Test Report

Report No	247/7341938 Issue 3 This Report consists of 14 pages
Client	Morelock Signs Limited Morelock House Strawberry Lane Willenhall West Midlands WV13 3RS
Authority & date	Order Number BSI Estimate 0000191822 Dated 12 March 2009
Items tested	MP – GRP Substrate Material
Specification	BS EN 12899-1 : 2007, for clauses 4.1.1.3, 4.1.1.4, 4.1.1.5.1 (4.1.1.5.3 only) and 4.1.2 In addition the client required testing to the corrosion test as detailed in BS EN 12899-1:2001 clause 5.3.5.
Results	The sample submitted complied with all relevant applicable clauses of BS EN 12899-1 Issue 3 of this Report supersedes all previous issues. The amendment giving rise to this issue of the Report can be ascertained by contacting the authorizing signatory
Prepared by	N. Debrick Technician Engineer
Authorized by	P R Overington Project Leader, Lighting Technology
Issue Date	08 December 2009
Conditions of issue	This Test Report is issued subject to the conditions stated in current issue of *CPO322 C*onditions of contract for testing'. The results contained herein apply only to the particular sample/s tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of the Managing Director, BSI, who reserves the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

1. INTRODUCTION

Twenty four mounted samples of different sheeting material. High Intensity Prismatic (HIP), Diamond Grade (DG), HI Glass Beaded (HI Glass Beaded) and Permanent Engineering Grade (Perm. Eng. Grade) Micro Prismatic retroreflective sign face material mounted on MP-GRP Substrate were submitted on 14 April 2009 for testing based on BS EN 12899-1 : 2007, for clauses 4.1.1.3, 4.1.1.4, 4.1.1.5.1 (4.1.1.5.3 only) and 4.1.2

In addition the client required testing to the corrosion test as detailed in BS EN 12899-1:2001 clause 5.3.5.

1.1 Samples Submitted

The samples submitted were as detailed below

MP-GRP Substrate for all samples

Batch Numbers Used for BS EN 12899:2007: Including Accelerated Non-natural Weathering

GRP/GB/R/1 – HI Glass Beaded Red Sample 1 – Used for Artificial Weathering
GRP/GB/W/1 – HI Glass Beaded White Sample 1 – Used for Artificial Weathering
GRP/GB/R/3 – HI Glass Beaded Red Sample 3 – Used for Salt Spray Endurance
GRP/GB/W/3 – HI Glass Beaded White Sample 3 – Used for Salt Spray Endurance
GRP/GB/R/4 – HI Glass Beaded Red Sample 4 – Impact Resistance
GRP/GB/W/4 – HI Glass Beaded White Sample 4 – Impact Resistance

GRP/Eng/R/1 – Perm. Eng. Grade Red Sample 1 – Used for Artificial Weathering
GRP/Eng/W/1 – Perm. Eng. Grade White Sample 1 – Used for Artificial Weathering
GRP/Eng/R/3 – Perm. Eng. Grade Red Sample 3 – Used for Salt Spray Endurance
GRP/Eng/W/3 – Perm. Eng. Grade White Sample 3 – Used for Salt Spray Endurance
GRP/Eng/R/4 – Perm. Eng. Grade Red Sample 4 – Impact Resistance
GRP/Eng/W/4 – Perm. Eng. Grade White Sample 4 – Impact Resistance

GRP/DG/R/1 - DG^3 Red Sample 1 – Used for Artificial Weathering
GRP/DG/W/1 - DG^3 White Sample 1 – Used for Artificial Weathering
GRP/DG/R/3 - DG^3 Red Sample 3 – Used for Salt Spray Endurance
GRP/DG/W/3 - DG^3 White Sample 3 – Used for Salt Spray Endurance
GRP/DG/R/4 - DG^3 Red Sample 4 – Impact Resistance
GRP/DG/W/4 - DG^3 White Sample 4 – Impact Resistance

GRP/HIP/R/1 – HIP Red Sample 1 – Used for Artificial Weathering
GRP/HIP/W/1 – HIP White Sample 1 – Used for Artificial Weathering
GRP/HIP/R/3 – HIP Red Sample 3 – Used for Salt Spray Endurance
GRP/HIP/W/3 – HIP White Sample 3 – Used for Salt Spray Endurance
GRP/HIP/R/4 – HIP Red Sample 4 – Impact Resistance
GRP/HIP/W/4 – HIP White Sample 4 – Impact Resistance

NOTE: Samples numbered 2 used for 3 years Natural Weathering which will be covered under BSI Report 247/7342274

2. TESTS

The tests were commenced 14 April 2009 and were based upon the procedures in BS EN 12899-1: 2007 and BS EN 12899-1:2001 as relevant.

For the photometric tests the results have been corrected to give the measured values in cd/lux/m^2 .

3. RESULTS

The results obtained are detailed on the following pages.

Clause 4.1.1.4 Coefficient of Retroreflection Before Tests

HI Glass Beaded

Entrance angle	**5°**			**30°**			**40°**		
Observation angle	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**
GRP/GB/R/1	55.0	42.6	1.4	43.0	34.6	1.0	28.0	23.7	0.8
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/GB/W/1	239	177	5.25	203	154	4.2	144	114	3.0
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
GRP/GB/R/3	56.2	43.4	1.42	45.9	36.3	1.10	32.2	26.6	0.86
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/GB/W/3	240	176	5.02	200	153	3.8	136	111	3.0
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
GRP/GB/R/4	54.7	42.3	1.3	44.2	35.0	1.0	49.9	24.7	0.8
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/GB/W/4	240	179	5.2	240	156	4.2	147	118	3.2
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5

Prem. Eng. Grade

Entrance angle	**5°**			**30°**			**40°**		
Observation angle	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**
GRP/Eng/R/1	25.9	20.1	2.2	12.6	11.0	1.8	4.6	4.3	1.3
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/Eng/W1	96.8	73.4	7.5	49.9	42.9	6.1	20.2	18.3	4.6
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
GRP/Eng/R/3	24.9	19.5	2.1	12.1	10.6	1.6	4.6	4.2	1.2
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/Eng/W/3	94.0	71.2	7.6	49.8	42.7	6.1	20.3	18.3	4.6
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
GRP/Eng/R/4	24.5	18.7	2.3	12.8	11.1	1.8	5.2	4.7	1.4
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/Eng/W/4	94.4	70.8	7.7	50.2	43.1	6.2	50.5	18.6	4.7
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5

DG^3

Entrance angle	**5°**			**30°**			**40°**		
Observation angle	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**
GRP/DG/R/1	105	147	3.7	27.8	19.2	1.1	18.6	11.4	0.8
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/DG/W/1	496	580	18.1	115	100	4.7	79.2	48.9	3.5
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
GRP/DG/R/3	110	150	3.9	33.2	23.9	1.1	22.7	14.3	0.8
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/DG/W/3	500	576	18.0	119	102	4.6	83.6	51.2	3.5
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
GRP/DG/R/4	110	150	3.9	32.2	23.1	1.1	21.8	13.6	0.8
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/DG/W/4	498	578	17.9	115	99.6	4.5	83.6	51.0	3.6
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5

HIP

Entrance angle	**5°**			**30°**			**40°**		
Observation angle	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**
GRP/HIP/R/1	118	103	1.3	86.8	34.1	0.7	64.0	28.2	0.7
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/HIP/W/1	419	487	8.6	291	126	5.5	248	107	3.8
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
GRP/HIP/R/3	110	92.0	1.2	80.4	30.9	0.7	60.0	26.6	0.7
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/HIP/W/3	472	550	9.40	314	152	4.8	251	116	4.1
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
GRP/HIP/R/4	112	94.0	1.1	82.4	32.5	0.7	62.8	28.2	0.7
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
GRP/HIP/W/4	439	501	9.0	303	132	5.8	242	108	4.0
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5

Note: Specification limits are included for information purposes only

3M EC RETROREFLECTIVE MATERIAL

Clause 4.1.1.3 Daylight appearance of retroreflective signs Before Tests

Colour	Code	Chromaticity		
Red	GRP/GB/R/1	x = 0.633	y = 0.317	z = 0.056
White	GRP/GB/W/1	x = 0.309	y = 0.329	z = 0.362
Red	GRP/GB/R/3	x = 0.628	y = 0.322	z = 0.050
White	GRP/GB/W/3	x = 0.310	y = 0.329	z = 0.361
Red	GRP/GB/R/4	x = 0.636	y = 0.316	z = 0.048
White	GRP/GB/W/4	x = 0.310	y = 0.330	z = 0.360
Red	GRP/Eng/R/1	x = 0.638	y = 0.336	z = 0.026
White	GRP/Eng/W/1	x = 0.309	y = 0.327	z = 0.364
Red	GRP/Eng/R/3	x = 0.640	y = 0.336	z = 0.024
White	GRP/Eng/W/3	x = 0.309	y = 0.327	z = 0.364
Red	GRP/Eng/R/4	x = 0.641	y = 0.336	z = 0.023
White	GRP/Eng/W/4	x = 0.308	y = 0.326	z = 0.366
Red	GRP/DG/R/1	x = 0.663	y = 0.314	z = 0.023
White	GRP/DG/W/1	x = 0.313	y = 0.334	z = 0.353
Red	GRP/DG/R/3	x = 0.668	y = 0.313	z = 0.019
White	GRP/DG/W/3	x = 0.314	y = 0.335	z = 0.351
Red	GRP/DG/R/4	x = 0.666	y = 0.313	z = 0.021
White	GRP/DG/W/4	x = 0.313	y = 0.335	z = 0.352
Red	GRP/HIP/R/1	x = 0.651	y = 0.310	z = 0.039
White	GRP/HIP/W/1	x = 0.320	y = 0.338	z = 0.340
Red	GRP/HIP/R/3	x = 0.645	y = 0.309	z = 0.046
White	GRP/HIP/W/3	x = 0.316	y = 0.335	z = 0.349
Red	GRP/HIP/R/4	x = 0.648	y = 0.310	z = 0.042
White	GRP/HIP/W/4	x = 0.319	y = 0.337	z = 0.344

4.1.1.3 Daylight appearance of retroreflective signs Before Tests

Luminance factor ß

Colour	Code	Measured value	BS EN 12899-1 Limits Table 3	BS EN 12899-1 Limits Table 4
Red	GRP/GB/R/1	0.04	≥ 0.05	≥ 0.03
White	GRP/GB/W/1	0.40	≥ 0.35	≥ 0.27
Red	GRP/GB/R/3	0.04	≥ 0.05	≥ 0.03
White	GRP/GB/W/3	0.31	≥ 0.35	≥ 0.27
Red	GRP/GB/R/4	0.04	≥ 0.05	≥ 0.03
White	GRP/GB/W/4	0.31	≥ 0.35	≥ 0.27
Red	GRP/Eng/R/1	0.06	≥ 0.05	≥ 0.03
White	GRP/Eng/W/1	0.31	≥ 0.35	≥ 0.27
Red	GRP/Eng/R/3	0.07	≥ 0.05	≥ 0.03
White	GRP/Eng/W/3	0.41	≥ 0.35	≥ 0.27
Red	GRP/Eng/R/4	0.07	≥ 0.05	≥ 0.03
White	GRP/Eng/W/4	0.41	≥ 0.35	≥ 0.27
Red	GRP/DG/R/1	0.04	≥ 0.05	≥ 0.03
White	GRP/DG/W/1	0.33	≥ 0.35	≥ 0.27
Red	GRP/DG/R/3	0.04	≥ 0.05	≥ 0.03
White	GRP/DG/W/3	0.32	≥ 0.35	≥ 0.27
Red	GRP/DG/R/4	0.04	≥ 0.05	≥ 0.03
White	GRP/DG/W/4	0.34	≥ 0.35	≥ 0.27
Red	GRP/HIP/R/1	0.03	≥ 0.05	≥ 0.03
White	GRP/HIP/W/1	0.38	≥ 0.35	≥ 0.27
Red	GRP/HIP/R/3	0.03	≥ 0.05	≥ 0.03
White	GRP/HIP/W/3	0.37	≥ 0.35	≥ 0.27
Red	GRP/HIP/R/4	0.03	≥ 0.05	≥ 0.03
White	GRP/HIP/W/4	0.38	≥ 0.35	≥ 0.27

Clause 4.1.1.4

Coefficient of Retroreflection After Weathering and Corrosion

HI Glass Beaded

Entrance angle	**5°**			**30°**			**40°**		
Observation angle	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**
After Weathering									
GRP/GB/R/1	21.7	16.8	**0.5**	16.7	13.4	0.4	11.6	9.9	0.3
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
After Weathering									
GRP/GB/W/1	99.6	73.4	**2.2**	83.2	63.6	**1.7**	64.4	51.5	**1.4**
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
After Corrosion									
GRP/GB/R/3	52.9	40.9	1.3	43.0	34.2	1.0	29.4	24.3	0.8
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
After Corrosion									
GRP/GB/W/3	226	167	**4.7**	188	144	3.6	124	101	2.8
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5

Prem. Eng. Grade

Entrance angle	**5°**			**30°**			**40°**		
Observation angle	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**
After Weathering									
GRP/Eng/R/1	**8.9**	**6.9**	1.0	4.9	4.2	0.7	2.1	2.0	0.6
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
After Weathering									
GRP/Eng/W1	**34.1**	**26.1**	**3.3**	**19.7**	**16.8**	2.5	**9.4**	**8.5**	2.0
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
After Corrosion									
GRP/Eng/R/3	22.0	17.6	1.9	10.2	9.0	1.4	3.9	3.5	1.0
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
After Corrosion									
GRP/Eng/W/3	87.6	67.4	6.9	44.0	37.9	5.5	18.6	16.8	4.1
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5

DG^3

Entrance angle	**5°**			**30°**			**40°**		
Observation angle	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**
After Weathering									
GRP/DG/R/1	48.8	68.4	1.7	12.5	8.7	0.4	9.2	5.6	0.4
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
After Weathering									
GRP/DG/W/1	223	258	7.8	54	46	**2.0**	41.8	25.4	1.7
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
After Corrosion									
GRP/DG/R/3	107	146	4.2	34.0	24.1	1.2	23.7	14.8	0.8
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
After Corrosion									
GRP/DG^3/W/3	479	576	20	130	107	4.8	99.2	58.7	3.8
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5

HIP

Entrance angle	**5°**			**30°**			**40°**		
Observation angle	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**	**12'**	**20'**	**2°**
After Weathering									
GRP/HIP/R/1	44.8	40.1	**0.5**	33.1	13.2	0.2	26.9	11.9	0.3
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
After Weathering									
GRP/HIP/W/1	189	217	4.1	132	56.7	2.4	119	51.8	1.8
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5
After Corrosion									
GRP/HIP/R/3	115	97.2	1.2	84.0	32.7	0.7	66.1	29.4	0.7
RA1 Limits	10.1	7	0.7	4.2	2.8	0.3	1.4	1.2	0.3
RA2 Limits	31.5	17.5	0.7	17.5	9.8	0.2	10.5	9.1	0.2
After Corrosion									
GRP/HIP/W/3	527	590	9.2	349	171	4.6	308	145	4.5
RA1 Limits	70	50	5	30	24	2.5	10	9	1.5
RA2 Limits	250	180	5	150	100	2.5	110	95	1.5

Note: Specification limits are included for information purposes only
Note: The retroreflection was measured after corrosion for information purposes only
Note:- Failure points are in bold

3M EC RETROREFLECTIVE MATERIAL

Clause

4.1.1.3 Daylight appearance of retroreflective signs after weathering and corrosion

Colour	Code	Chromaticity		
Red	GRP/GB/R/1	x = 0.604	y = 0.319	z = 0.077
White	GRP/GB/W/1	x = 0.311	y = 0.331	z = 0.358
Red	GRP/GB/R/3	x = 0.575	y = 0.323	z = 0.102
White	GRP/GB/W/3	x = 0.309	y = 0.328	z = 0.309
Red	GRP/Eng/R/1	x = 0.622	y = 0.336	z = 0.042
White	GRP/Eng/W/1	x = 0.314	y = 0.331	z = 0.355
Red	GRP/Eng/R/3	x = 0.559	y = 0.335	z = 0.106
White	GRP/Eng/W/3	x = 0.310	y = 0.329	z = 0.361
Red	GRP/DG/R/1	x = 0.625	y = 0.323	z = 0.052
White	GRP/DG/W/1	x = 0.314	y = 0.333	z = 0.353
Red	GRP/DG/R/3	x = 0.635	y = 0.315	z = 0.050
White	GRP/DG/W/3	x = 0.313	y = 0.332	z = 0.355
Red	GRP/HIP/R/1	x = 0.576	y = 0.311	z = 0.113
White	GRP/HIP/W/1	x = 0.311	y = 0.330	z = 0.359
Red	GRP/HIP/R/3	x = 0.598	y = 0.316	z = 0.086
White	GRP/HIP/W/3	x = 0.313	y = 0.330	z = 0.357

4.1.1.3 Daylight appearance of retroreflective signs

Luminance factor ß

Colour	Code	Measured value	BS EN 12899-1 Limits Table 3	BS EN 12899-1 Limits Table 4
Red	GRP/GB/R/1	0.04	≥ 0.05	≥ 0.03
White	GRP/GB/W/1	0.32	≥ 0.35	≥ 0.27
Red	GRP/GB/R/3	0.05	≥ 0.05	≥ 0.03
White	GRP/GB/W/3	0.33	≥ 0.35	≥ 0.27
Red	GRP/Eng/R/1	0.07	≥ 0.05	≥ 0.03
White	GRP/Eng/W/1	0.40	≥ 0.35	≥ 0.27
Red	GRP/Eng/R/3	0.11	≥ 0.05	≥ 0.03
White	GRP/Eng/W/3	0.52	≥ 0.35	≥ 0.27
Red	GRP/DG/R/1	0.05	≥ 0.05	≥ 0.03
White	GRP/DG/W/1	0.39	≥ 0.35	≥ 0.27
Red	GRP/DG/R/3	0.06	≥ 0.05	≥ 0.03
White	GRP/DG/W/3	0.42	≥ 0.35	≥ 0.27
Red	GRP/HIP/R/1	0.04	≥ 0.05	≥ 0.03
White	GRP/HIP/W/1	0.38	≥ 0.35	≥ 0.27
Red	GRP/HIP/R/3	0.04	≥ 0.05	≥ 0.03
White	GRP/HIP/W/3	0.38	≥ 0.35	≥ 0.27

Note: The colour and Luminance factors were measured for the weathering and corrosion tests only

4.1.2 Impact Resistance

GRP/GB/R/4	No Cracking or Delamination
GRP/GB/W/4	No Cracking or Delamination
GRP/Eng/R/4	No Cracking or Delamination
GRP/Eng/W/4	No Cracking or Delamination
GRP/DG/R/4	No Cracking or Delamination
GRP/DG/W/4	No Cracking or Delamination
GRP/HIP/R/4	No Cracking or Delamination
GRP/HIP/W/4	No Cracking or Delamination

Summary of Results

Retroreflection before testing: All samples passed the retroreflection tests before any tests were carried out on the samples.

Colour before testing: All samples passed the colour of retroreflection before any tests were carried out on samples.

Impact testing: All samples passed the Impact test showing no signs of cracking or delamination of the substrate or material.

Corrosion Resistance: All samples passed the salt spray endurance with no signs of cracking or wear to the substrate.

NOTE**:** One sample did fail on one point of the retroreflection but this does not affect the tests, as the substrate material is the test subject.

Accelerated Artificial Non-Natural Weathering: All samples passed the Non-Natural Weathering endurance with no apparent sign of cracking or wear to the substrate.

NOTE: Five samples did fail on points of the retroreflection but this does not affect the tests, as the substrate material is the test subject.

Load testing: BSI recognises the Buchanan Computing software and its compliance with BS EN 12899-1: 2007. Please see letter from client attached to page 14 of this Report.
Morelock signs have commissioned a Report from the University of Salford which adequately demonstrates that the MP-GRP material is capable of meeting the loading requirements of BS EN 12899 when used in a sign designed appropriately.
It will be the responsibility of each sign manufacturer to ensure that their design meets the loading requirements on a case by case basis and this can be verified by calculation using one of the approved software tools available.

Conclusion: The samples submitted complied with all relevant applicable clauses of BS EN 12899 – 1.

Software Declaration

To ensure compliance with BS EN 12899-1: 2007 loading classifications and as necessary, sign support detail are calculated using **SignLoad Professional v2.00**

Buchanan Computing provides the software.

SGS Contact: Peter Downs - Technical Co-ordinator Technical Co-ordinator
e-mail: peter.downs@sgs.com Tel: 01934 529263

As a sign manufacturer, Morelock's quality system has been assessed by SGS for compliance with ISO 9001:2000. We are also pleased to advise you that Morelock have added the more recent National Highway Sector Scheme 9A to our registration scope. Compliance to Sector Scheme 9A has also formally been assessed by SGS.

We would appreciate you confirming receipt of the test samples and providing an estimated time scale for the completion of the testing programme.

If I can be of any further assistance please do not hesitate to contact me.

Yours faithfully
For Morelock Signs Limited

R.G.Fletcher
Quality and Health & Safety Officer

Tel: 01902 637575
Fax: 01902 637576
e-mail: ronf@morelock.co.uk