



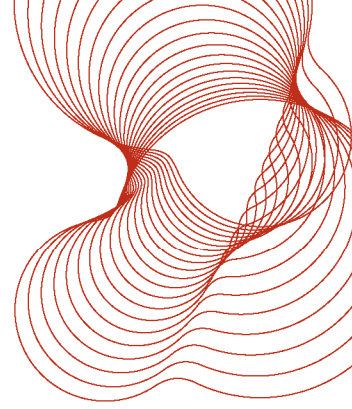
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**Fire performance of
innovative hanger
system**

Prepared for: Gripple Limited

8 November 2012

Client report number 132129



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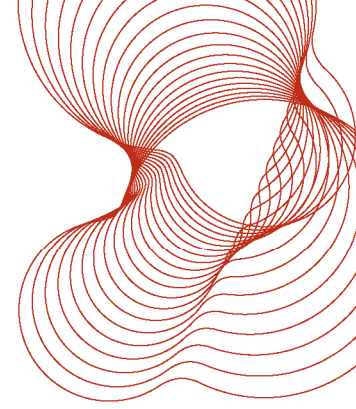
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Executive Summary

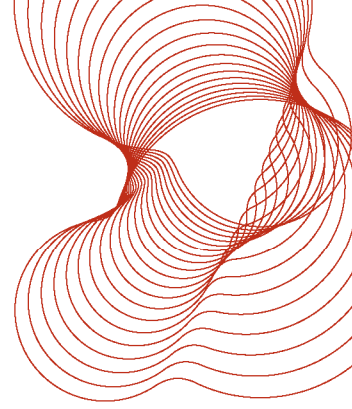
BRE Global has undertaken nine fire tests to investigate the performance of an innovative hanger system used to support mechanical and electrical installations, services etc. Three different systems have been tested under load and exposed to a heating curve corresponding to 30, 60 or 90 minutes standard fire exposure^{1,2}. This report contains all relevant test results and observations.

The performance of the product was assessed in terms of the ability to continue to support the applied load when subject to a heating curve corresponding to 30, 60 or 90 minutes standard fire exposure as agreed with the client. In terms of the performance criteria set out in this report the performance of the specimens is as follows:

Group	Test ref.	Description	Applied load (kg)	Standard fire exposure (min)	Performance
1	1	Gripple Trapeze Plus No. 3 unit with M8 stud end fixing	45	30	Pass
	2	Gripple Trapeze Plus No. 3 unit with 90° eyelet and fixing	45	30	Pass
	3	Gripple Trapeze Plus No. 3 unit with straight eyelet end fixing	45	30	Pass
2	1	Gripple Trapeze Plus No. 3 unit with M8 stud end fixing	20	60	Pass
	2	Gripple Trapeze Plus No. 3 unit with 90° eyelet and fixing	20	60	Pass
	3	Gripple Trapeze Plus No. 3 unit with straight eyelet end fixing	20	60	Pass
3	1	Gripple Trapeze Plus No. 3 unit with M8 stud end fixing	10	90	Pass
	2	Gripple Trapeze Plus No. 3 unit with 90° eyelet and fixing	10	90	Pass
	3	Gripple Trapeze Plus No. 3 unit with straight eyelet end fixing	10	90	Pass

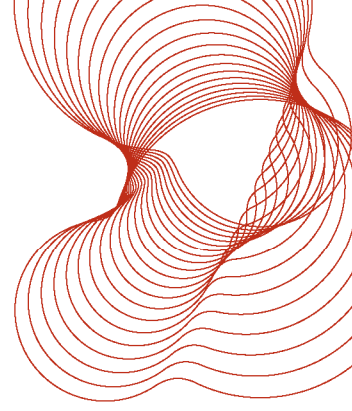
¹ British Standards Institution, BS 476-20:1987, Fire tests on building materials and structures – Part 20: Method for the determination of the fire resistance of elements of construction (general principles), BSI, London, 1987

²DIN 4102 Part 2, Fire Behaviour of Building Materials and Components, Building components, Definitions, Requirements and Tests, Deutsche Normen, Berlin, September 1977



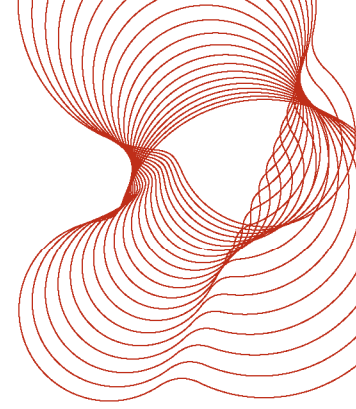
Contents

Introduction	4
Description of the project	5
Performance criterion	8
Findings	9
Results summary	21
References	22



Introduction

BRE Global have undertaken a series of fire experiments to investigate the performance of a number of stainless steel wire rope connecting systems when under load and subject to a thermal exposure corresponding to 30, 60 or 90 minutes of the standard fire curve¹.



Description of the project

The client required information on the performance of a number of steel wire rope suspension systems subject to a standard fire exposure. The experimental programme, as agreed with the client is summarised in Table 1 below.

Group ref.	Test ref.	Duration of exposure to the standard fire curve (min)	Description	Applied load to the cable system (kg)
1	1	30	Gripple Trapeze Plus No. 3 unit with M8 stud end fixing	45
	2	30	Gripple Trapeze Plus No. 3 unit with 90° eyelet end fixing	45
	3	30	Gripple Trapeze Plus No.3 unit with straight eyelet end fixing	45
2	1	60	Gripple Trapeze Plus No. 3 unit with M8 stud end fixing	20
	2	60	Gripple Trapeze Plus No. 3 unit with 90° eyelet end fixing	20
	3	60	Gripple Trapeze Plus No.3 unit with straight eyelet end fixing	20
3	1	90	Gripple Trapeze Plus No. 3 unit with M8 stud end fixing	10
	2	90	Gripple Trapeze Plus No. 3 unit with 90° eyelet end fixing	10
	3	90	Gripple Trapeze Plus No.3 unit with straight eyelet end fixing	10

Table 1 Experimental programme

In each case the load was applied by hanging a weight to a length of channel fixed to the cable by means of a “Gripple” fixing (Figure 1). The fixing to the other end was attached to a threaded bar suspended above the furnace and varied for each test in accordance with the description in the table above. The fixings are illustrated in Figures 2-4. In each case the cable was a stainless steel wire rope of 3mm diameter. In each case both fixings were entirely contained within the furnace.

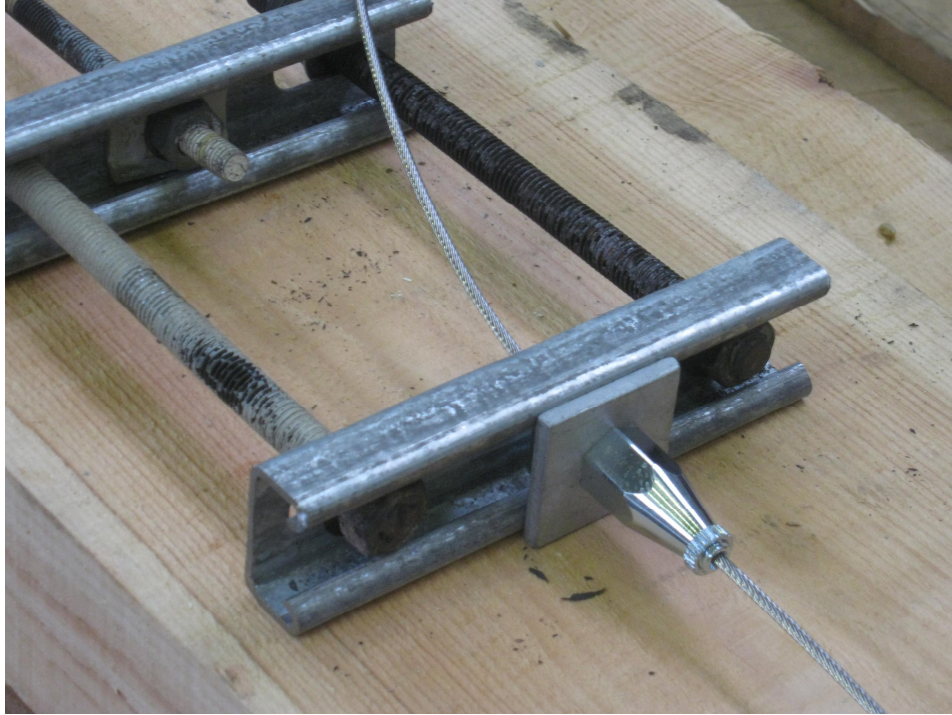
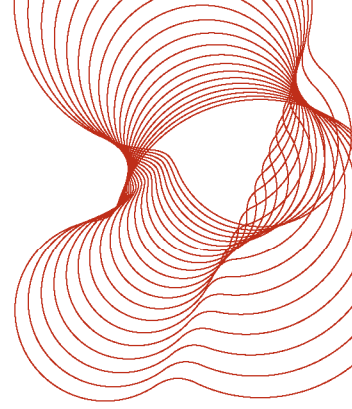


Figure 1 “Gripple” fixing attached to channel



Figure 2 M8 stud end fixing connected to M8 stud

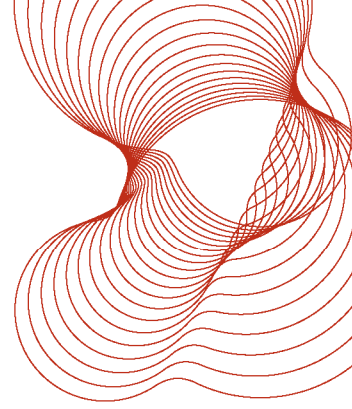
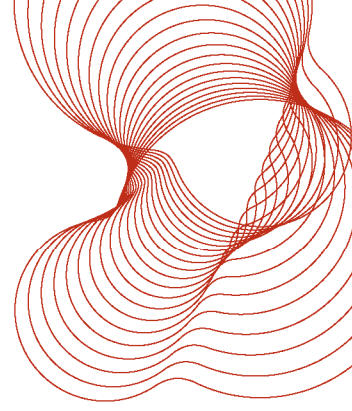


Figure 3 90° eyelet end fixing connected to M8 stud

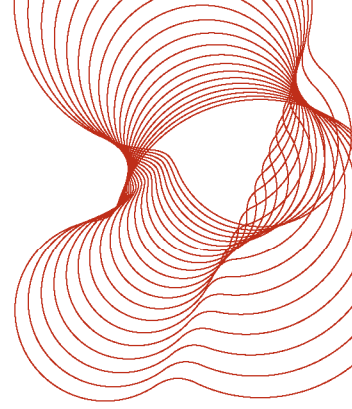


Figure 4 Straight eyelet end fixing connected to channel



Performance criterion

The systems were evaluated against a performance requirement to continue to support the applied design load (as specified by the client) for the entire duration of the test. In order to provide additional information total elongation was also measured for the duration of the test.



Findings

Group 1 Test 1 Gripple Trapeze Plus No. 3 unit with M8 stud end fixing 45kg load 30 minutes fire exposure

The results from the first fire test are shown in Figure 5 below. The measured temperature within the furnace is shown alongside the standard (BS476) fire curve. The results indicate a good agreement between the measured temperature and the standard curve. The maximum deflection was approximately 30mm after 30 minutes. The system continued to support the applied load for the test period. The sample is shown on removal from the furnace in Figure 6. The sample comprised both the Gripple unit and M8 stud end fixing and approximately 750mm of the wire rope. At the end of the test the sample appeared to be supported on the bottom of the furnace (Figure 7). However for the 30 minute test period the sample continued to deflect so it is likely that the sample was supported on the bottom of the furnace after the test was completed.

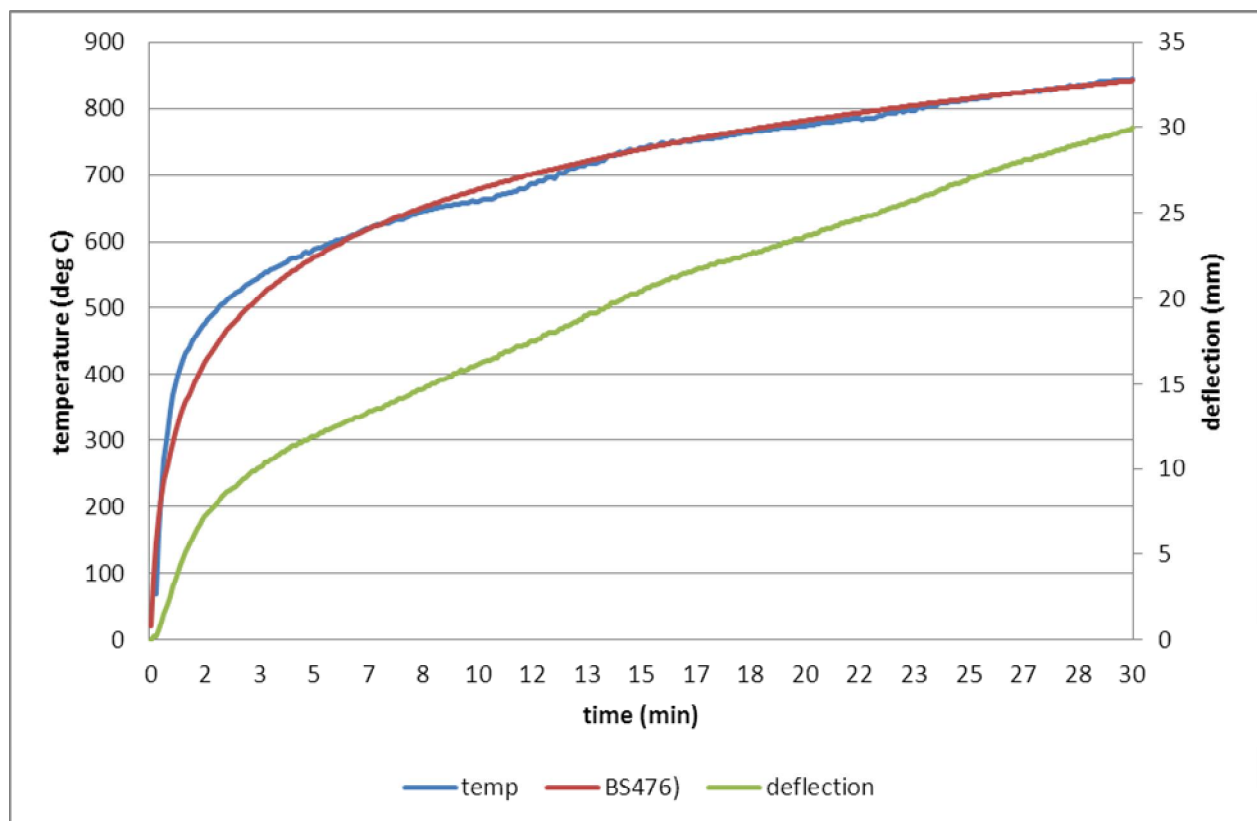


Figure 5 Results from Group 1 test 1

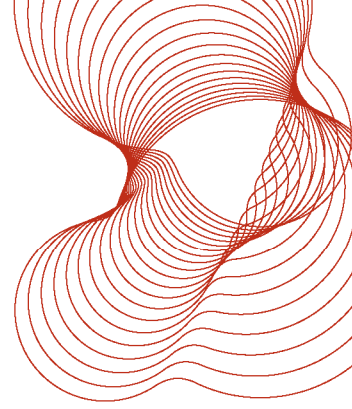
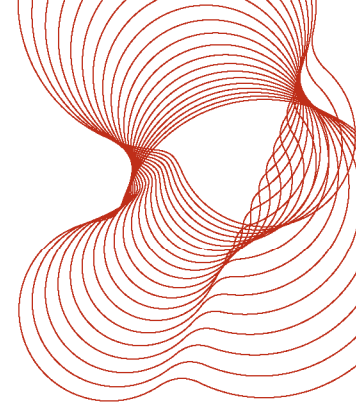


Figure 6 Fixings on removal from the furnace



Figure 7 Sample supported on bottom of the furnace at the end of the test



Group 1 Test 2 Gripple Trapeze Plus No. 3 unit with 90° eyelet end fixing 45kg load 30 minutes fire exposure

The results from the second test are shown in Figure 8. Again there is good agreement between the measured temperature within the furnace and the standard fire curve. The system supported the load for the duration of the test. The maximum deflection was approximately 76mm at 30 minutes. The sample is shown on removal from the furnace in Figure 9.

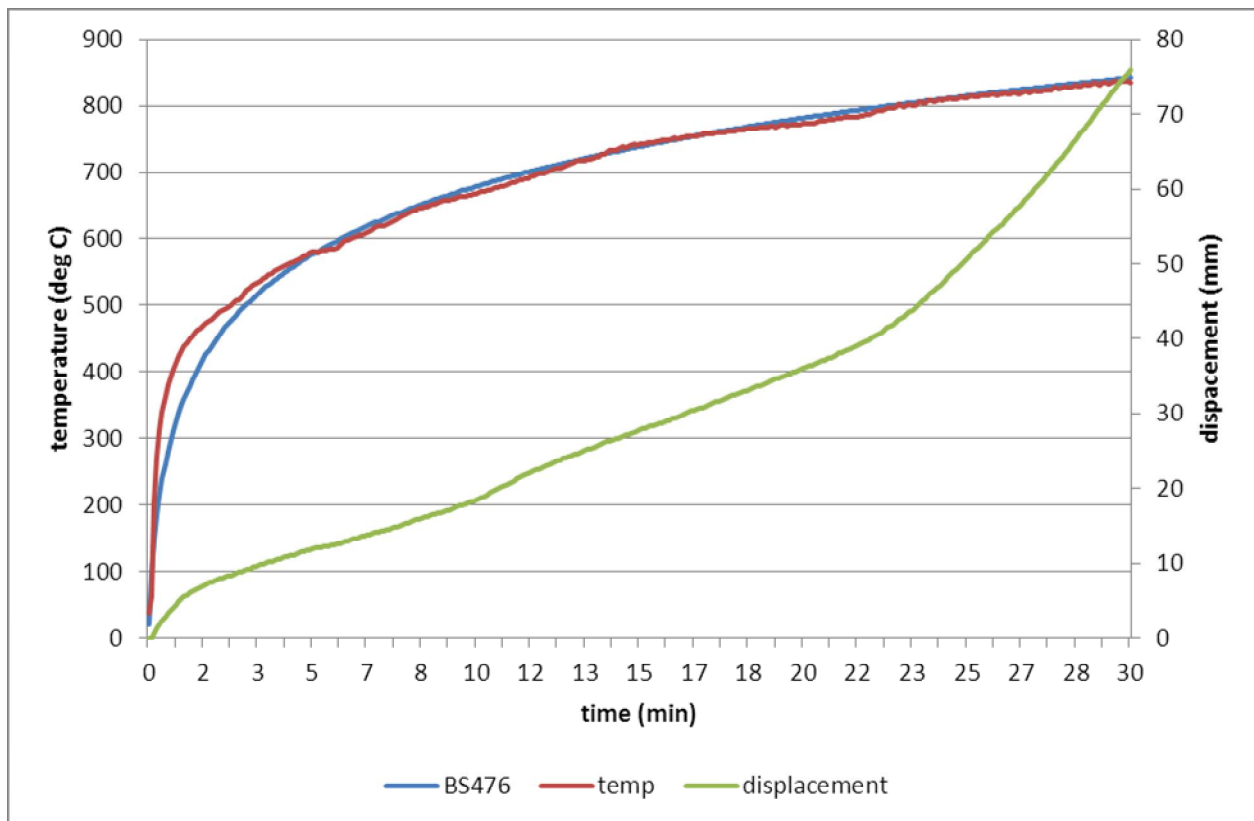


Figure 8 Results from Group 1 test 2

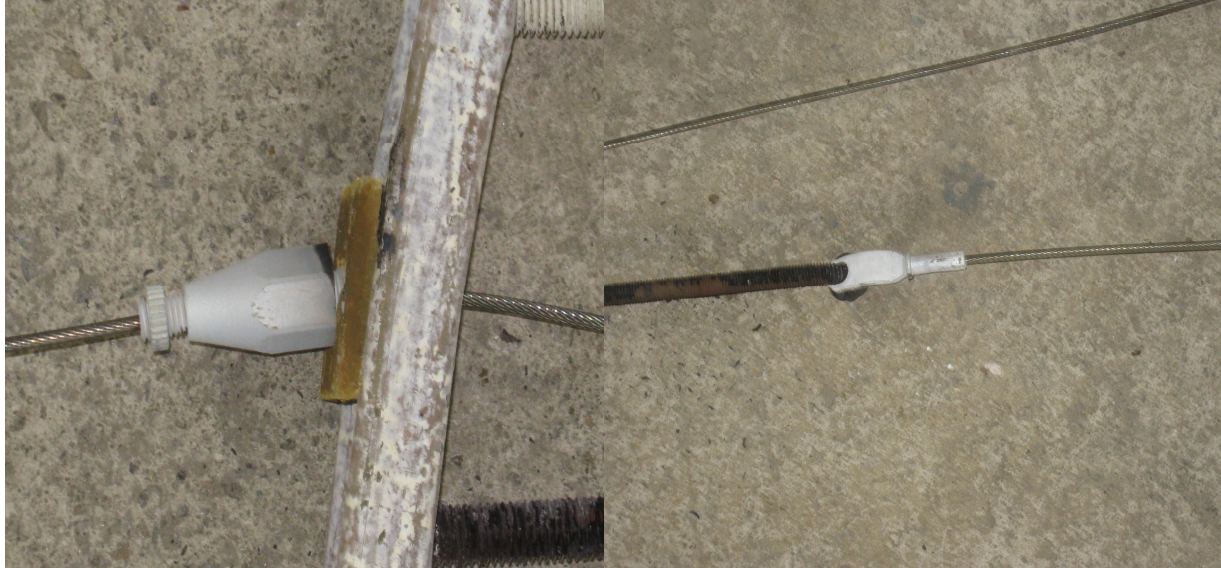
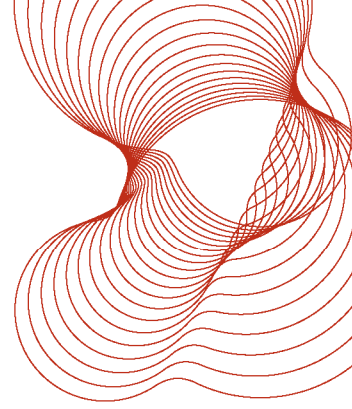


Figure 9 Fixings on removal from the furnace

Group 1 Test 3 Gripple Trapeze Plus No. 3 unit with straight eyelet connector 45kg load 30 minutes fire exposure

The results from the third test are shown in Figure 10. The system supported the load for the duration of the test. The maximum deflection was approximately 77mm at 30 minutes. The sample is shown on removal from the furnace in Figure 11.

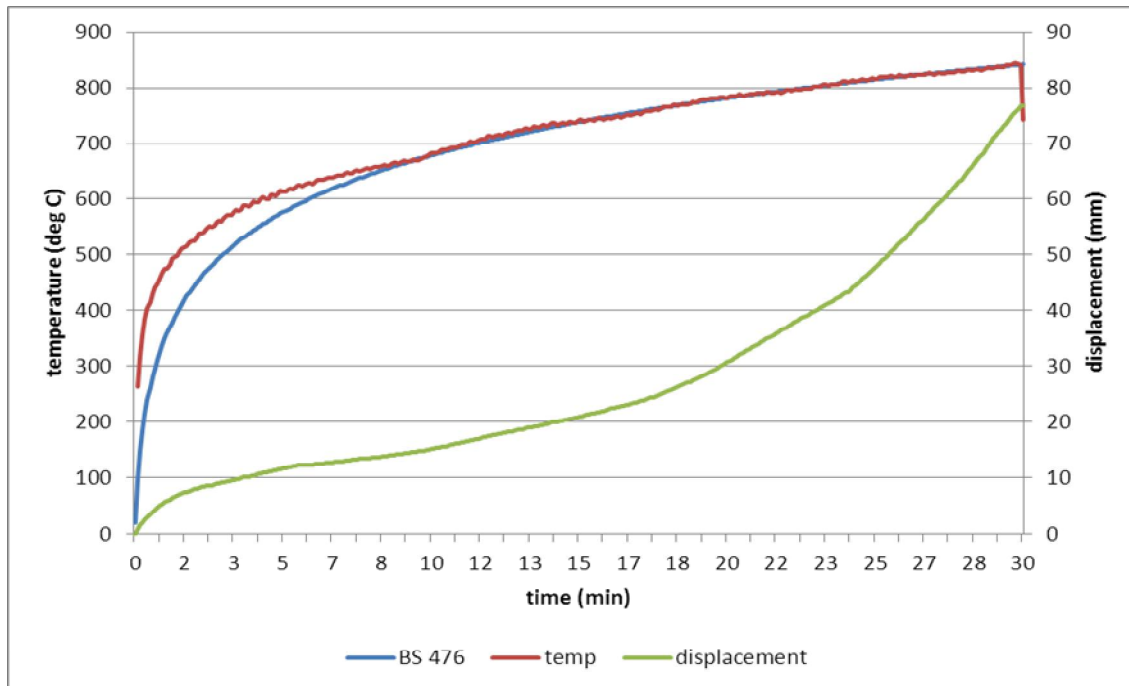


Figure 10 Results from Group 1 test 3

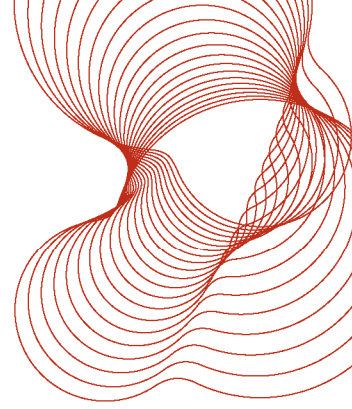


Figure 11 Fixings on removal from the furnace

Group 2 Test 1 Threaded connector 20kg load 60 minutes fire exposure

The results from the fourth test are summarised in Figure 12.

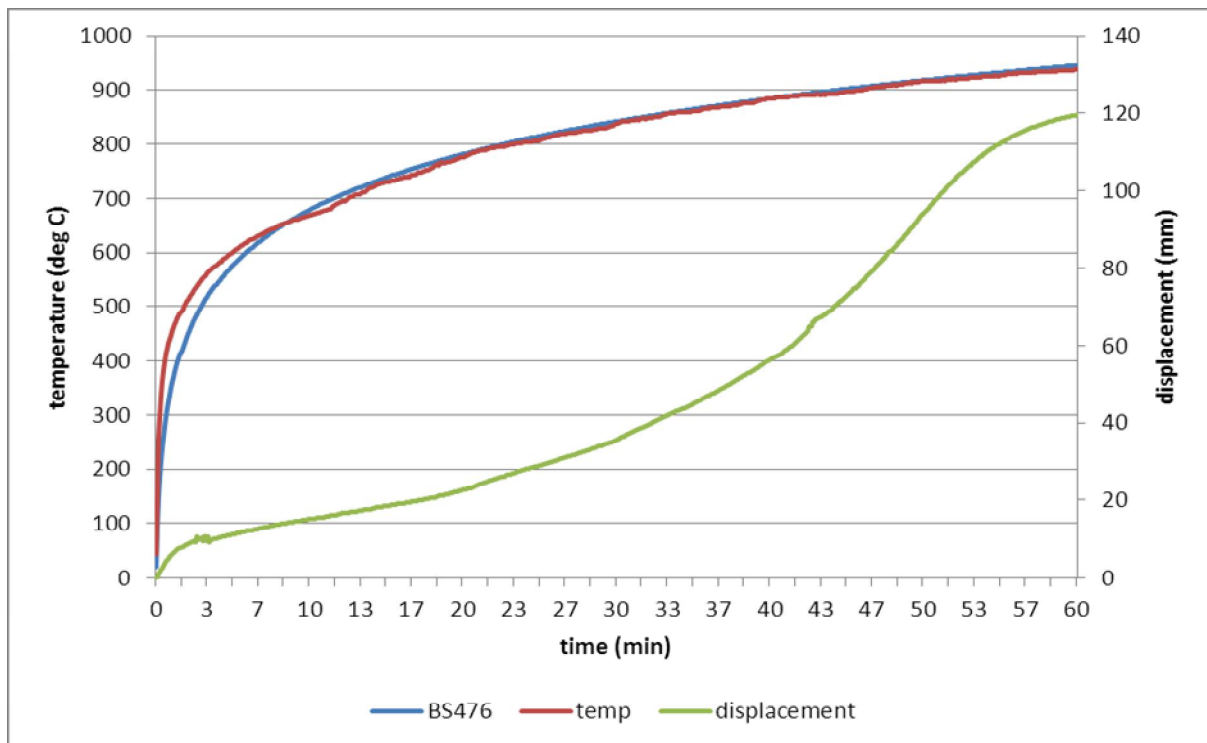
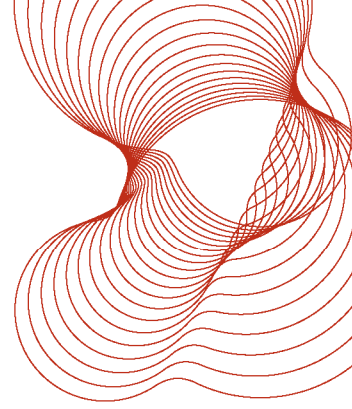


Figure 12 Results from Group 2 test 1



The system supported the load for the duration of the test. The maximum deflection was approximately 120mm at 60 minutes. The sample is shown on removal from the furnace in Figure 13.



Figure 13 Fixings on removal from the furnace

Group 2 Test 2 Gripple Trapeze Plus No. 3 unit with 90° eyelet end fixing 20kg load 60 minutes fire exposure

The results for the fifth test are summarised in Figure 14. The system supported the load for the duration of the test. The maximum deflection was approximately 118mm at 60 minutes. There is no clear reason for the increase in deflection between 48 and 49 minutes into the test although it may have been caused by deformation of the loading frame. The sample is shown on removal from the furnace in Figure 15. In this case the test was continued until failure which occurred at 69 minutes.

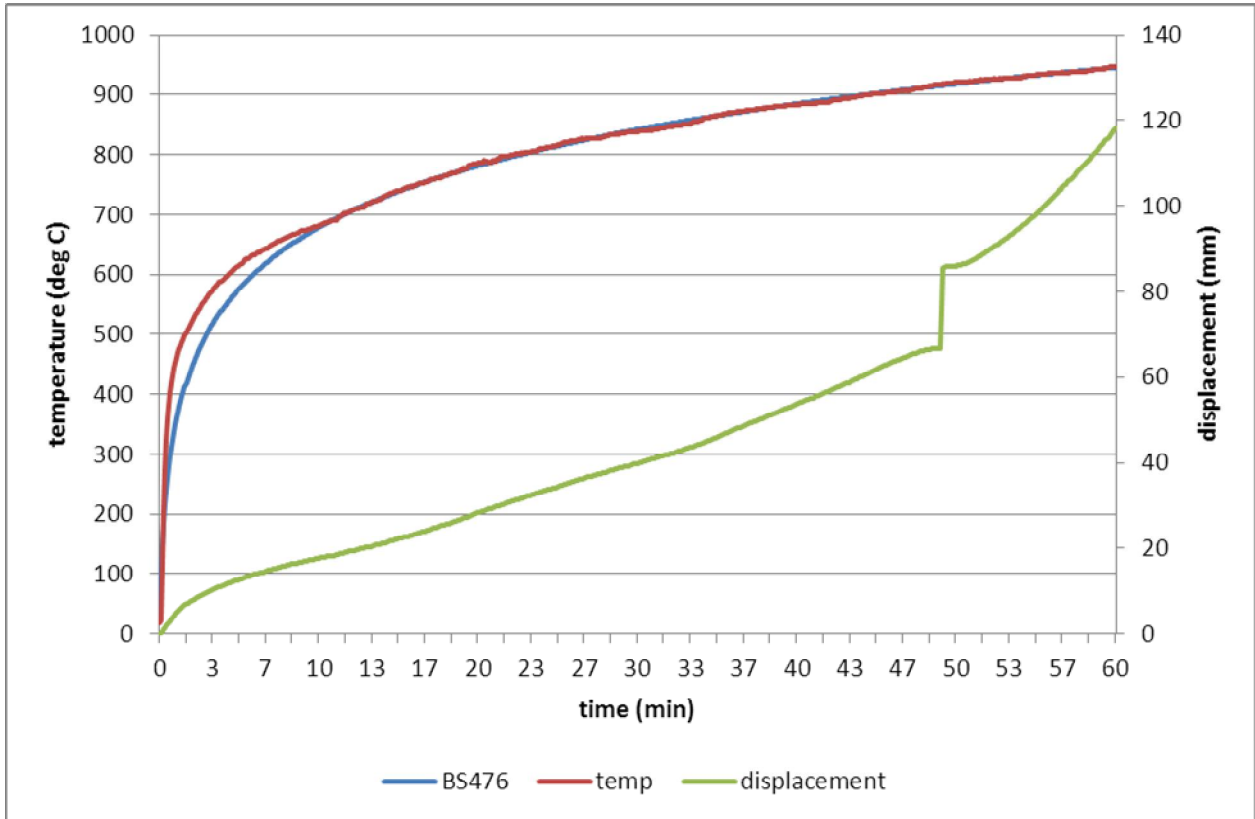
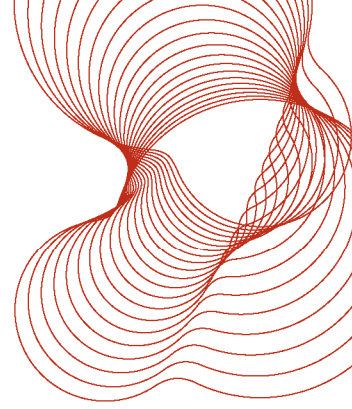
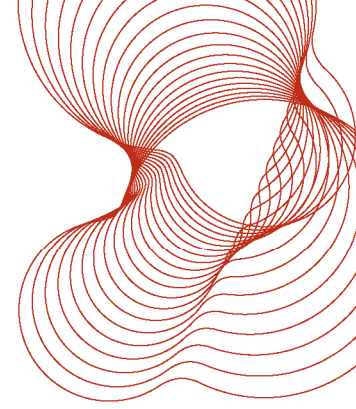


Figure 14 Results from Group 2 test 2



Figure 15 Fixings on removal from furnace



Group 2 Test 3 Gripple Trapeze Plus No. 3 unit with straight eyelet 20kg load 60 minute fire exposure

The results for the sixth test are summarised in Figure 16. There were problems with the data logging system for this test. The displacement transducer stopped recording after approximately 15 minutes and all communication with the data logging system was lost after approximately 23 minutes. The test was continued for 60 minutes. The system supported the load for the duration of the test. The sample is shown on removal from the furnace in Figure 17.

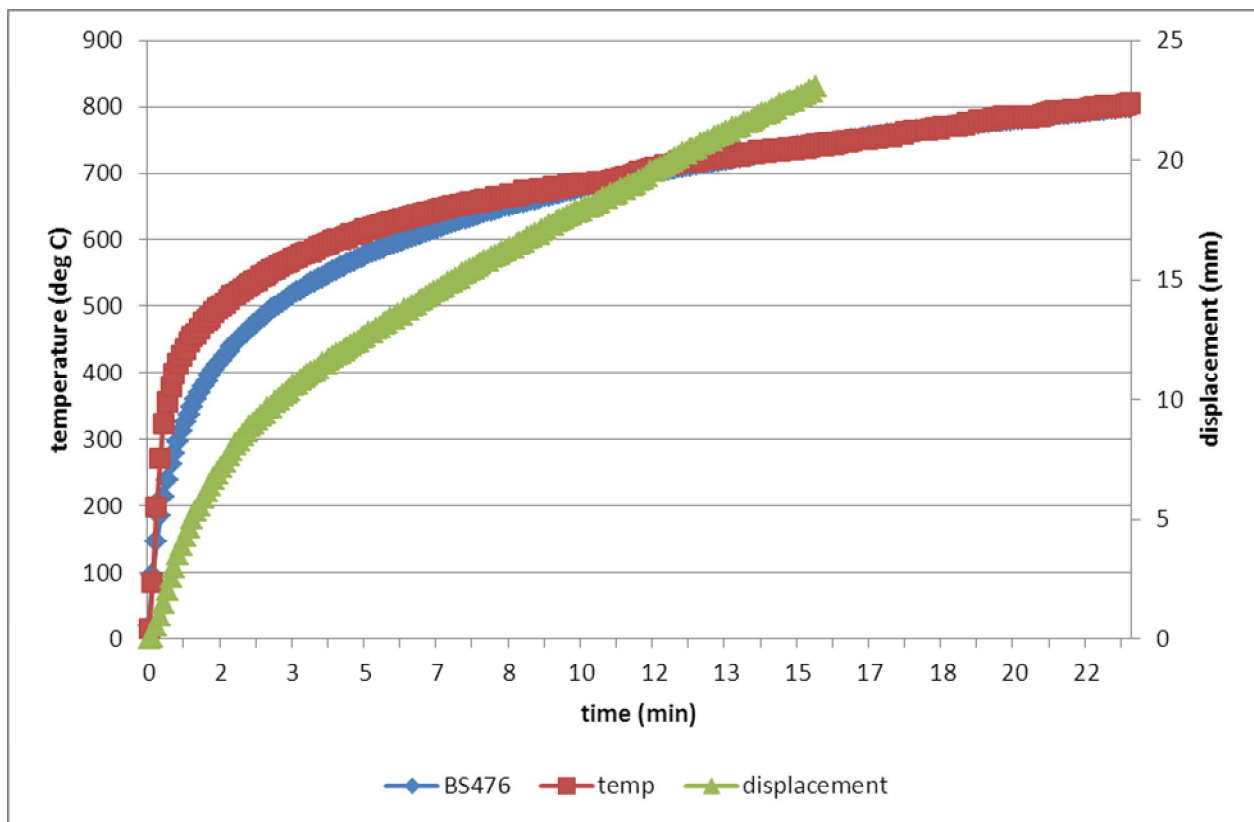


Figure 16 Results from Group 2 test 3

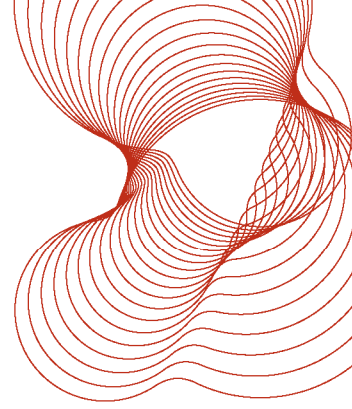


Figure 17 Fixings on removal from the furnace

Group 3 Test 1 Gripple Trapeze Plus No. 3 unit with M8 stud end fixing 10kg load 90 minutes fire exposure

The results for the seventh test are summarised in Figure 18. The maximum deflection is approximately 86mm at 90 minutes. The system supported the load for the duration of the test. The sample is shown within the furnace in Figure 19.

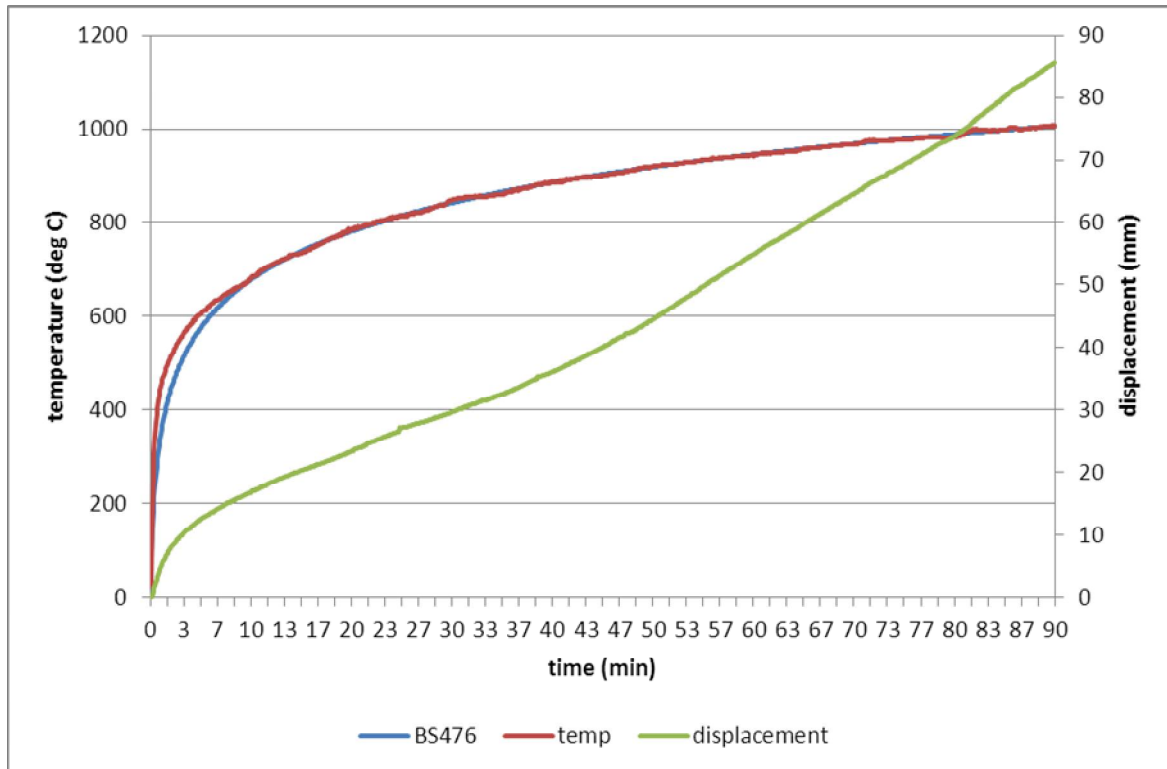
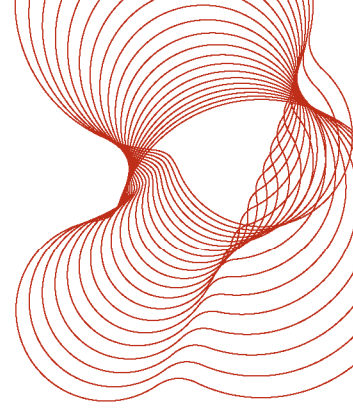


Figure 18 Results from Group 3 test 1

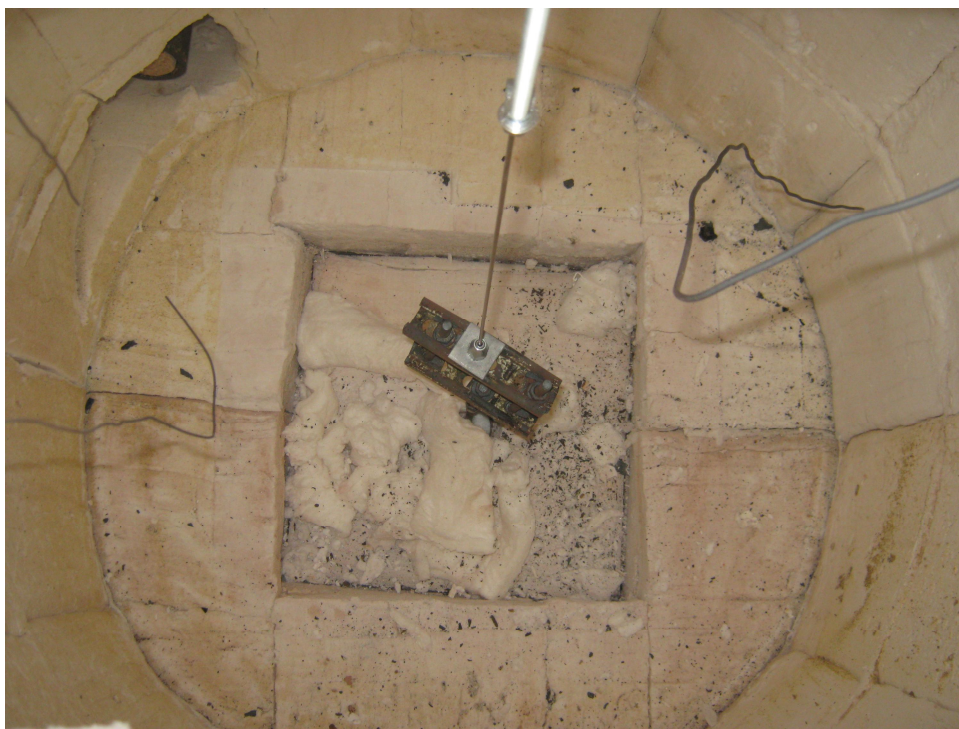
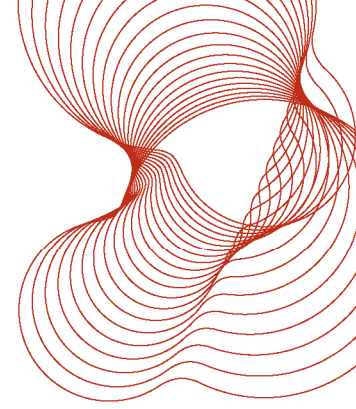


Figure 19 Sample within the furnace



Group 3 Test 2 Gripple Trapeze Plus No. 3 unit with 90° eyelet end fixing 10kg load 90 minutes fire exposure

The results from the eighth test are summarised in Figure 20. The system supported the load for the duration of the test. The maximum deflection was approximately 101mm at 90 minutes. The sample is shown within the furnace in figure 21.

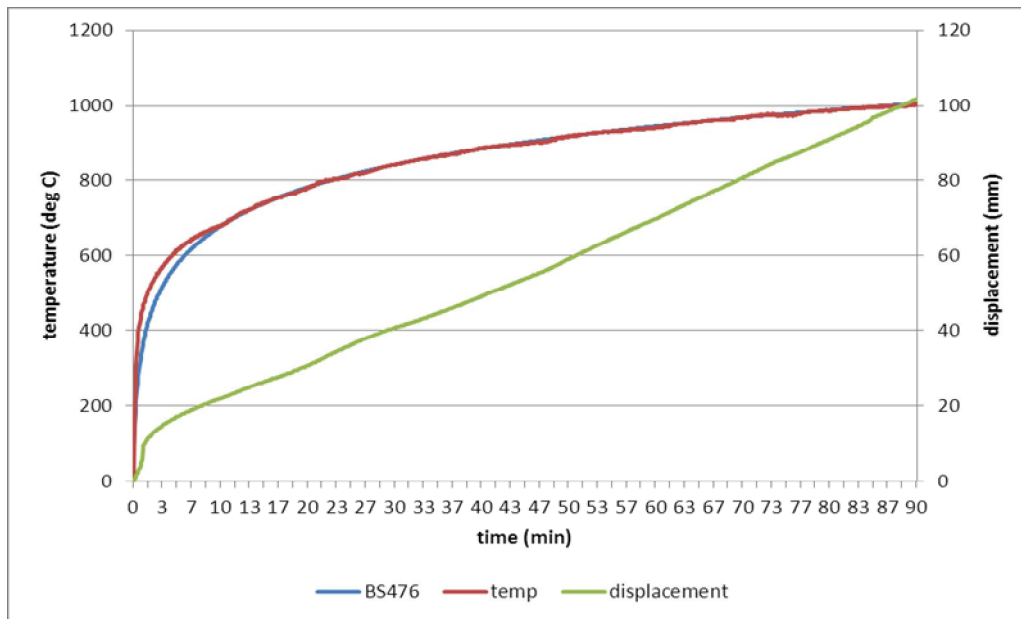
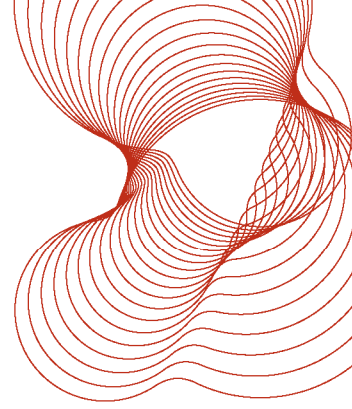


Figure 20 Results from test 8



Figure 21 Sample within the furnace



Group 3 Test 3 Gripple Trapeze Plus No. 3 unit with straight eyelet end fixing 10kg load 90 minutes fire resistance

The results from the ninth test are summarised in Figure 22. The maximum deflection is approximately 89mm at 90 minutes. The sample is shown on removal from the furnace in Figure 23.

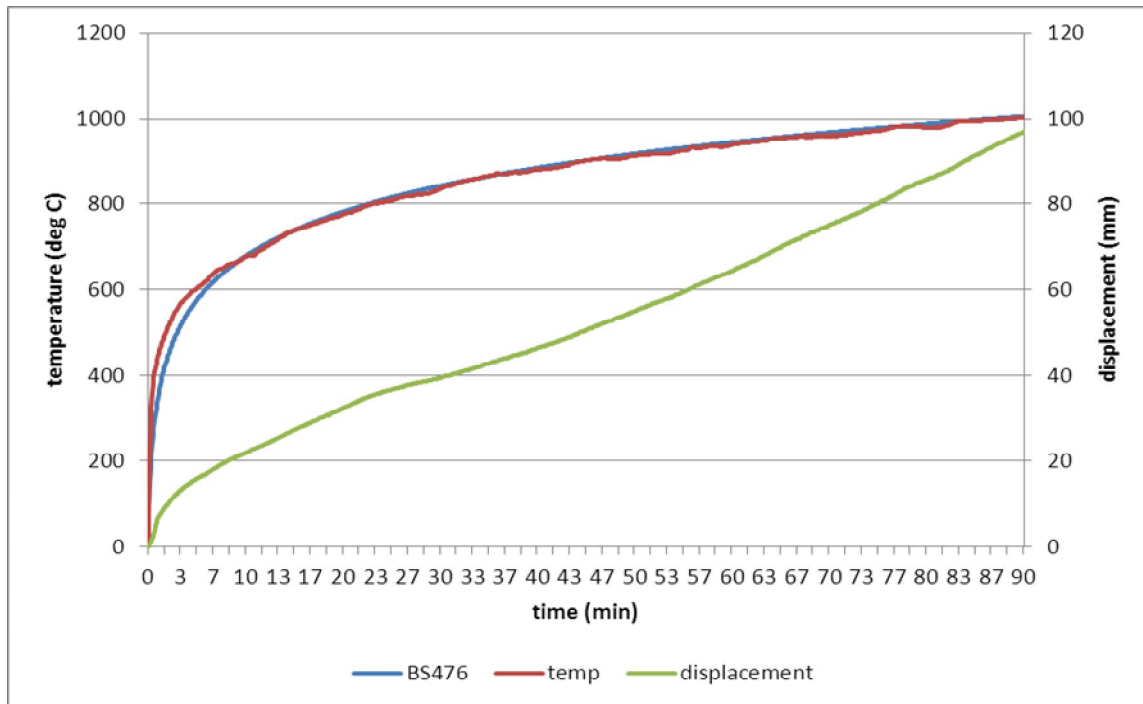
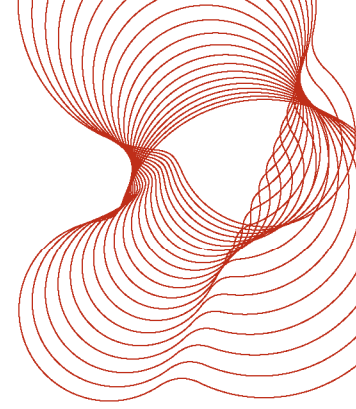


Figure 22 Results from Group 3 test 3



Figure 23 Fixings on removal from the furnace

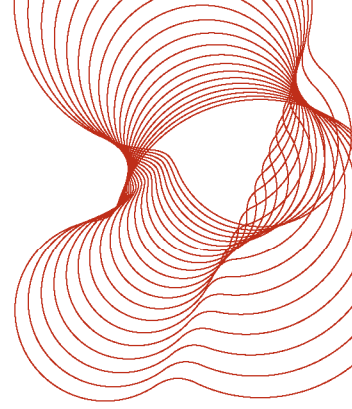


Results summary

A total of nine fire tests have been undertaken on a wire rope suspension system incorporating a “gripple” connector at one end and a variety of different fixing systems at the other end. In each case the fixings, incorporating a length of wire rope, were suspended from a supporting frame, put under load and subject to a heating regime corresponding to a specified exposure to the standard fire curve. The results from the experimental programme are summarised in Table 2.

Test ref.	Description	Applied load (kg)	Maximum extension (mm)	Approximate exposed wire length (mm)	Comments
1/1	Gripple Trapeze Plus No. 3 unit with M8 stud end fixing	45	29.96	750	Test terminated at 30 minutes. Load supported by furnace floor.
1/2	Gripple Trapeze Plus No. 3 unit with 90° eyelet end fixing	45	75.84	500	Test terminated at 30 minutes
1/3	Gripple Trapeze Plus No. 3 unit with straight eyelet end fixing	45	76.71	500	Test terminated at 30 minutes
2/1	Gripple Trapeze Plus No. 3 unit with M8 stud end fixing	20	119.64	500	Test terminated at 60 minutes
2/2	Gripple Trapeze Plus No. 3 unit with 90° eyelet end fixing	20	118.3	500	Test terminated at 60 minutes
2/3	Gripple Trapeze Plus No. 3 unit with straight eyelet end fixing	20	-	500	Test terminated at 60 minutes
3/1	Gripple Trapeze Plus No. 3 unit with M8 stud end fixing	10	85.63	500	Test terminated at 90 minutes
3/2	Gripple Trapeze Plus No. 3 unit with 90° eyelet end fixing	10	101.86	500	Test terminated at 90 minutes
3/3	Gripple Trapeze Plus No. 3 unit with straight eyelet end fixing	10	96.97	500	Test terminated at 90 minutes

Table 2 Summary of test results



References

1. British Standards Institution, BS 476-20:1987, Fire tests on building materials and structures – Part 20: Method for the determination of the fire resistance of elements of construction (general principles), BSI, London, 1987
2. DIN 4102 Part 2, Fire Behaviour of Building Materials and Components, Building components, Definitions, Requirements and Tests, Deutsche Normen, Berlin, September 1977