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RE: 58 Richmond Street

14th March 2017
Reference: sal-2017-010

For the attention of William Fraine

Dear William Fraine

Further to our visit to the above structure on the 02 March 2017, this document has been compiled for your attention by Steve Allen of Sika Limited detailing the remedial work necessary to extend the life of the structure.

Our concrete repair and protection remedial specification is based upon discussions, an understanding of the requirements and site survey and testing data where applicable.

This specification is valid for a period of 12 months, after which a further site survey should be carried out to ensure the suggested proposals are still fit for purpose.

Any variations to this specification and related clauses must be confirmed by Sika Limited to ensure the suitability of the proposed changes and any impact this may have on the performance of the proposed system specified in the specification clauses.

As part of Sika Limited's continuous product development, we retain the right to alter our product specifications in accordance with relevant national and international standards without notice.

For this project, Our specification is based on a remedial system that will provide a 15 yr guarantee.

The Contractor must inform Sika Limited before commencement of work to ensure guarantee requirements are met and confirmed.

Any changes made to the recommendations in any documents or on site without being confirmed in writing by Sika Limited will invalidate the guarantee.

We trust this is of assistance to you. If we can be of further help on this, or any other project, please do not hesitate to contact me on 07970122270.

Yours sincerely



Steve Allen
Area Sales Manager - Refurbishment



Checked by Steven Hardy
Technical Services Advisor - Refurbishment

SPECIFICATION DOCUMENT



CCS CONSULTING - MANCHESTER

PROJECT: **58 RICHMOND STREET**

PROJECT REF: **SAL-2017-010**

DATE: **14 MARCH 2017**

BUILDING TRUST



CONTACT SHEET

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Date: 14 March 2017

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1. PROJECT OVERVIEW

GENERAL COMMENTS

- The structure is located in a City
- The use of the structure is Commercial
- The approximate year of construction is 1940s

CLIENTS REQUIREMENTS

- Provide a long term concrete repair and protection solution with effective corrosion control measures to extend the service life of the structure.
- A guarantee of 15 yrs is also required for the above requirements.

PHOTOGRAPHIC OVERVIEW OF STRUCTURE



Severe spalling of concrete to the window surrounds with exposed rebar in a number of places.



Evidence of spalled concrete and severe cracking to columns with exposed reinforcement.



Damp areas on all floors, showing water ingress from above. From observations it was clear that the roof has areas where water is pooling and leaking through. This needs to be addressed prior to any concrete repairs taking place.



Damp areas on the soffit and concrete spalling to the beam, which is likely to be caused by the water ingress from the roof.



Concrete beam with exposed reinforcement. Engineers have taken temporary measures to support the beam due to fears that the reinforcement may be corroded to such an extent that it may have lost some of its load bearing capabilities. A survey should be carried out to determine the load bearing capacity of the beam currently. Sika's range of carbon fibre strengthening solutions could be an option should the beam require strengthening.



Evidence of concrete spalling on the front external elevation. This appears to be happening mainly on the window heads. These concrete panels are coated with a render, but in certain areas, the concrete has spalled leaving the reinforcement visible.

2. SPECIFICATION - UNCOATED INTERNAL REPAIRS TO BEAMS, COLUMNS, WALLS, STAIRCASE, WINDOW SURROUNDS, WINDOW HEADS AND WINDOW CILLS

2.1 CONDITION REPORT

2.1.1 TESTING CARRIED OUT

- We understand data is unavailable with regard to hammer testing, reinforcement cover depths, carbonation depths, Chloride levels, half cell potentials or corrosion rates etc.
- Based on the location of the structure it is assumed corrosion is predominately carbonation induced.

2.1.2 BEAM-INTERNAL

- The surface finish of the beams to be repaired are predominantly fair faced
- The beams have evidence of hairline cracks
- The beams have evidence of minor cracks.
- The beams have evidence of major cracks.
- The beams have evidence of excessive spalling with exposed reinforcement.

2.1.3 COLUMN-INTERNAL

- The surface finish of the column(s) to be repaired are predominantly fair faced
- The column(s) have evidence of minor cracks
- The column(s) have evidence of minor spalling with exposed reinforcement
- The column(s) have evidence of excessive spalling with exposed reinforcement.

2.1.4 WALL-INTERNAL

- The surface finish of the wall(s) to be repaired are predominantly fair faced
- The wall(s) have evidence of minor cracks
- The wall(s) have evidence of major cracks
- The wall(s) have evidence of minor spalling with exposed reinforcement
- The wall(s) have evidence of excessive spalling with exposed reinforcement.

2.1.5 STAIRCASE-INTERNAL

- The surface finish of the staircase(s) to be repaired are predominantly fair faced
- The staircase(s) have evidence of hairline cracks
- The staircase(s) have evidence of minor cracks
- The staircase(s) have evidence of major cracks
- The staircase(s) have evidence of minor spalling with exposed reinforcement
- The staircase(s) have evidence of excessive spalling with exposed reinforcement.

2.1.6 WINDOW SURROUND-INTERNAL

- The surface finish of the window surrounds to be repaired are predominantly fair faced
- The window surrounds have evidence of hairline cracks
- The window surrounds have evidence of minor cracks
- The window surrounds have evidence of major cracks
- The window surrounds have evidence of minor spalling with exposed reinforcement

- The window surrounds have evidence of excessive spalling with exposed reinforcement.

2.1.7 WINDOW HEAD-INTERNAL

- The surface finish of the window head(s) to be repaired are predominantly fair faced
- The window head(s) have evidence of hairline cracks
- The window head(s) have evidence of minor cracks
- The window head(s) have evidence of major cracks
- The window head(s) have evidence of minor spalling with exposed reinforcement
- The window head(s) have evidence of excessive spalling with exposed reinforcement.

2.1.8 WINDOW CILL-INTERNAL

- The surface finish of the window cill(s) to be repaired are predominantly fair faced
- The window cill(s) have evidence of hairline cracks
- The window cill(s) have evidence of minor cracks
- The window cill(s) have evidence of major cracks
- The window cill(s) have evidence of minor spalling with exposed reinforcement
- The window cill(s) have evidence of excessive spalling with exposed reinforcement.

2.2 – SYSTEM SCHEDULE

AREA	MATERIAL
Main Degradation Cause	Carbonation
Guarantee required	15 Year
Total Corrosion Management?	Yes
Reinforcement Corrosion Protection Coating	Sika® MonoTop -610
Placement Method Options	Hand Placed Pourable / Flowable
Repair Mortars	Sika® MonoTop-615 Sika® MonoTop-614F
Corrosion Management Systems	Sika® FerroGard® 903+
Smoothing Coat	Sika® MonoTop 620
Protective Coating Primer System	Sikagard® 552W Aquaprimer
Protective Coating System	Sikagard® 550W Elastic

The following specification is to be read in conjunction with the project condition report, drawings and project specific documentation and all points should be considered as part of the scope of works.

2.3 – REMEDIAL PROPOSALS

The following remedial proposals are based on visual observations, investigation data (If available) and clients requirements.

Concrete repair and protection proposals are in accordance with BS EN 1504 Products and systems for the protection and repair of concrete structures- Part 9 General principles for use of products and systems.

CONCRETE & STEEL REINFORCEMENT PREPARATION

- Clean and prepare all concrete surfaces
- Remove cracked and delaminated concrete
- Prepare repair area
- Remove corrosion from exposed reinforcement

REINFORCEMENT PROTECTION - CARBONATION

- Protect exposed reinforcement with corrosion protection coating:

Sika® MonoTop -610

BONDING PRIMER FOR HAND PLACED REPAIRS

- Primer to improve bond between substrate & hand placed repair material:

Sika® MonoTop -610

CONCRETE REPAIR OPTIONS

Carry out concrete repairs using the following repair mortar options depending on concrete breakout volumes & structural requirements:

- Hand applied R3 high build structural or overhead:

Sika® MonoTop-615

- Flowable/poured R3/R4 non structural / structural:

Sika® MonoTop 614F

CORROSION MANAGEMENT OF UNREPAIRED AREAS

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Carbonated concrete.

Corrosion Management to control corrosion by delaying the start of corrosion and reducing corrosion rates, apply corrosion inhibitor to all unrepaired areas:

- Sika® FerroGard® 903+

CONCRETE PROTECTION

Apply protective coating incl appropriate smoothing coat /pore sealer & primer:

- Sikagard® 550W Elastic

2.4 – GENERAL

Repair and Protective Material Selection/Compliance

In all cases the Contractor shall provide manufacturers' evidence to verify that they meet the requirements set out in BS EN1504 and as such all materials where relevant should be 'CE' marked.

All materials must be compatible and shall not have any effects on long term durability and bond. The materials must be supplied from a BS EN 1504 approved manufacturing plant and supplied from a single manufacturer to ensure compatibility and ensure long term durability.

For individual product application requirements refer to current Product data sheet.

2.5 – CONCRETE SUBSTRATE QUALITY AND PREPARATION

Concrete Surfaces (Uncoated)

The concrete shall be cleaned and all blowholes and honeycombed areas exposed.

The resulting surface shall be free from dust, loose material, surface contamination, existing renders, laitance, coatings, membranes, oil and other materials which could reduce the required adhesion values of a protective coating / membrane system.

Surfaces should be cleaned and prepared using abrasive blast cleaning techniques or high pressure waterblasting (up to 18 MPa / 2700 psi) techniques.

Where smoothing mortars, pore fillers, coating / membrane systems are to be used, surfaces should be prepared to an open texture suitable for the system specified to achieve the following adhesion values:

BS EN 1504-2 without trafficking: adhesion test average for smoothing mortar/pore filler/coatings must be $\geq 0.8 \text{ N/mm}^2$ (MPa) with no single value below 0.5 N/mm^2 (MPa) for crack bridging coatings and $\geq 1.0 \text{ N/mm}^2$ (MPa) with no single value below 0.7 N/mm^2 (MPa) for rigid coatings.

BS EN 1504-2 with trafficking: adhesion test average for coatings/membranes must be $\geq 1.5 \text{ N/mm}^2$ (MPa) with no single value below 1.0 N/mm^2 (MPa) for crack bridging coatings and $\geq 2.0 \text{ N/mm}^2$ (MPa) with no single value below 1.5 N/mm^2 (MPa) for rigid coatings.

2.6 – CONCRETE REMOVAL

After removal of defective concrete, the prepared area shall be free from dust, loose material, surface contamination and materials which reduce bond or prevent suction or wetting by repair materials.

Delaminated, weak, damaged and deteriorated concrete and where necessary sound concrete shall be removed by suitable mechanical or very high pressure waterblasting (up to 110 MPa / 16500 psi) techniques.

Tying wire fragments, nails and other metal debris embedded in the concrete should be removed where possible.

The edges where concrete is removed should be cut at a minimum angle of 90° to avoid undercutting and a maximum angle of 135° to reduce the possibility of debonding with the top surface of the adjacent sound concrete and should be roughened sufficiently to provide a mechanical key between the original material and Sika concrete repair mortar.

Ensure sufficient concrete is removed from around the reinforcement to allow application of the reinforcement corrosion protection coating and compaction of the repair material.

2.7 – PREPARATION OF STEEL REINFORCEMENT

Rust, scale, mortar, concrete, dust and other loose and deleterious material which reduces bond or contributes to corrosion shall be removed to a minimum standard of SA2 or SA2½ depending on the reinforcement corrosion protection coating used.

The whole circumference of the exposed reinforcement shall be uniformly cleaned, except where structural considerations prevent it.

Unless the cleaning is carried out immediately before application of the reinforcement corrosion protection coating, the reinforcement shall be protected against further contamination.

Surfaces should be prepared using abrasive blast cleaning techniques or high pressure waterblasting techniques.

Method and choice of cleaning shall take into account bar congestion, contact between bars, proximity to concrete substrate and other factors which prevent access for cleaning.

Where exposed reinforcement is contaminated with chloride or other material which may cause corrosion, the reinforcement shall be cleaned by low pressure waterblasting techniques to wash away contaminants.

2.8 – REINFORCEMENT CORROSION PROTECTION COATING APPLICATION

(BS EN 1504-7 Classification)

Immediately after preparation to SA2 or other specified preparation standard specified in this document, apply to the whole exposed circumference of reinforcement, two coats of Sika MonoTop 610.

2.9 – CONCRETE REPAIR MORTAR APPLICATION

Structural/Non structural/overhead repairs

Hand Applied

(BS EN 1504-3 Classification R3,R2,R1)

Before applying the concrete repair mortar, apply a bonding primer of Sika[®] MonoTop-610.

Pre-wet the surface of the prepared repair area.

The surface should not be allowed to dry before application of the bonding primer. The pre-wetted surface should achieve a dark matt appearance without glistening and surface pores and pits should not contain water.

Apply the pre-mixed Sika[®] MonoTop-610 to pre-dampened repair substrate at a thickness of >1.0mm.

Apply the pre-mixed Sika[®] MonoTop-615 repair mortar “wet on wet” onto the bonding primer between the minimum and maximum layer thicknesses and compacted without inclusion of entrapped air pockets using a trowel or gloved hand.

Where layers are to be built up to prevent sagging or slumping, each layer should be allowed to stiffen before applying subsequent layers “wet on wet”. When layers cannot be applied “wet on wet”, or if more than 24 hours between layers elapses, apply a bonding primer of pre-mixed Sika[®] MonoTop-610 and apply pre-mixed Sika[®] MonoTop-615 “wet on wet”.

Finishing of the applied repair mortar should be carried out to the required surface texture as soon as the mortar has started to stiffen. To prevent surface cracking, do not apply water or overwork the surface with finishing tools.

Site adhesion values to comply with BS EN 1504-3:

Structural Repairs: Class R3 $\geq 1.5 \text{ N/mm}^2$ (MPa).

Non Structural repairs: Class R1 & R2 $\geq 0.8 \text{ N/mm}^2$ (MPa)

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Non structural repairs / Structural repairs

Flowable/Poured

(BS EN 1504 Classification R4,R3,R2,R1)

Repairs requiring formwork support.

All formwork should be of adequate strength, treated with release agent and sealed to prevent leakage. Sealing can be achieved by using Sikaflex[®] -11 FC+ sealant beneath or around formwork and between joints.

Ensure formwork includes outlets for extraction of the pre-soaking water. A header box/hopper should be constructed on one side of the formwork so that a head of 150-200 mm can be maintained during the pouring operation.

All repair areas including horizontal decks/slabs.

The concrete substrate should be pre-soaked with clean water continuously for 2 - 6 hours to ensure a saturated surface dry condition throughout the operation.

Immediately before pouring, remove all excess or standing water from within any formwork, cavities or pockets.

Mix Sika[®] MonoTop-614F and within 20 minutes of final mixing , pour into the header box/hopper ensuring continuous material flow during the complete pouring operation to avoid trapping air to a thickness of between 40-200mm.

Site adhesion values to comply with BS EN 1504-3:

Structural Repairs: Class R4 ≥ 2.0 N/mm² (MPa). Class R3 ≥ 1.5 N/mm² (MPa).

Non Structural repairs: Class R1 & R2 ≥ 0.8 N/mm² (MPa)

2.10 – CURING TREATMENT

It is essential to cure the repair mortar immediately after application for a minimum of 3-7 days depending on site exposure and weather conditions, to ensure full cement hydration and to minimise cracking. Use polythene sheeting taped down at the edges or other approved method.

Curing compounds shall not be used if subsequent smoothing coats/pore filling or protective coatings are to be used.

2.11 – CORROSION MANAGEMENT – CORROSION CONTROL: SURFACE APPLIED INHIBITOR

Uncoated Concrete

(BS EN 1504-9 principle 11 method 11.3)

SIKA FERROGARD® 903+ MULTIFUNCTIONAL CORROSION INHIBITOR SHALL BE APPLIED TO ALL UNREPAIRED UNCOATED CONCRETE AREAS TO REDUCE EXISTING CORROSION RATES AND DELAY LATENT DAMAGE CORROSION IN CARBONATED and CHLORIDE CONTAMINATED CONCRETE

General

For chloride contaminated concrete, it is recommended that Sika® FerroGard® -903+ should only be applied if free chloride ion concentrations at the reinforcement are up to a maximum 1% by weight of cement.

Sika® FerroGard® -903+ should be applied after the concrete repair areas have been fully reinstated.

The following construction materials have to be protected from splashes of Sika® FerroGard® -903+ during application:

Aluminium, copper, galvanised steel, marble and other similar natural stone

Substrate Quality and Preparation

Surface preparation should have been carried out in accordance with Clause 2.5 'Concrete Substrate Quality and Preparation'.

Depending on the condition of the existing preparation, further treatment may be considered for the circumstances below:

Fair faced concrete: water blast the concrete surface with pressure (up to 18 MPa – 180 bars).

Concrete surface to be further overcoated: roughen the surface using water blasting with high pressure (up to 60 MPa – 600 bars).

Do not use hot water.

Allow substrate to dry out before application of Sika® FerroGard® -903+

Application

Apply Sika® FerroGard®-903+ to saturation by brush, roller, low pressure or airless spray equipment. Sika® FerroGard®-903 is supplied ready for use and shall not be diluted.

Care should be taken when working from Scaffolding or cradles that overspray is reduced to a minimum. This may involve reducing the pressure at the nozzle.

A total consumption of 500g per m² / 480 ml per m² should be applied.

Vertical surfaces: 2 - 3 coats.

Horizontal Surfaces: Saturate surface using 1-2 coats taking care to avoid ponding.

Waiting time between coats: This is dependent on the porosity of the concrete and the weather conditions, normally 1-6 hours. Allow the surface to dry out between coats to a matt damp appearance. Dense concrete may take longer to dry.

After the application of the last coat, as soon as the surface becomes matt, carry out a low pressure water dousing to assist penetration (water hose). This process maybe omitted if tests show that penetration has been achieved without water dousing.

The day after application, the treated surfaces shall be cleaned of any residue by pressure washing (~ 10 MPa – 100 bars).

On-Site Quality Control

Tests to ascertain the application of Sika® FerroGard®-903+ shall be carried out at random locations on the structure determined by the Supervising Officer.

The tests shall comprise of the removal of surface concrete to a depth of 5.0mm (minimum) and surface area 25mm x 25mm, before the application of overlays, levelling mortars, coatings, impregnations, etc.

The concrete samples will be tested for the presence of Sika® FerroGard®-903+ in accordance with the test requirements of the Sika “Qualitative Colour Test”.

All testing will be carried out in the presence of the Supervising Officer. If Sika® FerroGard®-903+ is not identified from the test sample, additional tests will be carried out at a frequency determined by the Supervising Officer.

Where testing confirms that satisfactory application of Sika® FerroGard®-903+ has not been achieved, reapplication of the corrosion inhibitor will be carried out to areas determined by the Supervising Officer, as per the above procedure.

The test area shall be reinstated to its original profile using an appropriate concrete repair product from the Sika Repair System used on the project.

Corrosion Rate Monitoring

Where it is required to monitor concrete elements of the structure for monitoring the performance of the Concrete Repair and Protection strategy, an appropriate monitoring system should be implemented. The system should be designed by an experienced Corrosion Engineer.

Note:

Sika Limited suggest the monitoring system measures corrosion rates using linear polarisation measurements from embedded probes incorporating a compatible software package.

2.12 – SMOOTHING COAT APPLICATION

Surface preparation should have been carried out in accordance with concrete substrate quality & preparation clause prior to application.

Apply a smoothing coat of Sika MonoTop® 620 to a thickness of 2mm over the concrete surfaces to the required surface texture to provide a pore (holiday) free surface in preparation for protective coatings.

Site adhesion values to comply with BS EN 1504-2 Adhesion test average for smoothing coat must be ≥ 0.8 N/mm² (MPa) with no single value below 0.5 N/mm² (MPa) for crack bridging coatings and ≥ 1.0 N/mm² (MPa) with no single value below 0.7 N/mm² (MPa) for rigid coatings.

2.13 – PROTECTIVE COATING SYSTEM: PRIMER APPLICATION

Following application of Sika MonoTop® 620 smoothing coat/pore filler or Sikagard® 545W Elastofill pore filler, apply by brush or roller one coat of Sikagard® 552W Aquaprimer at a consumption rate of not less than 0.12 ltr/m².

2.14 – PROTECTIVE COATING SYSTEM: COATING APPLICATION

(BS EN 1504-2 Classification)

Following application of the Sika MonoTop® 620/Sikagard® 545W Elastofill smoothing coat/pore filler and primer where necessary, apply by brush, spray or roller 2-3 coats of Sikagard® 550W to achieve a minimum total dry film thickness of 400 microns.

Site adhesion values to comply with BS EN 1504-2 Adhesion test average for coating must be $\geq 0.8 \text{ N/mm}^2$ (MPa) with no single value below 0.5 N/mm^2 (MPa) for crack bridging coatings.

A coating primer may not be required if the above coating adhesion values can be achieved by the coating on the smoothing coat/pore filler finish.

To be confirmed by trials prior to full coating application.

If a guarantee is required a primer shall always be used.

It is recommended that samples of the coating are applied to areas of the structure as controls before application to the complete structure for adhesion tests, and agreement of colour and surface finish.

2.15 – PRODUCT DESCRIPTIONS

REINFORCEMENT CORROSION PROTECTION COATINGS

- Sika MonoTop® -610 is a one component cementitious, polymer modified reinforcement corrosion protection coating and a bonding primer for MonoTop and other Sika concrete repair mortars. Meets the requirement of BS EN 1504-7.

BONDING PRIMER

- Sika MonoTop® -610 is a one component cementitious, polymer modified reinforcement corrosion protection coating and a bonding primer for MonoTop and other Sika concrete repair mortars. Meets the requirement of BS EN 1504-7.

CONCRETE REPAIR MORTARS

- Sika® MonoTop-615 is a cement-based, one component polymer modified hand placed /wet spray high build structural repair mortar. Meets the requirements of BS EN 1504-3 Class R3 mortar
- Sika® MonoTop-614F is a cement-based, one component pourable/flowable structural repair mortar. Meets the requirements of BS EN 1504-3 Class R4 mortar

CORROSION MANAGEMENT

- Sika® FerroGard® 903+ is a one component, surface-applied mixed corrosion inhibitor based on inorganic compounds. It penetrates uncoated concrete in a liquid and vapour state and forms a protective monomolecular layer on the surface of the embedded steel reinforcement, both delaying the start of corrosion and reducing the corrosion rate.

PORE FILLER/SEALERS/SMOOTHING COATS

- Sika® MonoTop 620 is a one component, cementitious, polymer modified smoothing coat/levelling mortar and pore filler/sealer for use prior to the application of protective coatings. Meets the requirements of BS EN 1504-2.

PROTECTIVE COATING PRIMERS

- Sikagard® 552W Aquaprimer is a one component, water dispersed acrylic primer for use under Sikagard protective coatings. Meets the requirements of BS EN1504-2

PROTECTIVE COATINGS

- Sikagard® 550W Elastic is a one component, water based, pigmented coating and available in a wide range of colours. It prevents the ingress of carbon dioxide and moisture whilst permitting two-way water vapour diffusion. It is highly crack-bridging and elastomeric. Meets the requirements of BS EN1504-2

3. SPECIFICATION - COATED INTERNAL REPAIRS TO BEAMS, COLUMNS, WALLS, STAIRCASE, WINDOW SURROUNDS, WINDOW HEADS AND WINDOW CILLS

3.1 CONDITION REPORT

3.1.1 TESTING CARRIED OUT

Refer to specification 1.

3.1.2 BEAM-INTERNAL

- The beams to be repaired are predominantly coated.
- The coating on the beams is generally in poor condition.
- The beams have evidence of minor cracks.
- The beams have evidence of major cracks.
- The beams have evidence of excessive spalling with exposed reinforcement.

3.1.3 COLUMN-INTERNAL

- The column(s) to be repaired are predominantly coated
- The coating on the column(s) is generally in poor condition
- The column(s) have evidence of minor cracks
- The column(s) have evidence of minor spalling with exposed reinforcement
- The column(s) have evidence of excessive spalling with exposed reinforcement.

3.1.4 WALL-INTERNAL

- The wall(s) to be repaired are predominantly coated
- The coating on the wall(s) is generally in poor condition
- The wall(s) have evidence of minor cracks
- The wall(s) have evidence of major cracks
- The wall(s) have evidence of minor spalling with exposed reinforcement
- The wall(s) have evidence of excessive spalling with exposed reinforcement.

3.1.5 STAIRCASE-INTERNAL

- The staircase(s) to be repaired are predominantly coated
- The coating on the staircase(s) is generally in poor condition
- The staircase(s) have evidence of hairline cracks
- The staircase(s) have evidence of minor cracks
- The staircase(s) have evidence of major cracks
- The staircase(s) have evidence of minor spalling with exposed reinforcement
- The staircase(s) have evidence of excessive spalling with exposed reinforcement.

3.1.6 WINDOW SURROUND-INTERNAL

- The window surrounds to be repaired are predominantly coated
- The coating on the window surrounds is generally in poor condition
- The window surrounds have evidence of hairline cracks
- The window surrounds have evidence of minor cracks

- The window surrounds have evidence of major cracks
- The window surrounds have evidence of minor spalling with exposed reinforcement
- The window surrounds have evidence of excessive spalling with exposed reinforcement.

3.1.7 WINDOW HEAD-INTERNAL

- The window head(s) to be repaired are predominantly coated
- The coating on the window head(s) is generally in poor condition
- The window head(s) have evidence of hairline cracks
- The window head(s) have evidence of minor cracks
- The window head(s) have evidence of major cracks
- The window head(s) have evidence of minor spalling with exposed reinforcement
- The window head(s) have evidence of excessive spalling with exposed reinforcement.

3.1.8 WINDOW CILL-INTERNAL

- The window cill(s) to be repaired are predominantly coated
- The coating on the window cill(s) is generally in poor condition
- The window cill(s) have evidence of hairline cracks
- The window cill(s) have evidence of minor cracks
- The window cill(s) have evidence of major cracks
- The window cill(s) have evidence of minor spalling with exposed reinforcement
- The window cill(s) have evidence of excessive spalling with exposed reinforcement.

3.2 – SYSTEM SCHEDULE

AREA	MATERIAL
Main Degradation Cause	Carbonation
Guarantee required	15 Year
Total Corrosion Management?	Yes
Reinforcement Corrosion Protection Coating	Sika® MonoTop -610
Placement Method Options	Hand Placed Pourable / Flowable
Repair Mortars	Sika® MonoTop-615 Sika® MonoTop-614F
Corrosion Management Systems	Sika® Margel VPI 580
Smoothing Coat	Sika® MonoTop 620
Protective Coating Primer System	Sikagard® 552W Aquaprimer
Protective Coating System	Sikagard® 550W Elastic

The following specification is to be read in conjunction with the project condition report, drawings and project specific documentation and all points should be considered as part of the scope of works.

3.3 – REMEDIAL PROPOSALS

The following remedial proposals are based on visual observations, investigation data (If available) and clients requirements.

Concrete repair and protection proposals are in accordance with BS EN 1504 Products and systems for the protection and repair of concrete structures- Part 9 General principles for use of products and systems.

CONCRETE & STEEL REINFORCEMENT PREPARATION

- Clean and prepare all concrete surfaces
- Remove cracked and delaminated concrete
- Prepare repair area
- Remove corrosion from exposed reinforcement

REINFORCEMENT PROTECTION - CARBONATION

- Protect exposed reinforcement with corrosion protection coating:

Sika® MonoTop -610

BONDING PRIMER FOR HAND PLACED REPAIRS

- Primer to improve bond between substrate & hand placed repair material:

Sika® MonoTop -610

CONCRETE REPAIR OPTIONS

Carry out concrete repairs using the following repair mortar options depending on concrete breakout volumes & structural requirements:

- Hand applied R3 high build structural or overhead:

Sika® MonoTop-615

- Flowable/poured R3/R4 non structural / structural:

Sika® MonoTop 614F

CORROSION MANAGEMENT OF UNREPAIRED AREAS

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Carbonated concrete.

Corrosion Management to control corrosion by delaying the start of corrosion and reducing corrosion rates, apply corrosion inhibitor to all unrepaired areas:

- Sika® Margel VPI 580

CONCRETE PROTECTION

Apply protective coating incl appropriate smoothing coat /pore sealer & primer:

- Sikagard® 550W Elastic

3.4 – GENERAL

Repair and Protective Material Selection/Compliance

In all cases the Contractor shall provide manufacturers' evidence to verify that they meet the requirements set out in BS EN1504 and as such all materials where relevant should be 'CE' marked.

All materials must be compatible and shall not have any effects on long term durability and bond. The materials must be supplied from a BS EN 1504 approved manufacturing plant and supplied from a single manufacturer to ensure compatibility and ensure long term durability.

For individual product application requirements refer to current Product data sheet.

3.5 – CONCRETE SUBSTRATE QUALITY AND PREPARATION

Coated Concrete Surfaces (Removal)

The coated concrete shall have all existing coatings removed and all blowholes and honeycombed areas exposed.

The resulting surface shall be free from dust, loose material, surface contamination, existing renders, laitance, oil and other materials which could reduce the required adhesion values of a protective coating /membrane system.

Surfaces should be cleaned and prepared using abrasive blast cleaning techniques or high pressure waterblasting (up to 18 MPa / 2700 psi) techniques.

Where smoothing mortars, pore fillers, coating / membrane systems are to be used, surfaces should be prepared to an open texture suitable for the coating system specified to achieve the following adhesion values:

BS EN 1504-2 without trafficking: adhesion test average for smoothing mortar/pore filler/coatings must be $\geq 0.8 \text{ N/mm}^2$ (MPa) with no single value below 0.5 N/mm^2 (MPa) for crack bridging coatings and $\geq 1.0 \text{ N/mm}^2$ (MPa) with no single value below 0.7 N/mm^2 (MPa) for rigid coatings.

BS EN 1504-2 with trafficking: adhesion test average for coatings/membranes must be $\geq 1.5 \text{ N/mm}^2$ (MPa) with no single value below 1.0 N/mm^2 (MPa) for crack bridging coatings and $\geq 2.0 \text{ N/mm}^2$ (MPa) with no single value below 1.5 N/mm^2 (MPa) for rigid coatings.

Coated Concrete Surfaces (Remain)

If it is deemed that existing coatings are to be overcoated rather than removed, then compatibility testing between existing coating and new Sika[®] coating system together with additional tests outlined below should be undertaken prior to proceeding with the works. However, it should be borne in mind that failure to remove existing coatings may lead to an increased risk of technical compromise. Before proceeding, trial results must be interpreted by the Contract Administrator. Sika Limited is not responsible for failures related to the underlying coating.

Existing Coatings

Existing coatings must be tested to confirm their suitability.

For existing coatings to be considered for overcoating with Sika[®] coating, all test criteria from the Dry Cross-Cut Tests & Adhesion Tests shall be satisfied as stated below.

Dry Cross-Cut Test

Carried out in accordance with BS EN ISO 2409

At least 2 cross-cut tests need to be performed for each zone to be assessed. The results shall be interpreted as acceptable if they achieve: GT 0, 1 or 2.

Adhesion Test

Carried out in accordance with BS EN 1542

At least 5 pull off tests shall be performed per zone.

The results shall be considered as acceptable if they achieve the following:

Crack-Bridging/Flexible Systems:

Adhesion test average ≥ 0.8 N/mm² (MPa) with no single value below 0.5 N/mm² (MPa) or cohesive failure in the substrate.

Rigid Systems:

Adhesion test average ≥ 1.0 N/mm² (MPa) with no single value below 0.7 N/mm² (MPa) or cohesive failure in the substrate.

All testing shall be carried out using an accredited testing house.

Existing Coatings and new Sika® Coating System

Wait at least 2 weeks prior to conduct Dry Cross-Cut Test and Adhesion Tests.

All acceptance criteria mentioned for existing coatings apply for the existing coatings and new Sika® coating system.

Thickness of existing coating shall also be assessed to ensure full system of existing and new coatings do not exceed requirements for permeability to water vapour $SD < 5.0m$ to prevent water vapour build up, condensation issues and possible coating system failure.

Failure to carry out any of the above compatibility, cross cut and adhesion tests will invalidate any guarantee.

By suitable means, remove all delaminating coatings (and exposed laitance) back to a firmly adhering edge to the approval of the Contract Administrator.

Remaining coatings must be cleaned by high pressure water jetting or blastcleaning to remove all surface contaminants such as grease, dirt, etc, prior to overcoating.

The resultant surface should be sound, clean and stable, with all defective locations exposed for attention.

Prior to the application of Sikagard coatings, to improve adhesion, use one coat of Sikagard® -552 W Aquaprimer applied by brush or roller at a consumption rate of not less than 0.2 ltr/m² on top of water based coatings or Sikagard® -551S applied by brush or roller at a consumption rate of not less than 0.2 kg/m² on top of solvent based coatings.

If original type of coating is unknown, conduct trials with primers and Sikagard® coating to ensure compatibility and acceptable cross cut and adhesion values.

A trowel applied re- profiling mortar of Sikagard® -545W Elastofill and 20% by weight of 0.1- 0.3 mm kiln dried quartz sand should be used to re-profile and fill any remaining blowholes on the concrete coated surface prior to using a water based Sikagard® Anti - Carbonation coating.

3.6 – CONCRETE REMOVAL

After removal of defective concrete, the prepared area shall be free from dust, loose material, surface contamination and materials which reduce bond or prevent suction or wetting by repair materials.

Delaminated, weak, damaged and deteriorated concrete and where necessary sound concrete shall be removed by suitable mechanical or very high pressure waterblasting (up to 110 MPa / 16500 psi) techniques.

Tying wire fragments, nails and other metal debris embedded in the concrete should be removed where possible.

The edges where concrete is removed should be cut at a minimum angle of 90° to avoid undercutting and a maximum angle of 135° to reduce the possibility of debonding with the top surface of the adjacent sound concrete and should be roughened sufficiently to provide a mechanical key between the original material and Sika concrete repair mortar.

Ensure sufficient concrete is removed from around the reinforcement to allow application of the reinforcement corrosion protection coating and compaction of the repair material.

3.7 – PREPARATION OF STEEL REINFORCEMENT

Rust, scale, mortar, concrete, dust and other loose and deleterious material which reduces bond or contributes to corrosion shall be removed to a minimum standard of SA2 or SA2½ depending on the reinforcement corrosion protection coating used.

The whole circumference of the exposed reinforcement shall be uniformly cleaned, except where structural considerations prevent it.

Unless the cleaning is carried out immediately before application of the reinforcement corrosion protection coating, the reinforcement shall be protected against further contamination.

Surfaces should be prepared using abrasive blast cleaning techniques or high pressure waterblasting techniques.

Method and choice of cleaning shall take into account bar congestion, contact between bars, proximity to concrete substrate and other factors which prevent access for cleaning.

Where exposed reinforcement is contaminated with chloride or other material which may cause corrosion, the reinforcement shall be cleaned by low pressure waterblasting techniques to wash away contaminants.

3.8 – REINFORCEMENT CORROSION PROTECTION COATING APPLICATION

(BS EN 1504-7 Classification)

Immediately after preparation to SA2 or other specified preparation standard specified in this document, apply to the whole exposed circumference of reinforcement, two coats of Sika MonoTop 610.

3.9 – CONCRETE REPAIR MORTAR APPLICATION

Structural/Non structural/overhead repairs

Hand Applied

(BS EN 1504-3 Classification R3,R2,R1)

Before applying the concrete repair mortar, apply a bonding primer of Sika® MonoTop-610.

Pre-wet the surface of the prepared repair area.

The surface should not be allowed to dry before application of the bonding primer. The pre-wetted surface should achieve a dark matt appearance without glistening and surface pores and pits should not contain water.

Apply the pre-mixed Sika® MonoTop-610 to pre-dampened repair substrate at a thickness of >1.0mm.

Apply the pre-mixed Sika® MonoTop-615 repair mortar “wet on wet” onto the bonding primer between the minimum and maximum layer thicknesses and compacted without inclusion of entrapped air pockets using a trowel or gloved hand.

Where layers are to be built up to prevent sagging or slumping, each layer should be allowed to stiffen before applying subsequent layers “wet on wet”. When layers cannot be applied “wet on wet”, or if more than 24 hours between layers elapses, apply a bonding primer of pre-mixed Sika® MonoTop-610 and apply pre-mixed Sika® MonoTop-615 “wet on wet”.

Finishing of the applied repair mortar should be carried out to the required surface texture as soon as the mortar has started to stiffen. To prevent surface cracking, do not apply water or overwork the surface with finishing tools.

Site adhesion values to comply with BS EN 1504-3:

Structural Repairs: Class R3 $\geq 1.5 \text{ N/mm}^2$ (MPa).

Non Structural repairs: Class R1 & R2 $\geq 0.8 \text{ N/mm}^2$ (MPa)

Non structural repairs / Structural repairs

Flowable/Poured

(BS EN 1504 Classification R4,R3,R2,R1)

Repairs requiring formwork support.

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All formwork should be of adequate strength, treated with release agent and sealed to prevent leakage. Sealing can be achieved by using Sikaflex[®] -11 FC+ sealant beneath or around formwork and between joints.

Ensure formwork includes outlets for extraction of the pre-soaking water. A header box/hopper should be constructed on one side of the formwork so that a head of 150-200 mm can be maintained during the pouring operation.

All repair areas including horizontal decks/slabs.

The concrete substrate should be pre-soaked with clean water continuously for 2 - 6 hours to ensure a saturated surface dry condition throughout the operation.

Immediately before pouring, remove all excess or standing water from within any formwork, cavities or pockets.

Mix Sika[®] MonoTop-614F and within 20 minutes of final mixing, pour into the header box/hopper ensuring continuous material flow during the complete pouring operation to avoid trapping air to a thickness of between 40-200mm.

Site adhesion values to comply with BS EN 1504-3:

Structural Repairs: Class R4 $\geq$ 2.0 N/mm² (MPa). Class R3 $\geq$ 1.5 N/mm² (MPa).

Non Structural repairs: Class R1 & R2 $\geq$ 0.8 N/mm² (MPa)

3.10 – CURING TREATMENT

It is essential to cure the repair mortar immediately after application for a minimum of 3-7 days depending on site exposure and weather conditions, to ensure full cement hydration and to minimise cracking. Use polythene sheeting taped down at the edges or other approved method.

Curing compounds shall not be used if subsequent smoothing coats/pore filling or protective coatings are to be used.

3.11 – CORROSION MANAGEMENT – CORROSION CONTROL:VAPOUR PHASE APPLIED INHIBITOR

Coated Concrete

(BS EN 1504-9 principle 11 method 11.3)

SIKA® MARGEL VPI 580 VAPOUR PHASE CORROSION INHIBITOR SHALL BE APPLIED TO ALL UNREPAIRED COATED CONCRETE AREAS TO REDUCE EXISTING CORROSION RATES AND DELAYS LATENT DAMAGE CORROSION IN CARBONATED CONCRETE.

Drill 20mm diameter holes, 55mm deep in a grid pattern spaced 1metre apart horizontally and 500 mm staggered vertically. Distances from edges of concrete elements to capsule positions should be ≤ 250 mm.

On beams and columns the spacing should be no greater than 500mm apart and applied to one face if section dimensions are <500mm. If > 500mm insert 2nd capsule into hole at a greater depth or install additional capsules on other faces.

The drilled hole must be thoroughly cleaned with a blow pump starting from the bottom of the hole and carried out at least 2 times.

Place a Sika® Margel VPI 580 cartridge into bottom of pre- drilled hole.

After insertion of the Sika® Margel VPI 580 cartridge into pre- drilled hole, cut off a length of synthetic backing rod (thickness between 5.0 - 10.0 mm). Diameter of backing rod should be greater than diameter of hole, compress and push into hole behind the cartridge ensuring contact between them both.

Infill remaining space with an R3 or R4 Class Concrete Repair Mortar to a minimum concrete cover depth of existing reinforcement. If cover is less than 5.0mm use Sikadur® 31 EF. Ensure good compaction of mortar to help prevent vapour leakage from capsule & staining of any subsequent coatings.

Corrosion Rate Monitoring

Where it is required to monitor concrete elements of the structure for monitoring the performance of the Concrete Repair and Protection strategy, an appropriate monitoring system should be implemented. The system should be designed by an experienced Corrosion Engineer.

Note:

Sika Limited suggest the monitoring system measures corrosion rates using linear polarisation measurements from embedded probes incorporating a compatible software package.

3.12 – SMOOTHING COAT APPLICATION

Surface preparation should have been carried out in accordance with concrete substrate quality & preparation clause prior to application.

Apply a smoothing coat of Sika MonoTop[®] 620 to a thickness of 2mm over the concrete surfaces to the required surface texture to provide a pore (holiday) free surface in preparation for protective coatings.

Site adhesion values to comply with BS EN 1504-2 Adhesion test average for smoothing coat must be ≥ 0.8 N/mm² (MPa) with no single value below 0.5 N/mm² (MPa) for crack bridging coatings and ≥ 1.0 N/mm² (MPa) with no single value below 0.7 N/mm² (MPa) for rigid coatings.

3.13 – PROTECTIVE COATING SYSTEM: PRIMER APPLICATION

Following application of Sika MonoTop[®] 620 smoothing coat/pore filler or Sikagard[®] 545W Elastofill pore filler, apply by brush or roller one coat of Sikagard[®] 552W Aquaprimer at a consumption rate of not less than 0.12 ltr/m².

3.14 – PROTECTIVE COATING SYSTEM: COATING APPLICATION

(BS EN 1504-2 Classification)

Following application of the Sika MonoTop[®] 620/Sikagard[®] 545W Elastofill smoothing coat/pore filler and primer where necessary, apply by brush, spray or roller 2-3 coats of Sikagard[®] 550W to achieve a minimum total dry film thickness of 400 microns.

Site adhesion values to comply with BS EN 1504-2 Adhesion test average for coating must be ≥ 0.8 N/mm² (MPa) with no single value below 0.5 N/mm² (MPa) for crack bridging coatings.

A coating primer may not be required if the above coating adhesion values can be achieved by the coating on the smoothing coat/pore filler finish.

To be confirmed by trials prior to full coating application.

If a guarantee is required a primer shall always be used.

It is recommended that samples of the coating are applied to areas of the structure as controls before application to the complete structure for adhesion tests, and agreement of colour and surface finish.

3.15 – PRODUCT DESCRIPTIONS

REINFORCEMENT CORROSION PROTECTION COATINGS

- Sika MonoTop[®] -610 is a one component cementitious, polymer modified reinforcement corrosion protection coating and a bonding primer for MonoTop and other Sika concrete repair mortars. Meets the requirement of BS EN 1504-7.

BONDING PRIMER

- Sika MonoTop[®] -610 is a one component cementitious, polymer modified reinforcement corrosion protection coating and a bonding primer for MonoTop and other Sika concrete repair mortars. Meets the requirement of BS EN 1504-7.

CONCRETE REPAIR MORTARS

- Sika[®] MonoTop-615 is a cement-based, one component polymer modified hand placed /wet spray high build structural repair mortar. Meets the requirements of BS EN 1504-3 Class R3 mortar
- Sika[®] MonoTop-614F is a cement-based, one component pourable/flowable structural repair mortar. Meets the requirements of BS EN 1504-3 Class R4 mortar

CORROSION MANAGEMENT

- Sika[®] Margel VPI 580 is a patented vapour phase corrosion inhibitor in a solid capsule format . The vapour penetrates the concrete and forms a protective layer on the surface of the embedded steel reinforcement, both delaying the start of corrosion and reducing the corrosion rate. Can be used for coated structures or where reinforcement is at depths where Sika FerroGard 903+ cannot penetrate.

PORE FILLER/SEALERS/SMOOTHING COATS

- Sika[®] MonoTop 620 is a one component, cementitious, polymer modified smoothing coat/levelling mortar and pore filler/ sealer for use prior to the application of protective coatings. Meets the requirements of BS EN 1504-2.

PROTECTIVE COATING PRIMERS

- Sikagard[®] 552W Aquaprimer is a one component, water dispersed acrylic primer for use under Sikagard protective coatings. Meets the requirements of BS EN1504-2

PROTECTIVE COATINGS

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- Sikagard® 550W Elastic is a one component, water based, pigmented coating and available in a wide range of colours. It prevents the ingress of carbon dioxide and moisture whilst permitting two-way water vapour diffusion. It is highly crack-bridging and elastomeric. Meets the requirements of BS EN1504-2

4. APPENDICES

DISCLAIMER

CDM REGULATIONS

Sika Limited does not fulfil the role of the Principal Designer and therefore preparation for the proposed specification and subsequent works should only commence when all parties involved with the design and execution of the works are satisfied the appropriate CDM regulations have been fulfilled.

DISCLAIMER

The information contained herein and any other advice are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. The information only applies to the application(s) and product(s) expressly referred to herein. In case of changes in the parameters of the application, such as changes in substrates etc., or in case of a different application, consult Sika's Technical Service prior to using Sika products. The information contained herein does not relieve the user of the products from testing them for the intended application and purpose. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

PRODUCT DATA SHEETS

Uncoated internal repairs to beams, columns, walls, staircase, window surrounds, window heads and window cills

Sika® MonoTop-610 [View](#)

Sika® MonoTop-615 [View](#)

Sika® MonoTop-614F [View](#)

Sika® FerroGard® 903+ [View](#)

Sika® MonoTop 620 [View](#)

Sikagard® 552W Aquaprimer [View](#)

Sikagard® 550W Elastic [View](#)

Coated internal repairs to beams, columns, walls, staircase, window surrounds, window heads and window cills

Sika® MonoTop-610 [View](#)

Sika® MonoTop-615 [View](#)

Sika® MonoTop-614F [View](#)

Sika® Margel VPI 580 [View](#)

Sika® MonoTop 620 [View](#)

Sikagard® 552W Aquaprimer [View](#)

Sikagard® 550W Elastic [View](#)