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Stair - Survey Review

Basement Stairs: 22, 23 Mecklenburgh Square

Design Statement

Goodenough College

September 2017

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Document Details

Client Name: Goodenough College

Document Reference: Basement Stair Survey Houses 22 – 23, Goodenough College

Project Number: 16010

Quality Assurance

This document has been prepared and checked in accordance with CBP Architects IMS (ISO9001:2008)

Issue	Date	Prepared by	Checked by	Approved by
P01	11.09.17	CP	BB	CP

Revision	Comments
P01	Planning issue

Disclaimer

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

Contents

1.0 Introduction:

CBP Architects have been commissioned to carry out a visual assessment of the condition of 2 existing basement staircases to houses, 22 and 23, at Goodenough College, Mecklenburgh Square London WC1N 2AD by CBRE.

In addition, a structural appraisal of the staircases has been carried out by Collins Hall Green, the findings are combined in this report and associated supporting drawings.

The previous use of the properties was as residential and over time the use has changed to become a Hotel.

The main area of concern is the unevenness/ stability of the basement stair treads/ risers serving the lower ground floors, and the stability of the handrails which get heavy usage from the Public and Staff.

Any strengthening or new work to the existing staircases will require to be measured against the modern Building Regulations, and work closely with the Local Planning Department Conservation Officer. This consultation has been carried out with both parties, through Rapleys LLP pre-application advice with London Borough of Camden, with responses dated 26th June 2017. The feedback and comments being incorporated within this document, and on the supporting drawn information.

The report is supported by photographs where relevant to embellish the findings and comments/ conclusions.

1.1 Listed Building Consent and Relevant Historical Information:

The buildings containing the staircases are designated Grade Listed II*.

Early consultation in the form of a pre-application advice enquiry with the Local Planning Authority/ Conservation Officer has been carried out with Sarah Freeman, Conservation Officer at London Borough of Camden and an application for Listed Building Consent will be required for items that require to be removed, replaced, and/ or refurbished/ reinstated.

These reports are intended to indicate where remedial/ removal/ reinstatement and new work/ or management intervention will be required or where further investigations should be undertaken. In addition, the observations and proposed remedial work in these documents, and supporting drawings can be used to engage with the Conservation Officer, Historic England and other Consultee bodies as required.

1.2 Extent of the Review:

The inspection was undertaken in conjunction with a Structural Survey to assess where improvements could be made given the use of the buildings as a Hotel. Areas reviewed included:

- Dimensional differences, tread, rise and handrail heights.
- Stability of the existing handrails.
- Applied finishes installed on the stairs.
- Proposals to integrate reinforcement to the tread, rise and handrail.
- Areas of instability, wear and tear, and stability issues to the stairs as a whole.

No finishes were lifted nor removed to review the substrate or structure of the stairs.

1.3 Executive Summary:

- Following on from the review of the existing stairs to houses 21, 22, 23, 24, and 25, it is noted that the stairs do not conform to Modern current Building Regulation requirements in particular in relation to the vertical balustrade dimensions, baluster gap widths and irregular varied heights in some cases for the stair risers. Detail discussion with the Approved Inspector are taking place, who is assessing the information based on the submitted details for Conservation Officer review.

- In some cases, varying tread and riser dimensions on the same stair flight, coupled with limited bulkhead clearance heights (taken from the stair string) to the lower ground floor and upper floors stairs could form a hazard which requires to be managed/ identified by signage.

- This in the context of the building use originally as Residential but now used as a Hotel where loading requirements to the handrails and balustrades are now double if measured against the Modern Building Regulations.

- The thick carpet finish exacerbates the reduction in the tread and riser depths, as in some cases the stair treads do not support the full foot depth. The stair nosing's cannot be seen defining the end of each tread. The carpet finish is being reviewed with a more user-friendly covering.

- Although the Building Regulations may be relaxed in terms of Listed Buildings and their use, close liaison has taken place with the Approved Inspector as to the proposed remedial works to the stairs and balusters/ balustrades, the details are currently being assessed.

- It is understood the Approved Inspector will review and may make recommendations related to mandatory Fire Protection upgrading and also increase Sound reduction measures to ensure the stairs are compliant. These 2 basement staircases do have a store located under, and appear to be compliant with modern fire protection e.g. plasterboard and skim, but it would be prudent to gain an up to date check with the Fire Officer and The Approved Inspector to ensure as fuller compliance as possible of the stairs under the Building Regulations.

- The existing under store stair fire doors, where they could be reviewed, appeared to modern, with integrated smoke seals and brushes installed. A full audit of the fire doors and internal stair soffits/ walls should be carried out to ensure compliance and that they are fully fire protected.

- In terms of Sound Transmission, Impact and Airborne, this remit appeared to be not an issue with the adjacent rooms. The existing heavy carpet does contribute to sound reduction. Consideration is required if the carpet is to be removed and an alternative surface material installed with the potential impact on increasing the Impact and Airborne sound transmission that this may have on the stairs and surrounding spaces.

- It is anticipated that other remedial works may be negotiated with the Conservation Officer, by maintaining the existing Historic Fabric of the majority of the stairs yet offer practical and integrated reinforcement solutions with integral timber bracing to offer restraint, carry out strengthening/ reinforcement works, add new handrails to the perimeter of the stair wells. Refer to the separate method statement submitted with this application.

- Suggested strengthening and adaptions, minimal intervention have been proposed within the body of this report, with repair work coordinated into the existing context of the historic balustrades where bedded in the timber strings.

- Taking the Conservation Officers concerns and observations after the pre-application feedback, these 2 existing basement staircases are to be retained, and refurbished.

- The application has explored the introduction of an additional handrail meeting the current Building Regulations heights, to the perimeter walls opposite the main handrail particularly to the main staircases. Users will be encouraged to walk against the wall, with handrail support at the correct height. The new handrail location would draw the user to the outer extremity of the stairs as opposed to being drawn to the existing handrail, and limited tread kite winders at each turn on the stairs. All as shown on the attached supporting details.

- The basement stairs to the ground floor act as communication stairs to the external residential rooms, as well as fire exits, supporting ancillary spaces, and are subject to regular use as communication routes.

- We would advise that all Visitors, Customers, Users, Staff and Guests are made aware that the footing and guarding on all the stairs requires caution when in use, and if any assistance is required to advise reception. The safety sign is as described in the detail drawings, and are located at Ground level.

- Client/ end user to prepare detailed risk assessments and access statement.

- In conjunction with the above, method statements have been prepared for each work task, as far as possible to describe the works and also sequence of operation.

2.0 Survey Methodology:

The survey took the form of a visual assessment and no invasive exploratory techniques were used to carry out further investigations. CBP were accompanied by Collinshallgreen Ltd, Structural Engineers who undertook a visual structural assessment of each stair.

During the visual survey photographs were taken to identify defects. These photographs form the basis of this report that have been produced for each individual staircase inspected.

2.1 Restrictions to Survey Process:

There were no real restrictions and the stairs were viewed visually, only, there was no intrusive investigation works carried out, (other than access to the stores under the staircases, where located) and the 2 staircases were reviewed at each property.

2.2 When the Survey Took Place:

The survey took place on Friday 22nd April 2016.

3.0 Building 22 Mecklenburgh Square - Staircases:

a) Lower Ground – Ground Floor:

Going: 230mm approx. varies, feels unsafe under foot given limited and varied tread depth.

Rise: 180mm approx. and varies

Handrails: Unstable and moves under pressure. Appears handrail to be original. Balusters require checking for structural integrity and solid fixing, and require to be reinforced.

Stairs: Formed out of timber

Observations: Propose an additional feature handrail installed at the upper area of the stair, and to wall elevation at 900mm above string, consider reduced width and escape capacity.

Consider removal of thick carpet, and introduction of a thinner but suitable material to allow more tread depth.

Height of Bulkhead from stair string measured 1940mm approx. noted that warning signs are installed. This reduced dimension and limited reduced tread may cause an issue for users negotiating the stairs at this point.

Handrail height from string measures approximately 760mm being lower than the required dimension of 900mm. as the current Building Regulations.

Bottom and top treads require strengthening.

Handrail, Balustrade and Newel Post requires to be strengthened

Bottom/ intermediate treads require adjustment and reinforcement to accommodate consistent rise height over the whole flight.

Width of stairs approx. 790mm approx. Consider checking stair width in relation to escape numbers of people in the event of a fire and progressive escape from the upper levels to the lower ground floor external escape and place of safety.

Consider integrated safety notification signage.

4.0 Building 23 Mecklenburgh Square - Staircases:

a) Lower Ground – Ground Floor:

Going: 220 mm approx. varies, feels unsafe under foot given limited and varied tread depth.

Rise: Varied between 180mm approx, lower tread 165mm approx, one 200mm approx forming a trip hazard.

Handrails: Unstable and moves under pressure. Balusters which appear to be existing, require checking for structural integrity and solid fixing

Stairs: Formed out of timber.

Observations: Lower and intermediate tread requires reinforcement.

Propose an additional feature handrail installed at the upper area of the stair, and to wall elevation at 900mm above string, consider reduced width.

Consider removal of thick carpet, and introduction of a thinner but suitable material to allow more tread depth.

Height of Bulkhead from stair string measured approximately 1850mm approx, noted that warning signs are installed. This reduced dimension and limited reduced tread may cause an issue for users negotiating the stairs at this point.

Handrail height from string measures approximately 780mm being lower than the required dimension of 900mm. as the current Building Regulations.

Handrail and newel posts requires to be strengthened, particularly the Newel Post to the bottom of the stairs which has had a temporary previous repair but requires to be reinforced. The Newel Post is also slightly out of plumb.

Width of stairs approx. 790mm approx. Consider checking stair width in relation to escape numbers of people in the event of a fire and progressive escape from the upper levels to the lower ground floor escape and place of safety.

Store under stairs, plasterboard soffit requires to be repaired to maintain the required fire resistance to the store and protect the soffit of the stairs.

Consider integrated safety notification signage

Treads 4,5,8,9,10,11 are loose, irregular and unsafe, require repair, level adjustment and reinforcement to accommodate consistent rise height over the whole flight.

These stairs serve the dining room, and will be subject to heavier regular use.

5.0 Conclusion:

- Propose a change in carpet material to the treads and risers to achieve a larger tread, and consistent rise. New finish to be anti-slip, and also highlighted nosings. Nosings to be agreed with the Conservation Officer.

- Introduce of a new perimeter feature wall handrail fixed at 900mm above the stair string, to the staircases, to be used in conjunction with the existing handrails.

- The timber staircases with loose and damaged treads, risers and handrails/ balustrades, are to be repaired/ reinforced as detailed in the attached method statements.

- Ensure relevant approvals are gained on a repair strategy with the Local Planning Department, Heritage England, Approved Inspector and the Local Conservation Officer.

- Ensure all the work is coordinated and signed off via the Approved Inspector.

- No finishes have been disturbed, nor have we inspected any unexposed or inaccessible spaces, and are unable to report if any areas have been affected by rot, beetle, or worm infestation.

- These observations are limited to the visual inspection, and as such, CBP Architects are unable to accept liability for any loss or injury based however caused as a result of these comments.

- Consider the use of integrated safety notification signage, and advice to users, Customers, and staff on using the existing stairs being commensurate with an existing Listed Building.

6.0 Proposals Going Forward:

The site investigations identified that the balustrades require remedial strengthening works to address the stability, and although a strategy to repair, and strengthen is attached in the form of specification, materials, and supporting method statements, we have also formulated a strategy to test the handrails in situ to identify the areas that are deficient through a forensic approach.

This load test is to measure the strength and lateral movement of the balustrade, against the modern Building Regulations and British Standards. The design criteria are set out as below:

The 2 properties are presently used as a hotel, although their initial use will have been as domestic residences. This change of use introduces a change in the loading to be used on the handrail in accordance with British Standards. Below is an extract from BS 6399-1 1996 Loading for buildings, Part 1, table 4, indicating the different horizontal loads for a residence and hotel, e.g. other residential.

The load for a hotel is double that for a domestic residence.

Table 4 — Minimum horizontal imposed loads for parapets, barriers and balustrades, etc.

Type of occupancy for part of the building or structure	Examples of specific use	Horizontal uniformly distributed line load (kN/m)	A uniformly distributed load applied to the infill (kN/m²)	A point load applied to part of the infill (kN)
A Domestic and residential activities	(i) All areas within or serving exclusively one [D] single family [H] dwelling including stairs, landings, etc. but excluding external balconies and edges of roofs (see C3 ix)	0.36	0.5	0.25
	(ii) Other residential, (but also see C)	0.74	1.0	0.5

Structural calculations carried out on the reviewed sections verify that 35mm x 35mm timber balusters at 100mm centers are adequate for the increased load, whereas 22mm x 22mm timber balusters are not. (note, the majority of the balusters centers are in excess of the 100mm, and the balusters sections are 22mm x 22mm approx).

Within the pre-application response dated 26th June 2017, an observation has been made on the overall approach to the refurbishment works related to the handrails.

To apply a more detailed forensic approach to the balustrades requiring refurbishment and repair, it is proposed to carry out load tests to the handrails, and in turn the embedment and fixing within the timber strings. The results will allow a detailed focused assessment related to the exact areas requiring refurbishment and remedial reinforcement works.

Kiwa CMT Testing are specialist in load testing of balustrades, and having reviewed the areas, can install equipment to test the balustrades in situ. Protection to the walls is provided, and Kiwa are well versed in working in this environment and context.

The attached Kiwa CMT Testing data sheet outlines the strategy and proposed work method for additional supporting information. The testing of the balustrades will take 2 days on site.

To support the overall strategy the following additional non-intrusive tasks can be adopted by the Client:

- Client to develop adopted detailed Risk Assessments to address movement on the stairs, for all users and develop strategies to manage movement, carrying items, children, aged persons, disabled, ambulant disabled users and safety, particularly in the event of movement if evacuation is required.

- Client to develop access strategy for all users, linked to the Risk Assessments.

7.0 Handrail Details:

In terms of the handrail detail, we have reviewed the Historic England paper 'easy access to historic buildings' where there are many completed handrail configurations. The proposed fixing bracket we have developed has been adopted within this Historic England paper.

The handrail, which has been designed to reflect the original handrail to the external side, will be painted, colour to be confirmed. The most aesthetic approach yet being subservient to the existing handrail

We would propose a handrail sample painted for durability including visual affect and bracket is put in place on site for the Conservation Officer sign off before work commences.

Appendix A

Photographs

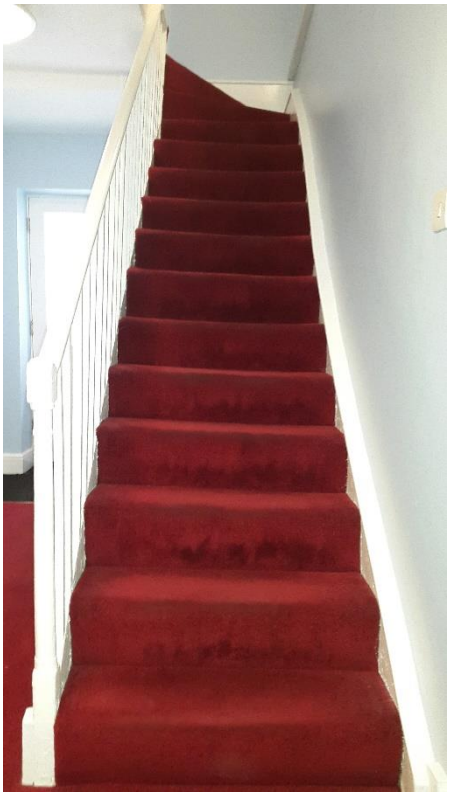
Building 22 – Lower – Ground Floor

1. Reinforce handrail/ balustrade / make consistent level treads.

2.Tread and handrails require reinforcement/ repair/ consistent height.
Introduction of additional handrail to wall side.

Building 23 – Lower – Ground Floor

3. Make good to under stair soffit, to maintain fire resistance integrity.



4. Tread and handrails requires reinforcement/ repair. Introduction of additional feature wall handrail. Newel post is loose/ requires reinforcement.

Appendix B

Building Regulation Part K Stairs

Section 1: Stairs and ladders

Scope

1.1 The guidance provided in this document covers internal and external steps and stairs when they are part of the building. Additional guidance is provided in Approved Document M when external stepped access also forms part of the principal entrances and alternative accessible entrances, and when they form part of the access route to the building from the boundary of the site and car parking. See Approved Document M Section 1 (for buildings other than dwellings) and Section 6 (for dwellings).

Steepness of stairs – rise and going

1.2 Measure the rise and going as shown in Diagram 1.1 (For steps with tapered treads, see also paragraphs 1.25–1.27.)

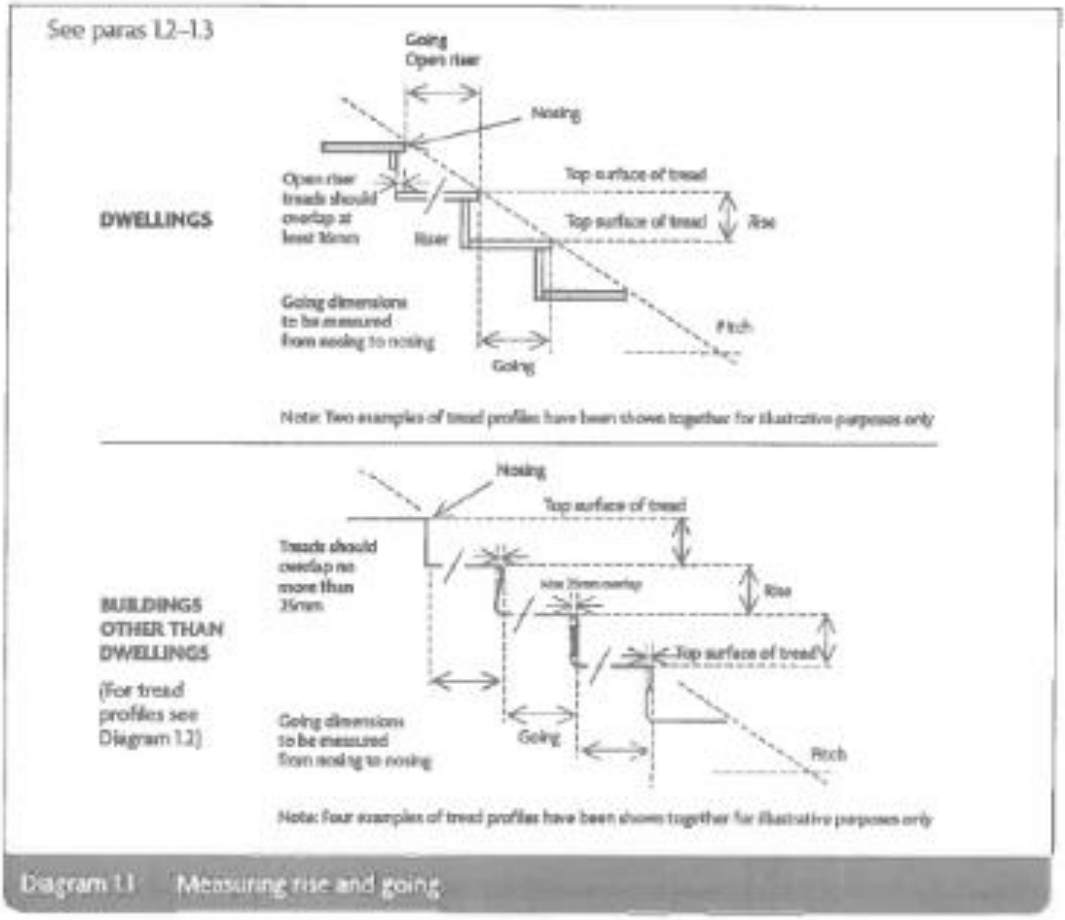


Diagram 1.1 Measuring rise and going

Requirement K1: Stairs, ladders and ramps

This approved document deals with the following requirement from Part K of Schedule 1 to the Building Regulations 2010.

Requirements

Requirement	*Limits on application*
Stairs, ladders and ramps	
K1. Stairs, ladders and ramps shall be so designed, constructed and installed as to be safe for people moving between different levels in or about the building	Requirement K1 applies only to stairs, ladders and ramps which form part of the building

Performance

In the Secretary of State's view, you can meet requirement K1 by ensuring that the steepness, rise and going, handrails, headroom, length and width of any stairs, ladders and ramps between levels are appropriate to afford reasonable safety to people gaining access to and moving about buildings.

The standard of provision needed to give an acceptable level of safety for access and use depends on the circumstances.

a. The standard of provision may need to be higher in a public building than in a dwelling, because people may not be familiar with the building and there may be more users.

b. A lower standard of provision may be acceptable where access is required only for maintenance, because greater care can be expected from the people requiring to gain access.

Handrails for stairs

For all buildings

1.34 Provide handrails in accordance with all of the following.

a. Position the top of the handrail 900mm to 1000mm from the pitch line or floor.

b. The handrail may form the top of a guarding if you can match the heights.

c. If the stairs are 1000mm or wider: provide a handrail on both sides.

For buildings other than dwellings and for common access areas in buildings that contain flats and do not have passenger lifts

1.35 Provide suitable continuous handrails, as dimensioned in Diagram 1.11 (for blocks of flats) and Diagram 1.12 (for buildings other than dwellings), in accordance with both of the following.

a. On each side of the flights.

b. On each side of the landings.

See paras 1.34–1.35

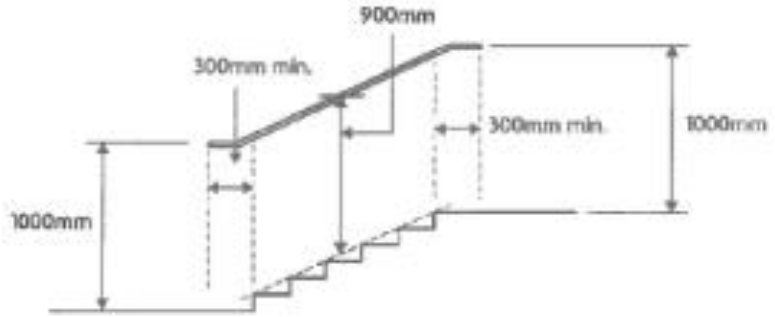


Diagram 1.11 Key dimensions for handrails for common stairs in blocks of flats

For buildings other than dwellings

1.36 Provide handrails in accordance with all of the following (in addition to paragraph 1.34).

a. Where there is full-height structural guarding, if you provide a second (lower) handrail, the vertical height from the pitch line of the steps (or the surface of the ramp) to the top of the second (lower) handrail should be 600mm.

b. Use a continuous handrail along the flights and landings of a ramped or stepped flight.

c. Ensure that handrails do not project into an access route.

d. Ensure that the handrail will contrast visually with the background against which it is seen, without being highly reflective.

Kiwa CMT

Inspection and Testing of Crush Barriers and Handrails

Several serious crowd - related accidents have occurred in sports grounds in recent years which has led to increased awareness of the need for instructive controls and guildlines to improve crowd safety.

It is the responsibility of Clubs and Stadia officials to ensure that the recommendations of the HMSO publication 'Guidance to Safety in Sports Grounds' (Green Guide) are implemented.

Using techniques, equipment and experience gained and developed over the past 40 years, Kiwa CMT Structural Investigation Division provide a service from initial consultation and planning to inspection and testing of crush barriers and handrails, and will advise on any necessary maintenance and work.

Our service is tailored to particular needs of every client, and includes:

- Risk assessment and corresponding test schedules in line with current (Green Guide) recommendations.
- Efficient and unobtrusive site testing using specialised equipment.
- Inspection and assessment of other safety related installations.
- Comprehensive reporting including interpretation, recommendations and conclusions.
- Prompt assistance and advice on re-testing and additional works.
- Fully co-operative closed season working to minimise disruption to planned event.

Our additional structural investigation resources provide for the inspection and testing of other concrete and steel components, installations and structures, complementing and enhancing the barrier testing service.

For further information about Barrier Testing or to speak to a member of our Structures Department please contact:
T : 01332 383333
E : cmtenquiries@kiwa.co.uk
W: www.kiwa.co.uk/cmt

We are also CHAS accredited and Constructionline registered so you know you can depend on our credentials.

CHAS Accredited Contractor CHAS.co.uk

Constructionline A UK GOVERNMENT CERTIFICATION SERVICE

Unit 5 Prime Park Way, Prime Enterprise Park, Derby, DE1 3QB T: 01332 383333 E:cmtenquiries@kiwa.co.uk

Kiwa CMT Testing **Site Services / Structures Department**	**ST8** **Page:** 1 of 3 **Issue No.** 3
Procedures Manual	**Issue Date:** Nov 2013 **Issued by:** MB

Test Procedure - ST8

Barrier Testing

General

Structural barriers require periodic inspection and testing to establish their condition and to ascertain whether or not they are adequate to carry out their required function.

Test Description

This procedure lists the equipment and outlines the method for conducting a barrier test in either a sports stadium or a car park.

Standard

"The Guide to Safety at Sports Ground", 2008 - for barriers in sports stadia.

BS 6180 for barriers in and around buildings including car parks.

Equipment

- steel spreaders
- Enerpac RC53 cylinders
- in-line pressure gauge
- hydraulic hoses and oil
- hand operated pump
- calibrated dial gauges and associated stands
- G-clamps
- aluminium or similar adjustable props
- calculator
- tape measure
- camera
- calculation sheets

Procedure

Uniformly distributed loads are applied along the test length of the barrier using the spreaders and cylinders mounted upon the adjustable props.

Deflection is measured using calibrated dial gauges positioned along the barrier at mid span between uprights i.e. where maximum movement id anticipated. (dials accurate to 0.01mm).

A bedding-in cycle and two proof cycles are applied in increments (usually 5) up to the specified load. When the maximum load is reached it is maintained for a period of 5 minutes before release.

At each increment the deflection is measured and when released the recovery recorded. The data can then be used to assess the barriers compliance.

Calculations

The following calculations are required in conjunction with the above procedure to perform the required testing.

1. Specified Load / m - is given either in 'The Guide to Safety at Sports Grounds", 1997 (tables 1, 2 and 3 chapter 10) or will be specified by the engineer.

2. Load at X - $\frac{\text{Length of barrier under test x specified load}}{\text{No of cylinders}}$

3. Load at X (bar) - Load at X x 15.0 (correction factor for cylinder)

4. Increments of test load - Load at X (bar) / No. of increments (usually 5)

5. Increments of bedding load - Repeat No's 1-4 with specified load for bedding from guide or specified by the engineer

Results Calculations

6.	Max deflection (bedding)	-	Reading at 5 or 5 mins (whichever is the greater)	-	First zero reading
7.	Residual deflection (bedding)	-	1st test off reading	-	Zero reading (bedding)
8.	Max deflection (test)	-	Reading at 5 or 5 mins (whichever is the greater)	-	1st test off reading
9.	Recovery (test)	-	Reading at 5 or 5 mins (whichever is the greater)	-	Last test off reading
10.	Permanent deflection	-	1st test off reading	-	Last test off reading
11.	% Recovery	-	$\frac{\text{Recovery (test)}}{\text{Max deflection (test)}} \times 100$		

Reports

The results of the barrier tests will be given in tabulated form accompanied by an individual photograph of each barrier.

Fosroc® Lokfix

FOSROC constructive solutions

Polyester resin anchoring grout meeting requirements of BS EN 1504-6: Anchoring of reinforced steel bars.

Uses

Lokfix mix and place anchoring grouts are used for anchoring of steel bars into concrete, brickwork, masonry and rock. Recommended applications include:

- Installation of starter bars
- Base plate bolts
- MOT Bolts
- Installation of balustrades
- Installation of barriers and safety fences
- Installation of tie bars

Advantages

- Easy to mix and apply
- Rapid strength gain
- Vibration resistant
- Corrosion resistant
- Non-expansive
- Can be placed underwater
- Increased flowability
- Two grades specifically for vertical and horizontal / overhead use

Description

Lokfix is a two component polyester anchoring grout supplied in pre-measured quantities. The material cures quickly to give consistent, high performance anchorages. The two versions of Lokfix are available :

Lokfix S25 - Blue lid

Pourable grade, 25 minute gel time at 20°C for use in vertical down holes where the hole is 8 to 40 mm greater in diameter than the bar.

Lokfix P25 - Yellow lid

Thixotropic grade, 25 minute gel at 20°C for use in overhead or horizontal holes where the hole is up to 25 mm greater in diameter than the bar. The thixotropic nature of Lokfix P25 reduces flow of grout out of the hole.

Specification Clause

The anchor grout should be Lokfix S25 pourable grout in vertical downwards holes or Lokfix P25 in horizontal and overhead holes. The anchor grout should comply with the requirements of BS EN1504-6 and have a compressive strength of 100 MPa at 28 days.

Standards compliance

Lokfix S and Lokfix P complies with the requirements of BS EN 1504-6 : Anchoring of reinforced steel bar.

Lokfix S and Lokfix P conforms to the requirements of Highways Agency Interim Advice Note 104/07: The anchorage of reinforcement and fixings in hardened concrete.

CE
0370

Fosroc Ltd
Drayton Manor Business Park, Coleshill Road, Tamworth, B78 3TL, UK
09
DoP: UK9-07 (Lokfix S25)
DoP: UK9-33 (Lokfix P25)
0370-CPR-0845

Lokfix S25 and Lokfix P25

EN1504-6: Anchoring of reinforcing steel bar

Testing of anchoring products by pull out method	≤ 0.6 mm at 75 kN
Chloride ion content	≤ 0.05%
Glass transition temperature Lokfix S25: Lokfix P25:	 67 °C 74 °C
Creep under tensile load	≤ 0.6mm
Fire Classification	B
Dangerous substances	Conforms to 5.4

Fosroc® Lokfix

Properties

The following results were obtained at a temperature of 20°C unless otherwise stated.

Test method	Standard	EN 1504-6	Result	
			LokfixS25	Lokfix P25
Testing of anchoring products by pull out method	EN 1881:2006	Displacement < 0.6mm @ 75KN bad	Dry 0.40 mm Wet 0.44 mm	Dry 0.34 mm Wet 0.43 mm
Determination of creep under sustained tensile load	EN 1544:2006	Displacement < 0.6mm after 3 months of continuous 50KN bad	0.47 mm	0.41 mm
Chloride ion content:	EN 1015-17:2000	≤ 0.05%	0.00%	.000%
Determination of glass transition Temperature	EN 12614:2006	> 45°C or > 20°C above ambient	67.2°C	73.5°C
Compressive Strength	EN 12190	-	100 MPa 28 days	100MPa
Tensile Strength	BS 6319 Pt.7	-	11MPa 28 days	11 MPa
Flexural Strength	BS 6319 Pt. 3	-	20 MPa 28 days	19 MPa
Gel time / minimum loading time	-	-	Temp °C / Gel Time / Min loading time (hrs) **5 / 130 / 12** **10** / 65 / 5 **20** / 25 / 2 30 / 10 / 1	
Chemical resistance	-	-	The cured resin is resistant to fresh and salt water. petrol, oils, grease and most acids, alkalis and solvents. Consult Fosroc Technical Services for specific chemical resistance	
Minimum annular gap **Maximum annular gap**	- -	- -	4 mm **20 mm**	

Clarification of property values: The typical properties given above are derived from laboratory testing. Results derived from field applied samples may vary.

Fosroc® Lokfix

Design Criteria

Selection of grout version

The version of Lokfix grout chosen will depend on anchor conditions (see 'Description').

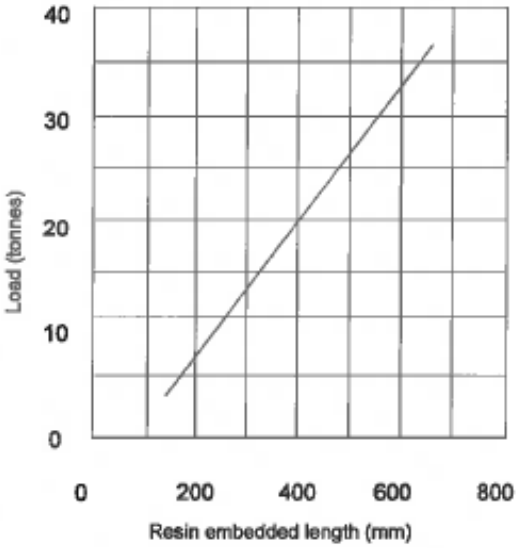
Parameters of anchor design

The high strength of the cured resin permits strong anchors to be created. Ultimate strength is varied by:

- Strength of host material
- Length of resin bond to bar
- Hole preparation and formation
- Type and dimension of bar

Typical loads attained

Concrete: 20 N/mm² unreinforced.
Bar: Deformed rebar to BS 4449.
Hole: Air-flushed rotary percussive drilled.



Note: The graph illustrates typical failure loads. Minimum safety factors of 1.5 in non-critical and 2 in critical cases should be considered for design purposes. Where relevant, the local codes of practice or standards must also be considered in relation to anchorage length.

Application Instructions

Hole preparation and formation

Optimum performance of Lokfix grouts requires rough sided, dust-free holes. Use of rotary percussive drills with air or water flushing is recommended.

Diamond drilled holes should be under-reamed or the surface roughened with a drill steel.
Cast holes should preferably be of inverse dovetail configuration. If parallel sided holes are cast they should be rough to provide adequate keying.

Bar preparation

All bars should be deformed. They should preferably be degreased and all flaky rust removed.

Mixing

A complete pack of resin and catalysed filler should be mixed in one operation. Mixing may be carried out manually or mechanically. When a smooth, even consistency is achieved the grout is ready for use and should be placed well within the gel time of the grout.
Packs have been designed to produce practical and economic volumes of grout.
DO NOT attempt to mix partial pack components.

Installation

Lokfix S25

Using the calculated volume of grout based on the estimating guide table, the grout should be poured steadily into the prepared holes. The anchor bar is then pressed into the hole to the required depth; slight agitation will assist in achieving a complete bond. The bar should be left undisturbed in the required position until the resin is set.

Lokfix P25

The grout should be injected to the rear of the hole to avoid air entrapment. The thixotropic nature of Lokfix P25 will prevent significant flow of resin out of the hole.

Cleaning

Any mixing drums, pumps, etc., should be cleaned with Fosroc Solvent 105 within he pot life of the grout. Cured material can only be removed mechanically.

Supply

Lokfix S25 - Blue Lid
Lokfix P25 - Yellow Lid

The pack consists of a can of resin and a plastic bag of hardener contained in a plastic mixing pail with a snap-on lid. Volume of mixed components: 2.5 litres.

Storage

Store in accordance with the Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972. Shelf life of 12 months at 20°C will be reduced at higher temperatures.

Limitations

Fire resistance

Resin anchors should not be used where structural load bearing performance has to be maintained in anchors subjected to fire

Fosroc® Lokfix

conditions. Conbextra GP or Conbextra HF would be suitable in this case. Contact Fosroc Technical Service for advice.

Precautions

Health and safety

For further information see appropriate Product Safety Data Sheet available from www.fosroc.com

Fire

Lokfix products and Fosroc Solvent 105 are flammable. Do not expose to naked flames or other sources of ignition. No Smoking. Containers should be tightly sealed when not in use. In the event of fire, extinguish with CO_2 or foam.

Flash points	
Lokfix S25:	29°C
Lokfix P25:	29°C
Fosroc Solvent 105:	43°C

Estimating guide

To find the quantity of material required

The table below indicates the quantity of material in litres required for each 100 mm of hole depth.

Example

- 100 fixings, each using a 20 mm diameter bolt into a 38 mm diameter hole which is 300 mm deep.
- From the table: 20 mm diameter bolt and 38 mm diameter hole gives **0.082 litre** per 100 mm depth of hole
  therefore **0.082 litre** x 3 (300 mm deep hole) equals **0.246 litre** per hole/fixing.
- As 100 fixings are required: 100 x 0.246 litre = **24.6 litres total.**
- Lokfix S25 and Lokfix P25 are supplied in 2.5 litre packs
  therefore 24.6/2.5 = 9.84 10 packs required

NB: This example and the table below quotes net quantities and makes no allowance for overdrilling the hole or for any wastage. A typical allowance to cover these factors is approximately 10%.

To determine the quantity of material per 100 mm of hole depth

Hole diameter	Bolt diameter 12 mm	16 mm	20 mm	25 mm	32 mm	38 mm	44.5 mm	51 mm
20 mm	0.020 litre	—	—	—	—	—	—	—
25 mm	0.038 litre	0.029 litre	—	—	—	—	—	—
32 mm	0.069 litre	0.060 litre	0.049 litre	0.031 litre	—	—	—	—
38 mm	—	0.093 litre	0.082 litre	0.064 litre	—	—	—	—
45 mm	—	—	0.128 litre	0.110 litre	0.079 litre	0.046 litre	—	—
51 mm	—	—	—	0.155 litre	0.124 litre	0.091 litre	—	—
57 mm	—	—	—	0.206 litre	0.175 litre	0.142 litre	0.100 litre	—
64 mm	—	—	—	0.273 litre	0.241 litre	0.208 litre	0.166 litre	0.117 litre
76 mm	—	—	—	—	—	0.340 litre	0.298 litre	0.249 litre

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VION WINDOW FILM SAFETY 4 SERIES

VION WINDOW FILMS

VWF-SAFETY 4 films are ideal for internal application to help secure your windows. These clear films hold together broken, shattered glass in the event of an impact, explosion or fire. Safety 4 PET window films offer 10 year durability, as well as being compliant with European Standard EN 12600 2B2 and REACH RoHS compliant with a M1 Fire Resistance Rating.

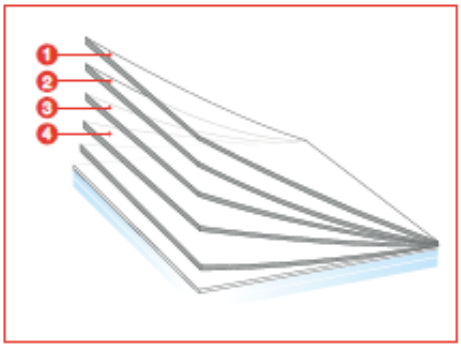
TECHNICAL DATA

UV Reduction	99%
Visible Light Transmission	85%
Reflection of Internal Visible Light	11%
Reflection of External Visible Light	11%
Total Solar Energy Rejected	19%
Solar Energy Reflection	9%
Solar Energy Absorption	14%
G Value	0.83
U Value	5.7
Shading Coefficient	0.9
Glare Reduction	14%
Thickness	120 micron

Data calculated based on film applied to clear glass 3 mm thick.

MULTI-LAYER CONSTRUCTION

1. Hard scratch resistant layer
2. High optical quality polyester
3. Reinforced PS Adhesive for elasticity in case of impact
4. Protection release liner



INSTALLATION ADVICE

Valid for vertical glazed surfaces and areas not exceeding 2.5m². Recommended for internal application to all single and double pane glass.

CLEANING INSTRUCTIONS

Clean soapy water solution. Do not clean for at least one month after application. Do not apply any type of sticker or adhesive on the film.

This information is subject to change.
The values are typical for this film and not intended for use in specifications.

vionfilms.co.uk

VISUAL VIBRANT VIVID VION

3M ™ Safety Film Safety S70

Description

3M™ Safety Film Safety S70 is designed for use on the interior surface of windows. It is composed of a transparent and weather stable polyester film, scratch resistant surface and a strong acrylic adhesive. The films high tensile strength and elongation at break increases resistance of the glazing system to impact and pressure. The film also significantly reduces the transmission of UVA and UVB rays which are the main cause of fading.

3M™ Safety Films provide an effective protection from injuries to persons or damage to items caused the fragments of broken glass. In the case of glass breakage the fragments are held together by the strong acrylic adhesive.

3M™ Safety Film S 70 has been tested and approved according to EN 12600 (Pendulum test). It is classed as 1B1 on 4 mm float glass. Safety S 70 is approved for the use on vehicles according to ABG No. D-5235 in Germany and CH-KO1-06132 in Switzerland.

Features (on 6 mm clear glass)

Glare reduction:	9 %
UV rays blocked:	98 %

Rated Class A fire resistant according to ASTM E84.

Film properties

Thickness:	0.175 mm/ 175 µm
Colour:	Clear
Material:	Polyester
Adhesive:	Pressure sensitive acrylic
Top coating:	Scratch resistant hard coat

Installation

3M Window films are installed using a water and soap solution. Full adhesion is reached after approximately 20 days at 18°C (in dry conditions).

Cleaning

3M Window films may be cleaned 30 days after installation using ordinary window cleaning agents and avoiding the use of abrasive particles. Do not use rough sponges, cloths or brushes. Synthetic sponges, soft wipes or rubber squeegee cleaners are recommended.

Glass type	Film Type	Visible Light Transmitted %	Visible Light Reflected Interior %	Tensile Strength ASTM D882-95a	Elongation at break ASTM D882-95a	Break strength ASTM D882-95a	Tear Resistance ASTM D 1938-02	Puncture Propagation ASTM D2582-03
Single Pane				N/ 25,4 mm	N/25,4 mm	N/25,4mm		
Clear	No Film	89	9					
	Safety S70	**86**	**9**	**197 N/mm²**	**120 %**	**79 kg**	**1,04 kg**	**2,31 kg**
Tinted	No Film	53	6					
	Safety S70	**47**	**6**	**197 N/mm²**	**120 %**	**79 kg**	**1,04 kg**	**2,31 kg**
Douple Pane								
Clear	No Film	79	15					
	Safety S70	**77**	**16**	**197 N/mm²**	**120 %**	**79 kg**	**1,04 kg**	**2,31 kg**
Tinted	No Film	47	13					
	Safety S70	**43**	**8**	**197 N/mm²**	**120 %**	**79 kg**	**1,04 kg**	**2,31 kg**

General notes:
All 3M Safety films have been tested to EN12600 and/or EN356 as appropriate. For detailed information and relevant certification for any specific project, please contact your local 3M specialist.
All technical data is based on a combination of relevant European test methods and/or US test methods. Before using this product the customer / applicator must ensure the product is suitable to be used for the intended purpose. If there is any uncertainty, please check with your local 3M Window Film specialist. All issues

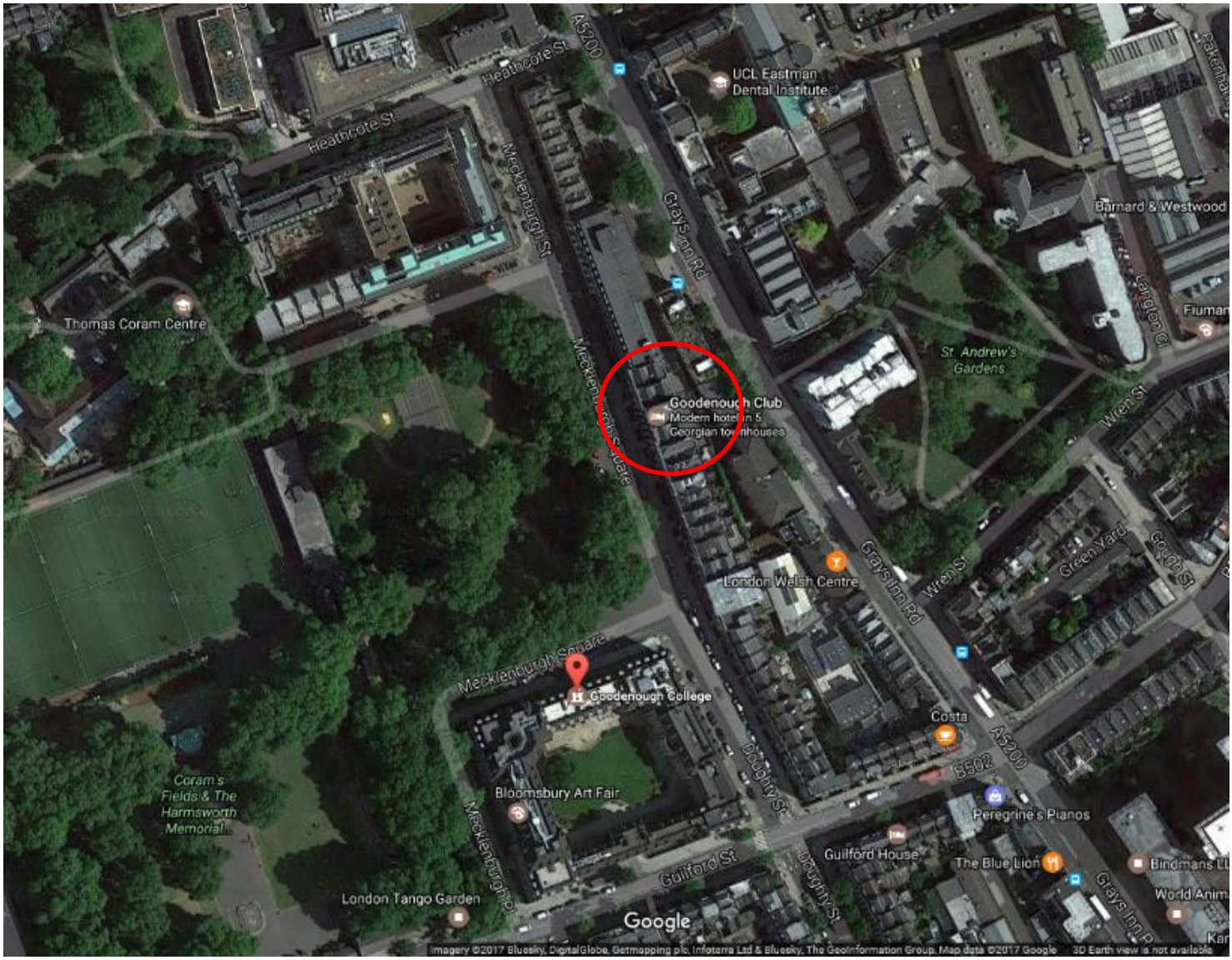
3M

Renewable energy Division
Window Films
www.3M.com/windowfilms

Your local Window Film Dealer:

Appendix C

Site Location Plan



Site Location

Google Maps