

TEST REPORT

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Project Title: Performance Testing of a Guttering System

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1 INTRODUCTION

Guttermaster Ltd has never experienced any failures with their Gutter system with brackets installed correctly. The client needed to undertake this program of work to establish the loading capabilities of their Gutter/bracket system and to be able to establish a benchmark within this industry sector.

2 MATERIALS

An RG gutter system was supplied by the client. Two gutter sections (RG 150 x 100mm, and 3m long) and 10 supporting brackets were received from the client. The Gutter sections were 2mm thick.

3 TEST PROGRAMME

3.1 Static Maximum Load Test

Three brackets were set up at nominally 1050mm centres, with an empty guttering system.

A static load test was then carried out to failure using lead weights.

3.2 Impact Load (empty)

An impact load test was carried out utilising a plywood 45° slope. Plastic air-filled packing was installed across the full length of the guttering to form the soft body element to the test. A board approximately 2.4m wide was then allowed to fall down the slope of the plywood from a height of 1m. The board weight was 12.6kg. Steel weights were then installed onto the plywood board to give a total weight of 14.32kg. The board was then allowed to impact the gutter system. This process was repeated with increased incremental loads applied respectively at total loads of 17.52, 18.54, 20.06, 27.52 and 30.36kg.

Observations were carried out following each loading interval until the test was terminated.

3.3 Impact Load (half full)

A repeat of the above test was carried out whereas the gutter was filled half full using sand. 7Kg/m was applied to the gutter.

The incremental loads applied were 12.6kg (board only), 17.52, 22.6, 27.52 and 30.36kg.

Observations were carried out at each loading interval until the test was terminated.

4 RESULTS

4.1 Static Maximum Load Test

The empty Gutter system failed at a dead load of 891Kg

4.2 Impact Test (empty gutter)

The loads applied to the empty Gutter system are shown in Table 1. At an applied energy of 211.5 Nm the test was terminated. Although the system had not failed the system could not function as a gutter system due to deformation of the gutter and the supporting brackets.

4.3 Impact Test (half-filled gutter)

The results mirrored those achieved for the empty Gutter system.

5 DISCUSSION

5.1 Static Load Test

For the static maximum load test, the Gutter system was 'dead loaded' to 891kg to failure. Failure was a simultaneous splitting of the gutter front top edge connection to the supporting bracket and bending of the supporting brackets.

It can be suggested that this load of 891kg, over a 3m span would far exceed in situ loading. If the 3m guttering was completely filled with water/ice then this would equate to approximately 45kg plus any snow coming down off the roof. The extra snow would then have to be approximately 19 times a fully filled gutter which can be suggested as being unlikely.

5.2 Impact Load Tests

For the impact load tests, both tests (on empty gutter and half filled gutter respectively), were terminated at an applied energy of 211.5Nm at which time the test become difficult to complete. At the test termination of both respective tests, similar failure patterns were observed at the same corresponding loads for both the empty and half filled bracket tests where the brackets were severely deformed and the gutter could no longer be described as a serviceable gutter system.

The results from the tests are probably best considered in terms of a weight of snow impacting from above. In the case of the loaded gutter 7kg/m is the equivalent to the weight of about 7cm of new snow over a roof area of 1m². The impact load is equivalent to some 10cm of new snow over an area of 1m² impacting the guttering having slid through 1m. This is of course quite artificial as the gutter could not contain this amount of snow which would spill over. If all the weight could be supported in the gutter this would amount to a column some 1.1m high standing in the 150mm wide gutter, not allowing for any dynamic effects. The comparisons are quite artificial but do indicate the severity of the test. The total weight hitting the gutter amounts to some 28.6kg (4.5 stone).

Table 1: Impact Test on Empty Guttering System

Extra Load(kg) Applied to Board	Board Weight	Total Applied Weight(kg)	Drop Height(M)	Total Energy Applied (Nm)	Observations
0	12.6	12.60	0.71	87.8	No obvious damage to brackets and guttering
1.72	12.6	14.32	0.71	99.7	No obvious damage to brackets and guttering
4.92	12.6	17.52	0.71	122.0	No obvious damage to brackets, some deformation of gutter
5.94	12.6	18.54	0.71	129.1	As above
7.46	12.6	20.06	0.71	139.7	As above
14.92	12.6	27.52	0.71	191.7	Brackets visually deformed Although failure not occurred, system not serviceable
17.76	12.6	30.36	0.71	211.5	More severe deformation of Brackets, test terminated

Table 2: Impact Test on Half Filled Guttering System

Extra Load(kg) Applied to Board	Board Weight	Total Applied Weight(kg)	Drop Height(m)	Total Energy Applied (Nm)	Observations
0	12.6	12.60	0.71	87.8	No obvious damage to brackets and guttering
4.92	12.6	17.52	0.71	121.7	No obvious damage to brackets, some localised deformation of gutter
10.00	12.6	22.6	0.71	157.4	Some small deformation of Brackets,
14.92	12.6	27.52	0.71	191.0	Brackets visually deformed Although failure not accrued, system not serviceable
17.76	12.6	30.36	0.71	211.5	More severe deformation of Brackets, test terminated



Plate 1 - Failure of Gutter at Bracket Connection



Plate 2 - Showing Bending of Brackets at Failure



Plate 3 - Impact Test Set-up



Plate 4 - Impact Test Set-up Showing Gutter Half Filled with Sand

NOTE: The results given in this report apply only to the samples that have been tested.

END OF REPORT