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RAILTRACK PLC

MODEL CLAUSES FOR SPECIFYING CIVIL ENGINEERING WORKS

SECTION 153

Brickwork and Masonry Repairs

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Amendments

Amendments and additions since the previous issue are marked by a vertical line in the right hand margin.

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SECTION 153

BRICKWORK AND MASONRY REPAIRS

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BRICKWORK AND MASONRY REPAIRS

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SECTION 153

BRICKWORK AND MASONRY REPAIRS

NOTES TO SPECIFIER

These notes do not form part of the Specification.

**Use of the Section
and interface with
other Sections**

153.1

This Section specifies the testing requirements to determine the cause, extent and degree of deterioration in brickwork, blockwork and masonry structures and the methods of repairing such structures.

This Section should be read in conjunction with Section 23: Structural Repair Survey, and Section 150: Brickwork, Blockwork and Masonry.

**Diagnostic
investigations**

153.2

Before any repairs, other than emergency repairs, are carried out, it is essential that the root cause of the deterioration is identified. In commissioning diagnostic investigations it is important that the Specifier does not jump to conclusions regarding the cause of deterioration and thereby unduly limit the type of diagnostic testing which is commissioned. It is far better to keep an "open mind" and use the diagnostic investigation to eliminate unlikely causes of deterioration. By adopting this approach, causes of deterioration not readily apparent are less likely to be overlooked.

**Limitations on
application of this
Section**

153.3

This Section of the Specification covers specific testing of brickwork, blockwork and masonry structures and commonly used repair methods.

This Section does not cover the following aspects:

- (i) foundation Works,*
- (ii) under-water examination or Works.*

Also, major Contractor designed major strengthening repair work such as saddle type repairs or parapet and spandrel repairs involving the construction of substantial concrete haunches, are not covered by this Specification. It is recommended that specialist advice is sought where such types of repairs are considered applicable.

Choice of testing

153.4

Clause 153.004 should be used in conjunction with Section 23: Structural Repair Survey .

The Specifier, when choosing applicable tests should take into account the suitability of the tests, the results required and the relative complexities and costs of the tests.

It may be appropriate to undertake the testing, investigation and survey in two phases, the first to identify the deterioration mechanisms which are active, the second to identify the extent and degree of the deterioration, such that adequate repair details can be designed.

Use of Standard Drawings

153.5

Some of the Clauses in this Section are based on the notes and details shown on Railtrack set of Standard Drawings for repair details (RT/CED/436 series). These are referred to either within the Clause or in a Note to Specifier.

The Standard Drawings show suggested methods and repairs only. If Standard Drawings are to be used, the Specifier should ensure that the material, type and condition of the structure considered is suitable and that any amendments are compatible with the Standard Drawings.

These Standard Drawings are available from Zone document controllers or:

*Structures Standards Engineer
Railtrack Civil Engineering Directorate
Floor 2, East Side Offices
Kings Cross Station
London N1 9AP*

*Tel: 0170 465 9223 (BRT: 00 59223)
Fax: 0170 465 9210 (BRT: 00 59210)*

Brickwork, blockwork and masonry

153.6

Throughout this Specification, reference has been made to brickwork or masonry, and the Clauses are suitable for use with masonry, such as blockwork and stonework. The Specifier should, however where appropriate, ensure that the terms “brickwork” and “brick” or stonework or masonry are amended where other materials are required to be used.

For re-facing or patch repairs, the combination of Clauses to be used should be as follows:

- (i) major refacing repairs, excluding arch rings: 153.014, 153.015, 153.016,*
- (ii) minor refacing repairs, excluding arch rings: 153.014, 153.015, 153.017,*
- (iii) minor refacing repairs including arch rings: 153.014, 153.018 and 153.021.*

SECTION 153

BRICKWORK AND MASONRY REPAIRS

**Materials &
workmanship**

- 153.001** Materials and workmanship for repairs to brickwork and masonry shall be in accordance with Section 150: Brickwork, Blockwork and Masonry **!C!** **!CHECK!** unless modified by this Section.

NOTE TO SPECIFIER

The Specifier should check that the requirements of Section 150: Brickwork, Blockwork and Masonry are applicable. If there is a mixture of new and repaired brickwork or masonry, or if the number of Clauses required from Section 150: Brickwork, Blockwork and Masonry is small, the Specifier should consider importing the required Clauses into this Section.

The Specifier should note that the requirements for repairs in Section 150 are for small repairs carried out in conjunction with construction of new brickwork.

(153.001)

Definitions

- 153.002** The following definitions shall apply:

- (i) patch repairs shall mean the replacement of a portion of existing defective brickwork or masonry with new brickwork or masonry of similar construction such that all edges are bonded into the original brickwork or masonry,
- (ii) re-facing shall mean either the complete removal and subsequent replacement of a skin of brickwork or masonry, or the addition of a skin of brickwork or masonry on to an existing brickwork or masonry “core”,
- (iii) stitching shall mean the process of inserting steel bars to bridge fractures, and grouting in such bars such that the grout penetrates the fractures,
- (iv) pinning shall mean the securing of new brickwork or masonry to existing brickwork or masonry below or behind, using bars which are anchored using “adhesives” so that the existing and new brickwork or masonry is anchored to the bar. No voids or fractures are filled by pinning,
- (v) grouting shall mean insertion of cementitious (or other) material into a structure through drilled holes to fill fractures and/or voids with suitable material to improve the structural performance,
- (vi) injection shall mean the insertion of cementitious (or other) material into a structure directly into the fracture.

(153.002)

Deterioration and defects to be identified

153.003
!C!

The factual report in accordance with Section 23: Structural Repair Survey **!CHECK!** shall detail the apparent deterioration of elements of the structure and identify defects which may be pertinent to the performance or durability of the structure. Deterioration to be detailed and defects to be identified shall include but not be limited to the following:

include or exclude as appropriate

- (i) cracks including, orientation, shape, size, depth, and any evidence suggesting new or long standing cracks,
- (ii) spalling including location, shape, size, and depth, and any evidence suggesting new or long standing spalling,
- (iii) drumminess (including arch ring separation), when struck with a suitable hammer, areas which sound “drummy” shall be identified, where visible, the amount of arch ring separation occurring,
- (iv) water seepage including rate of seepage, source of water, any evidence suggesting new or long standing water seepage, leachate, stone or brick slurry, and whether the area is wet, damp, dry or subject to wetting or drying,
- (v) insufficient mortar to joints including depth and joint width, and condition of mortar,
- (vi) misalignment of brickwork or masonry, (such as bulging, tilting and rotation) including dimensions of misalignment, degree of misalignment over a gauged length, and where practical a contour plot of any bulging,
- (vii) loose brickwork or masonry including the depth of such brickwork or masonry,
- (viii) apparent loss of strength (including crushing and softness) including an evaluation of the loss of section or strength of the material.

All defects shall be logged and shown on dimensioned sketches, to show the location, extent, and degree of deterioration and to detail the defect on the structure. Photographs, in accordance with Section 23: Structural Repair Survey **!CHECK!** for each defect shall be included, but shall not be used as a substitute for dimensioned sketches.

(153.003)

Tests

153.004

Details of the Contractor's proposed testing regime shall be submitted for the agreement of the Employer's Representative.

NOTE TO SPECIFIER

See *Notes to Specifier “Choice of Testing”*

The following tests shall be included in the Contractor's proposed testing regime:

Include or exclude as appropriate

- (i) compressive strengths of bricks and mortar,
- (ii) elastic modulus of repair area,

		(iii)	water absorption of bricks,	
Insert any additional requirements	!C!	(iv)		
				(153.004)

Design of brickwork and masonry repairs	153.005	!C!	<p>Unless detailed on the Contract Drawings, !CHECK! the design of brickwork and masonry repairs shall be carried out by the Contractor.</p> <p>Designs of brickwork and masonry repairs shall be in accordance with BS 5628 or BS 5390 as applicable to the material of the structure, and shall satisfy the load capacity, serviceability limits, durability and life expectancy and other design requirements of Section 23: Structural Repair Survey. !CHECK!</p> <p>Repairs to brickwork and masonry and the method of carrying out the repairs shall not adversely affect the performance of the structure by the introduction of local stiffening or adversely affecting the load path through the structure.</p> <p>Where the design of the repair is carried out by the Contractor, proposals for the repair shall be submitted in accordance with Section 23: Structural Repair Survey. !CHECK!</p> <p>Cleaning and superficial surface repairs to brickwork and masonry shall be in accordance with Clause 153.040. !CHECK!</p>	(153.005)
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Surface condition of existing brickwork and masonry	153.006	!C!	<p>Where new brickwork is to be bonded to existing brickwork, the surface condition of the existing brickwork shall be controlled, as far as is reasonably practicable, so as to comply with the suction rate requirements of Section 150: Brickwork, Blockwork and Masonry. !CHECK! Reduction of excessive suction rates may be achieved by wetting the existing brickwork with clean water. The existing brickwork shall not be soaked.</p>	
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Check this is applicable			<p>No repairs shall be carried out to brickwork which is subjected to running water or seepage which causes continuous wetting unless instructed to do so, in writing, by the Employer's Representative.</p>	(153.006)
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Bricks	153.007	!C!	<p>Permanently exposed bricks to be used in the repair of shall comply with BS 3921, !CHECK! Type FL (Frost resistant and low salt content). Bricks shall have a compressive strength, elastic modulus, and water absorption characteristics compatible with the existing bricks in the structure. The nominal size and appearance shall match the bricks in the structure.</p>	
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NOTE TO SPECIFIER			<p>Insert application for which the bricks are to be used and repeat paragraph if necessary if different bricks are required to be used for different applications. Care should be taken to ensure that any new brickwork is compatible with the existing brickwork. The compressive strength of the existing brickwork if known, should be given.</p>	
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Should the Contractor propose to reuse bricks from other redundant structures, such bricks shall be tested to confirm the compressive strength, elastic modulus and water absorption characteristics. Samples shall be provided to the Employer's Representative for agreement to the inclusion of such bricks in the repair.

Bricks from redundant structures shall be in good condition with all old mortar removed.

Non-standard bricks shall comply with BS 4729.

(153.007)

Stonework

153.008 Stonework shall match the existing masonry and shall be in accordance with Section 150: Brickwork, Blockwork and Masonry.**!CHECK!**
!CI!
(153.008)

Grout

153.009 Further to Section 150: Brickwork, Blockwork and Masonry**!CHECK!**
!CI! grout shall have a low heat of hydration and plastic shrinkage, high resistance to sulphate and other chemical attack and capable of developing the performance specified when large volumes of water are present. The grout shall comply with the following performance specification at 5°C:

- !CI!** (i) minimum compressive strength of 5 N/mm²**!CHECK!** at
!CI! three days, 7 N/mm²**!CHECK!** at seven days, and
!CI! 11 N/mm²**!CHECK!** at 28 days,
- !CI!** (ii) maximum compressive strength at 28 days of
..... N/mm²**!CHECK!** compatible with the strength of the
existing brickwork or masonry,

NOTE TO SPECIFIER

Amend or insert compressive strength values as necessary to be compatible with the existing brickwork or masonry. Excessive strength of the grout may affect the load path through the structure, and should be avoided where practicable.

- (iii) initial set at 1 hour maximum, final set at seven hours maximum,
- !CI!** (iv) pourable consistency with flow channel figure not less than 380 mm,**!CHECK!**
- !CI!** (v) maximum water / solids ratio: 0.4.**!CHECK!**

Admixtures including chlorides shall not be used.

(153.009)

Mortar

153.010 Except where mechanical pointing is to be used, mortar shall be in accordance with Section 150: Brickwork, Blockwork and Masonry**!CHECK!**
!CI! and shall be compatible with the existing construction. The colour of the mortar shall match the existing.

NOTE TO SPECIFIER

Where Contractor designed, the Specifier should include the relevant Clause from Section 150: Brickwork, Blockwork and Masonry, but delete references to specific mix designs. For prescribed mixes, ensure mortar strength is compatible with the existing and does not cause hard spots.