test and are available on request.

4. Results and Discussion

Table 1 summarise the outcome of the compression testing. Table 2 shows the salient images at each point in the testing.

Table 1: Summary of Compression Testing		
Sample	Load	Comments
1	5 Tonnes (Proof load)	Minor indentation mark left on yellow lid by steel plate. No breakage or other damage.
	17 Tonnes	Slight permanent deformation of the black rubber and slight damage to black rubber. Significant deformation of lid and Indentation in yellow lid more pronounced. No breakage.
2	5 Tonnes (Proof load)	Minor indentation mark left of yellow lid by steel plate. No breakage or other damage.
	17 Tonnes	Slight permanent deformation of the black rubber and slight damage to black rubber. Significant deformation of lid and Indentation in yellow lid more pronounced. Yellow hinge split at seam at loading in excess of 14 Tonnes.
3	5 Tonnes (Proof load)	Minor indentation mark left of yellow lid by steel plate. No breakage or other damage.
	17 Tonnes	Slight permanent deformation of the black rubber and slight damage to black rubber. Significant deformation of lid and Indentation in yellow lid more pronounced. No breakage.

Table 2: Photographic summary



Photo 1: Image shows sample 1 under a load of 5 tonne proof load. Sample can be seen to have compressed to some extent under the load. Slight bowing of lid at ends of samples evident. This image is representative of all samples at this point of the test.



Photo 2: Image shows sample 1 after being loaded to 5 tonnes and is typical of all 3 samples. Notice slight indentations left by the steel plate, under normal conditions the load is applied via a lorry tyre so it is unlikely that this deformation will occur in service. Also notice that no damage has occurred to the hinges at this stage.

Table 2: Photographic summary



Photo 3: Image shows sample 2 under a load of 17 tonnes and is representative of all samples. Notice significant compression of sample and lifting of the ends is evident.



Photo 4: Image shows permanent deformation of lid to sample 1 caused by the load of 17 tonnes and is representative of other samples. Notice that hinges are still intact.

Table 2: Photographic summary



Photo 5: Image shows deformation and splitting observed in the base of sample 1 directly underneath the point of load after application of 17 tonne load and is also representative of the damage found to sample 3.



Photo 6: Image shows crack to hinge that occurred in sample 2 during loading to 17 tonnes. This damage was only evident in this sample, no damage to hinges was observed in other samples. It should also be noted that the cracking occurred at greater than 14 tonnes, well in excess of the 5 Tonne proof load.

5. Discussion

Application of the proof load with a steel plate is a relatively simple test but it may not be representative of the load application in service. In service the load will be predominantly applied by a tyre and hence will tend to spread the stress at the edges of the loading. For this reason the testing performed in this work may represent the worst case scenario. A more rounded profile or steel plate covered with a tyre would probably not result in a permanent deformation mark.

The product performed well up to the 5 Tonne proof load point but some flexural deformation of the product did occur at loads in excess of 2.5 Tonne.

At loads above 14 Tonne the load rate increases significantly and hence is probably due to compression of the rubber substrate (black rubber moulding). Hence it is probably not realistic to consider loads in excess of this figure.

One sample did show cracking of the hinge at the higher loads and this appears to have split at the weak point in the hinge i.e. the seam line of the plastic.

6. Conclusions

Compression testing of 3 TRAFFIC-LINE Cable Protection Ramp products has been conducted at the proof load of 5 Tonnes and finally up to a maximum load of 17 tonnes as requested by Moravia.

The following conclusions can be made from this testing:

- All samples showed some permanent deformation to the lid directly underneath the loaded area after being loaded to 5 tonnes but no cracking was observed. This damage was caused by the edges of the loading plate and is therefore unlikely to occur under service conditions when the load is applied via a lorry tyre.
- At loads in excess of 14 Tonnes sample 2 was seen to develop a crack in the yellow hinge at the join line. Sample 1 and 3 did not show any signs of breakage.
- All sample showed slight permanent deformation to both the lid and base once loaded to 17 tonnes. Slight damaged occurred to the black rubber material at these loads.
- All samples were flex at the ends due to deformation of the base when under heavy load.

Overall, it can be concluded that all samples did not show any evidence of cracking when loaded to 5 tonnes and only 1 sample cracked when loaded in excess of 14 tonnes, well in excess of the proof load.



Prepared by: Nick Kenworthy