National Asset Delivery
Technical Surveys and Testing

Works Information for 570135
M5 91.5 Winnycroft Lane
Concrete Testing

CONTENTS AMENDMENT SHEET

Amend. No.	Revision No.	Amendments	Initials	Date
0	0	Original version issued with tender	ET	04/08/20

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1 DESCRIPTION OF THE WORKS

1.1 Project objectives

1.1.1 The principle objective of this project is to investigate the condition of the concrete deck.

1.1.2 The specification that applies to the *works* is included in Section 6

1.2 Scope of works

1.2.1 The *works* to be provided under this contract are:

Concrete testing on the bridge deck to detect any deterioration. Concrete testing shall include Half-cell potential; resistivity; chloride ion content; depth of carbonation; cement content; sulphate content; alkali content; and cover meter survey. Works are to be coordinated to ensure concrete testing can be completed within the trial pits excavated by *Others*. See Drawing HE570135U-KIER-SBR-M5_MP91.5-DR-CB-0004.

1.3 Deliverables

1.3.1 The *Contractor* is required to produce the following deliverables:

- Programme of works
- Risk Assessments and Method Statements
- Scale drawings upon which survey information can be presented.
- Detailed factual and interpretive report for the specified concrete testing carried out on the deck.
- The output should be produced and submitted within 3 weeks of completion of all site activities.

2 EXISTING INFORMATION

2.1.1 Location

Winnycroft Lane Overbridge carries the unclassified Winnycroft Lane over the M5 motorway at marker post 91.50. Grid reference: 384980, 213850. See location plan drawing no. HE570135-KIER-SBR-M5_MP91.5-DR-CB-0001.

2.1.2 The Drawings listed below apply to this contract. Refer to the site information for details of existing site conditions including ground conditions, limitation on access, position of existing structures etc.

Drawing Number	Title	Revision / Date
HE570135-KIER-SBR- M5 MP91.5-DR-CB-0001	Location Plan	C1
HE570135-KIER-SBR-M5_MP91.5-DR-CB-0004	Concrete Testing Requirements	C1
TOPO1250_M5-100-23147	Statutory Undertakers Information	-

As Built Drawings		
Drawing Number	**Title**	**Revision / Date**
523/AC5/15-1	Winnycroft Lane Bridge General Arrangement	April 1971
520/AC/0.11	Deck Reinforcement Sheet 3 Cross Section	July 1970
Standard Detail No. 8/1	General Notes Concrete and Reinforcement	December 1971

3 CONSTRAINTS ON HOW THE CONTRACTOR PROVIDES THE WORKS

3.1 General

3.1.1 The *Contractor* Provides the Works in such manner as to minimise the risk of damage or disturbance to or destruction of third party property.

3.1.2 The *Contractor* complies with the constraints and meets with the requirements outlined in Appendix 1.

3.1.3 The *Contractor* submits information detailing how the *Contractor* will provide the Works to the *Employer* prior to the *works* commencing. This information will include any lifting plans, risk assessments, method statements, the *Contractor's* staff training information and any other relevant Health and Safety requirements.

3.2 Working hours & site specific constraints

3.2.1 The *Contractor's* working hours for site works shall be between the off-peak daytime hours of 9:30 to 15:30, Monday to Friday.

3.2.2 The *Contractor* to undertake works within the Traffic management provided by the Principal Contractor and shall remain within the highways boundaries.

3.3 Health, Safety and Environment & Risk Management

Health and Safety requirements

3.3.1 In Providing the Works the *Contractor* meets the requirements of Annex 2 of the supplementary constraints in relation to health and safety duties.

3.3.2 The *Contractor* shall comply with the requirements of Highways England's safety passport scheme and ensure that all of his employees, and any of his subcontractor's, are registered in accordance with the implementation of the scheme. Details on the scheme can be found here: http://www.highwayssafetyhub.com/safety-passport.html

3.3.3 For details of the CDM duty holders, refer to the pre-construction information included in the tender package.

3.3.4 Before commencing the construction phase of the *works*, the *Contractor* confirms to the *Employer* that adequate welfare facilities are in place. Where the facilities detailed in section 5 are not deemed adequate, the *Contractor* provides all necessary facilities to Provide the Works and to comply with the minimum requirements set out in HSE guidance document L153.

Environmental requirements

3.3.5 In Providing the Works the *Contractor* meets the requirements of Annex 2 of the supplementary constraints in relation to environmental duties.

Risk Management

3.3.6 The *Contractor* identifies, manages and mitigates risks in accordance with the principles of ISO31000.

3.3.7 The *Contractor* submits a risk register, which captures all risks associated with the delivery of the *works* including those identified by the *Employer*, with his tender and maintains it for the contract period.

4 REQUIREMENTS FOR THE PROGRAMME

4.1.1 The *Contractor* submits programme to the *Employer* with his tender.

4.1.2 The *Contractor* Provides the Works taking into account the following programme constraints:

(i) the *starting date* and *completion date* and any post site works, reporting and review period

(ii) The services and other things provided by *Employer* (see Section 5)

(iii) Completion of site works and reports submitted to Highways England in accordance with the requirements stated in section 6.1.8.

(iv) The excavations to expose the concrete will be carried out by the Asbestos Testing Contractor. The programme should be suitably flexible such that the Contractor can work around those excavating the trial holes.

4.1.3 The programme should be in the form of an activity and time related bar chart, produced as a result of a critical path analysis.

4.1.4 The programme should preferably be provided in either a PDF or MS Excel format and cover the full contract period including post site activities. Activities should be clearly defined and named and the programme should detail the following:

(i) dates and times associated with the project, including the *starting date*, *completion date* & *Contractor's* planned completion, and any other dates or times that will specifically impact the delivery of the project

(ii) activities associated with delivering the project

(iii) The programme should be flexible to ensure that the Contractor can work safely in conjunction with those excavating the trial holes

(iv) for each activity, the proposed resources (plant & labour) expected to deliver each activity should be shown on the programme

(v) review periods for any reporting requirements

(vi) key dates for the Employer to provide 'services and other things'

(vii) key dates for co-ordination with Others

4.1.5 The *Contractor* updates the programme every week. The *Contractor* submits an updated programme to the *Employer* upon request.

5 SERVICES AND OTHER THINGS PROVIDED BY THE *EMPLOYER*

5.1.1 The following temporary traffic management will be provided by the *Employer* to allow the *Contractor* to Provide the Works:

(1) Concrete Testing will be carried out under single lane closure controlled by temporary traffic lights in both directions between the off-peak daytime hours of 09:30 to 15:30, Monday to Friday.

(2) Traffic management will be provided by the Principal Contractor.

5.1.2 The other things that will be provided by the *Employer* are as follows:

(1) Welfare facilities and access equipment shall be provided by the *Principal Contractor*.

(2) The trial holes required to facilitate concrete testing of the deck are to be excavated by the Asbestos Testing Contractor. The Asbestos Testing Contractor will also complete waterproofing repairs and temporary surfacing repairs.

6 SPECIFICATION FOR THE WORKS

6.1.1 The *Contractor* shall undertake the works as described in this section.

6.1.2 A representative of the *overseeing organisation* may be present on site to provide site supervision and to act as a project manager to advise the testing contractor on preferred test/sample locations etc.

6.1.3 Site testing and sampling shall be carried out as follows:

- Visual and Delamination Survey
- Half-cell potential testing
- Cover meter survey
- Depth of carbonation testing
- Resistivity testing

6.1.4 Laboratory testing shall be carried out as follows:

- Chloride ion content testing
- Cement content testing
- Sulphate content testing
- Alkali content testing

6.1.5 All site testing, sampling and surveys shall be carried out at locations shown on drawing no. HE570135-KIER-SBR-M5_MP91.5-DR-CB-0004. Concrete testing shall be coordinated to ensure that works are completed within the trial pits completed by the asbestos testing contractor.

6.1.6 Breakouts in the concrete made to facilitate site testing and sampling shall be reinstated using a class R4 proprietary polymer modified cementitious repair mortar complying with BS EN 1504. Before reinstatement, all debris, mud and standing water shall be removed to leave each location clean. Waterproofing repairs and temporary surfacing repairs are the responsibility of the asbestos testing contractor.

6.1.7 Tests and Surveys Procedure

In accordance with CS 462 Clauses 5.30 to 5.50 and as follows:

Visual and Delamination survey

- All concrete surfaces shall be tested by sounding with a light hammer.
- The survey shall identify all concrete defects including spalling, cracking, crazing, honeycombing or surface deterioration, together with patching or remedial work.
- The Contractor shall record the type and size of all the defects. Photographs of the defects shall be taken and recorded.
- Survey results and defect observations shall be recorded on contractor prepared developed drawings of the concrete surfaces at a minimum scale of 1:100. Autocad versions of drawing HE570135-KIER-SBR-M5_MP91.5-DR-CB-0004 may be requested from Matthew.Brogden@kier.co.uk
- All the defects are to be individually referenced, dimensioned and provided with locating dimensions. Locations are to be recorded on the contractors drawing using a longitudinal chainage from the bridge deck north expansion joint combined with an offset from the outer edge of the parapet to locate the defect laterally. All identified defects are to be photographed and cross referenced to the scaled drawings.

Half-cell potential testing

- Half-cell potential survey to be carried out in accordance with ASTM C876-15. The electrical continuity in the reinforcement shall be checked prior to commencement of the measurement by making two well-separated contact points. Electrical continuity is established if a stable resistance reading of less than 1 ohm is achieved. Contacts shall be made by drilling through the concrete to the surface of the reinforcement, cleaning the reinforcement to bright metal and the connection made using a self-tapping screw.
- The voltages measured shall be recorded in millivolts (mV) and shall be tabulated with the location of the reading. The results shall be resented in the form of both an equipotential contour plot with contours at 50mV intervals and a set of numerical values.
- The results shall be made available at the end of each day of recording or earlier if requested by the project manager.
- Breakouts in the concrete made to facilitate electrical connection to reinforcement shall be reinstated using a class R4 proprietary polymer modified cementitious repair mortar in accordance with BS EN 1504 part 3.
- The half-cell readings to be taken at 300x300mm orthogonal grid basis.

Cover meter survey

- The concrete cover to the outermost reinforcement shall be determined using an electro-magnetic cover meter. The cover shall be checked on the same grid as for the half-cell testing.
- Cover meter survey should be carried out in accordance with BS 1881-204.
- Prior to commencement of the cover meter survey, the cover meter shall be calibrated on site by drilling to expose the reinforcement and directly measuring the cover.
- At each survey location, the size, spacing and cover to each bar shall be determined and reported for bars in both directions.

Depth of carbonation testing

- Carbonation testing shall be carried out utilising the percussive holes drilled for dust sampling of chlorides. Testing shall be carried out in line with BRE information paper IP 6/81.
- All traces of drilling dust shall be cleaned from in and around the hole using a paint brush and compressed air.
- A freshly broken surface of concrete shall be produced by breaking the edge of the hole in at least two places around the circumference using a hammer and a 12mm cold chisel.
- The broken samples shall be sprayed immediately with phenolphthalein solution. The perpendicular depth of the interface between the magneta colouration and the uncoloured concrete from the surface of the concrete shall be measured.
- The minimum depth, the maximum depth and the mean depth from each of the two broken surfaces shall be recorded to the nearest mm. a set of tabular results shall be provided.

Resistivity testing

- Resistivity of concrete shall be measured directly using the Wenner four-probe resistivity meter, in accordance with BS1881 Part 201.
- Resistivity testing shall be carried out by drilling 10mm deep holes into the concrete and inserting the test probes. A suitable conductive fluid (e.g. aqueous graphite suspension) shall be used in the annulus between the probe and the concrete.
- Resistivity shall be measured in kilo-ohm cm and the surface temperature of the concrete shall be recorded in degrees. The locations of readings shall be recorded.

Dust sampling by percussive drilling:

- Prior to sample drilling, the Contractor shall undertake a cover meter survey to locate the position of the reinforcement. If necessary, the sampling location shall be adjustment to avoid damage to the reinforcement.
- Dust samples to be taken at highest negative half-cell potentials as indicated on HE570135-KIER-SBR-M5_MP91.5-DR-CB-0004 or as otherwise directed by the Project Manager on site.
- The orientation of the drilling shall be perpendicular to the concrete surface. A 20mm diameter masonry drill with unworn flutes shall be used.
- The following procedure shall be adopted for collecting the dust samples:
    a) Drill into the concrete to a depth of 5mm. Discard this sample and blow out the dust from in and around the hole using compressed air;
    b) The concrete shall be drilled and sampled in successive incremental depths of 25mm, i.e. 5mm-30mm, 30mm-55mm, 55mm-80mm etc. The Contractor shall:
        - Encourage the drilling dust to the surface by withdrawing the drill frequently.
        - Collect the dust by using an open-ended plastic container or funnel into a sample bag: 10g minimum is required for each chloride sample. 50g required for each sulfate, alkali or cement content.
        - Blow out the hole between each successive depths of sampling.
    c) The sample bag shall be clearly labelled with location, depth, and name of structure.

Chloride ion testing

- Chlorine content shall be determined from the dust samples removed from the structure.
- No samples are to be obtained away from joint or drip detail.
- Chloride content shall be determined in accordance with the method described in BS 1881: Part 124.
- The results of the chloride content testing shall be reported in terms of total percentage chloride content by weight of cement.

Cement content testing

- Cement content shall be determined in accordance with the method described in BS 1881: Part 124.

- Dust samples for the determination of cement content shall not be used in tests to determine chloride content.

Sulfate content testing

- Sulfate content shall be determined in accordance with the method described in BS 1881: Part 124.
- Dust samples for the determination of cement content shall not be used in tests to determine sulfate content.

Alkali content testing

- Alkali content shall be determined in accordance with the method described in BS 1881: Part 124.
- Dust samples for the determination of cement content shall not be used in tests to determine alkali content.

6.1.8 **Survey Output and Report Format**

- One electronic copy of the factual and interpretive report(s) (in pdf format) shall be supplied to the project manager.
- The factual report shall contain the following information:
  a) Bridge name- **Winnycroft Lane**, HE Structure Reference M5/91.5 and HE Structure Key **1684** and an elevation photograph of the structure.
  b) A plan of the bridge showing locations of the testing sites and sampling sites.
  c) A description of the site work and laboratory work, with a reference to the standards used, where appropriate.
  d) A description of the visual condition of each element subjected to testing.
  e) Results of the testing and surveying carried out that shall be presented as follows (with any plotting to an appropriate scale):
- Half-cell potential- tabular and with plotted colour-coded contour plans/elevations to indicate distribution of half-cell results. Half-cell results to have a contour interval of 50mV.
- Cover meter surveys- tabular and with plotted colour-coded contour plans/elevations to indicate distribution of cover results. Cover results to have a contour interval of 5mm.
- Chlorides- tabular presentation and with locations of sampling and results shown on half-cell contour drawings.
- Cement- tabular presentation and with locations of sampling and results shown on half-cell contour drawings.
- Sulfates- tabular presentation and with locations of sampling and results shown on half-cell contour drawings.

- Alkali- tabular presentation and with locations of sampling and results shown on half-cell contour drawings.
- Delamination and visual survey – developed drawings of the concrete surfaces to scale. Drawings shall be marked with defective areas and shall indicate the size and locations of all defects. Defects can be recorded on the drawing or in tabular form and colour photographs of all defects provided.
- Resistivity- tabular presentation of the results.

The interpretive report shall contain the following information:

a) Bridge name- Winnycroft Lane, HE Structure Reference M5/91.5 and HE Structure Key 1684 and an elevation photograph of the structure.

b) A plan of the bridge showing locations of trial pits.

c) A description of the site work, reinstatement products and laboratory work, with a reference to the standards used, where appropriate.

d) Interpretation and commentary on the alkali and sulfate results in relation to threshold contents for concrete durability and in relation to the accuracy of testing and laboratory methods.