Appendix G

Carlow & Wexford Bridges Rehabilitation Contract - Volume A – Works Requirements Part 2: Specification

Eirspan Bridge Management System

Carlow & Wexford Bridges Rehabilitation Contract

Volume A – Works Requirements

Part 2: Specification

Contract Issue
October 2016

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Eirspan Bridge Management System

Carlow & Wexford Bridges Rehabilitation Contract

Volume A – Works Requirements

Part 2: Specification

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Eirspan Bridge Management System

Carlow & Wexford Bridges Rehabilitation Contract

Volume A – Works Requirement
Part 2: Specification

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PREAMBLE TO SPECIFICATION

The Specification referred to in the Contract shall be the Specification for Works (SPW) in TII Publications (Standards) published by TII as a collective group of documents under the Construction and Commissioning activity within the online TII Publications system (http://www.tiipublications.ie/), current on the date 10 working days prior to the tender returns date or, if applicable, the extended tender returns date and incorporating all amendments current on that date and as extended by the following:-

(i) Appendix 0/1: Contract-specific Additional, Substitute and Cancelled Clauses, Tables and Figures;
(ii) Appendix 0/2: Contract-specific minor alterations to existing Clauses, Tables and Figures;
(iii) The Numbered Appendices listed in Appendix 0/3;
(iv) Appendix 0/4 containing a list of the drawings referred to in the Specification.

An Additional Clause as indicated by a suffix 'AR' in Appendix 0/1 is a Contract-specific alteration.

A Substitute Clause as indicated by a suffix 'SR' in Appendix 0/1 is a Contract-specific alteration.

A Cancelled Clause indicated by a suffix 'CR' in Appendix 0/1 is a Contract-specific alteration.

Insofar as any of the Numbered Appendices may conflict or be inconsistent with any provision of the SPW the Numbered Appendices shall always prevail.

Any reference in the Contract to a part of the SPW or Appendix shall be deemed to refer to the corresponding Substitute part of the SPW or Appendix listed in Appendix 0/1 or 0/2.

Where a part of the SPW is altered, any original Table/Figure referred to in the part of the SPW shall apply unless the Table/Figure is also altered. Where a Table/Figure is altered, any reference in a part of the SPW to the original Table/Figure shall apply to the altered Table/Figure.

Where a part of the SPW relates to work goods or materials that are not required for the Works it shall be deemed not to apply.

Any Appendix referred to in the SPW that is not used shall be deemed not to apply.

References in the SPW to "NRA Road Construction Details" shall be taken to refer to Standard Construction Details (SCD) in TII Publications (Standards) published by TII as a collective group of documents under the Construction and Commissioning activity within the online TII Publications system (http://www.tiipublications.ie/), current on the date 10 working days prior to the tender returns date or, if applicable, the extended tender returns date.

Text shown in grey highlight applies only to Contracts where the applicable Conditions of Contract is the Public Works Contract for Civil Engineering Works Designed by the Employer, the Public Works Contract for Minor Building and Civil Engineering Works Designed by the Employer.

Text shown in square brackets immediately following text shown in grey highlight, if any, is deemed to replace the text in grey highlight for Contracts where the applicable Conditions of Contract is the Public Works Contract for Civil Engineering Work Designed by the Contractor.

Throughout the SPW and Appendices to the SPW, the following interpretations shall apply:
"Base Course" shall mean "Binder Course"
"Roadbase" shall mean "Base"
"Wearing Course" shall mean "Surface Course"
"UK Department of Transport" shall mean "UK Highways Agency"

APPENDIX 0/1
Contract Specific Additional, Substitute and Cancelled Clauses, Tables and Figures included in the Contract

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APPENDIX 0/1
Contract-Specific Additional, Substitute and Cancelled Clauses, Tables and Figures included in the Contract

(i) Additional Clauses, Tables and Figures

Clause No.	Title and written text
112.4AR	**Setting Out** Notwithstanding the requirements of Clause 7.7 of the Conditions, the Contractor shall survey all tie-in sections of existing roads and drainage systems and submit the levels to the Employer's Representative prior to construction. The Contractor shall survey and record existing details of items which he is required to remove and subsequently replace.
116.6AR	**Privately and Publicly Owned Services or Supplies** *Gas Networks Ireland Pipelines* Where excavation or construction work is to be carried out in the vicinity of Gas Networks Ireland Pipelines, the Contractor shall apply, at least two weeks in advance of the works, for a Permit under the Gas Networks Ireland Permit to Work/Excavation Permit system. All works in the vicinity of Gas Networks Ireland Distribution Pipelines are to be carried out in accordance with the requirements of Gas Networks Ireland. Reference to Bord Gáis, Bord Gáis Networks, Bord Gáis Éireann and Bord Gáis Éireann Distribution shall be deemed to refer to Gas Networks Ireland.
116.7AR	Before commencing any excavation the Contractor shall notify all relevant authorities including, Local Authority, ESB, Telephone Utility Companies, Eir, etc. So that all available information regarding the location of underground services and working restrictions imposed by same is ascertained prior to such excavation.
116.8AR	The Contractor shall consult the responsible authorities before commencing excavation about the position and type of underground service, including all drainage and water mains likely to be encountered. It remains the Contractors responsibility to accurately locate all services on site. For the purposes of this Clause the Contractor shall provide in his initial Contract Sum for pipe and cable detection equipment for his own use on site. Electricity cables must be located using cable detection equipment and the Contractor shall not assume cables are located at a minimum depth.
116.9AR	Overhead lines are present, it shall be deemed that the Contractor has made note of these overhead services during his inspection of the site, and made due allowance for all temporary diversions necessary for construction of the Works. This shall include temporary diversions of overhead services in the location of the Works compounds. The Contractor shall restore overhead services to their original locations on completion of the Works. No such diversions may take place without prior notification and approval of relevant utility or statutory body.
116.10AR	**Support of Existing Structures and Services** The Contractor shall be responsible for maintaining all sewers, drains, pipes, cables, other services and structures encountered in excavations. While the locations of some services may be shown on the Contract Drawings, no guarantee is given that these are the only services likely to be encountered and the Contractor shall make provision accordingly in his Tender. All services shall be temporarily supported or diverted during the construction of the Works and subsequently shall be amended, altered or remade to the reasonable satisfaction of the Employer's Representative and the person, company or authority in whom they are vested.
132.3AR	**Control of Dust** The Contractor shall submit a Dust Minimisation Plan to the Employer's Representative a minimum of 2 weeks in advance of the commencement of works which may cause the release of dust. The plan shall detail the Contractor's proposed methodology for complying with the requirements of the Contract with regard to the control of dust. The plan shall be updated regularly to reflect the changing nature of the works on site.
170AR	**Protection of Water Quality**
170.1AR	**Protection of Water Quality** The Contractor shall undertake the works in such a manner as to avoid degradation of water quality either by pollution from oil spills, or contamination due to repointing operations, or by causing turbidity due to disturbance of silt or spoil from operations. Specific measures to be taken to prevent the above shall include the following:

Clause No.	Title and written text
170.1AR contd.	(i) Contractors plant, equipment etc. Shall be free of any mechanical defects, and be well maintained so as to prevent soil or fuel leaks into the river. (ii) The Contractor shall so arrange that the cleaning out of vehicles and equipment does not cause run-off to enter into the watercourses or drainage networks. (iii) The Contractor shall take special precautions in relation to protection of watercourses. Temporary environmental screens shall be erected sufficient to prevent construction debris, abrasive materials, oils, chemicals or other construction materials from entering any watercourse for the duration of the works. The Contractors method statement should make specific reference to measures for the protection of river quality. (iv) Sedimentation trap to be constructed within bunded dry-zone with appropriate filter attached to surplus water outlet (pump) to prevent fines entering the rivers. (v) Measures to ensure no spillage of fuel or cement based material or any other leakages occur to the watercourse for the duration of the works. (vi) The Contractor shall notify the Inland Fisheries Ireland 4 weeks in advance of commencement of the works and within 7 days of completion of the works and issue method statements as required by Inland Fisheries Ireland. (vii) All works will be undertaken in accordance with the following best practice guidelines for working alongside watercourses: • CIRIA Control of Water Pollution from Construction sites – Guidance for Consultants and Contactors (2001). • IFI Guidance Notes '*Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016); • NRA Guidelines (2006) NRA Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.
170.2 AR	**Geotextile Screen and Boom** Geotextile screen shall be provided at Str 04 Ballybing Culvert and Str 05 Glebe Bridge during construction and shall be capable of filtering out all silt, cement and other colloidal matter and preventing these materials from carrying further in the watercourse. The screen shall be supported by a floating boom, so that it will act as a barrier to floating debris. The geotextile screen shall be anchored to the bed of the watercourse by contiguous weights. Sufficient geotextile screen shall be provided to cater for the full flood range at the bridge locations. All details of the geotextile screen and boom, including materials, grades, fixings, connections to floating boom and connections to riverbed, shall be submitted to the Employers Representative for approval.
170.3 AR	**Maintenance of Geotextile Screen and Boom** The Contractor shall regularly inspect geotextile screens and booms and carry out any maintenance or repairs required. If for any reason the geotextile screen and boom has to be removed, for repair or maintenance, either fully or partially, or temporarily affected so as to prevent full performance than all works in the river shall be suspended until the geotextile screen and boom is again fully operational. The Contractor shall remove floating debris within the boom at regular intervals.
170.4 AR	**Oil Barrier** The Contractor shall provide an oil/hydrocarbon barrier at the geotextile screen and boom. An approved prop barrier is the SK8 Super 8 Pig Skimmer absorbent sack. The sack shall be attached to the full length of the floating boom on the side where the works take place. Oil barriers shall be replaced regularly, as per the manufacturer's instructions, as they lose absorbency. Contaminated oil barriers shall be safely disposed of to a toxic waste site.
170.5 AR	**Removal of Geotextile Screen and Boom** Work to remove the geotextile screen and boom shall be carried out in such a manner so as not to cause disturbance of silt. /or permit silt, colloidal material and other matter to enter the river.

Clause No.	Title and written text
171AR	**Other Contractors**
171.1AR	**Works by other Contractors** Works to be undertaken by "Other Contractors" are outlined in Appendix 1/71. During the progress of the Works, the Main Contractor shall liaise with and take measures required by the other Contractors, for the support and full protection of the Works undertaken by the other Contractor. The Contractor shall include for the programming consequences of such activities of these Contractors in his construction programme to the satisfaction of the Employer's Representative.
172AR	**Not Used**
174AR	**Independent Check Certificate for Temporary Works**
174.1AR	In addition to the requirements of the Conditions, the Contractor shall provide independent check certificates for significant elements of temporary works. The checking organisation shall be independent of the temporary works design organisation. The check shall be carried out by a competent Chartered Engineer. The checker may not make reference to the temporary works designer's calculations in order to fulfil his/her duties. The following elements of work require independent check certification: (a) Temporary works for excavations (b) Temporary construction Platforms (c) Transportation and erection of precast elements (d) Temporary support to existing structures A pro forma of the Independent Check Certificate for Temporary Works is given in Appendix 1/72. Independent Check Certificate shall be submitted to the Employer's Representative a minimum of four weeks in advance of erection of temporary works.
175AR	**Temporary Stability of Existing Structures during Construction**
175.1AR	**Temporary Stability of Existing Structures during Construction** The Contractor shall make provision in his programming of the Works to ensure the stability of the existing adjacent bridges and retaining structures at all times during the Works. The Contractor shall forward detailed method statements including supporting calculations 2 weeks in advance of carrying out works within 50m of existing structures.
176AR	**Requirement for Working in the River Channels**
176.1 AR	**Water Quality Measures** • Construction and operation shall be carried out in accordance with the TII Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA, 2006) and 'Requirements for the Protection of Fisheries and Habitats during Construction and Development Works at River Sites'. • Contractors will be in possession of, and familiar with the contents of: "Control of water pollution from construction sites - Guidance for consultants and contractors" published by the Construction Industry Research and Information Association (CIRIA 2001). • Contractors will be in possession of, and familiar with the contents of the IFI Guidance Notes '*Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters* (IFI, 2016). • Throughout all stages of the construction phase of the project the contractor shall ensure that good housekeeping is maintained at all times and that all site personnel are made aware of the importance of the freshwater environments and the requirement to avoid pollution of all types. This will be reflected in the Construction Management Plan for the site. • Careful site management of earthworks shall involve the use of silt fences and bunding adjacent to watercourses. • Site Compounds shall be located at least 25m from any watercourse. • Any machinery required to operate in-stream will be steam-cleaned in advance of in-stream works and routinely checked to ensure no leakage of oils or lubricants occurs. All fuelling of machinery will be undertaken on dry land. • The storage of oils, hydraulic fluids, etc shall undertaken in accordance with current best practice for oil storage (Enterprise Ireland, BPGCS005).

Clause No.	Title and written text
176.1 AR contd.	• Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to codes of practice. • Fuelling and lubrication of equipment will be carried out in a bunded area and will not be carried out close to watercourses. • Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling. • All machinery and plant used will be regularly maintained and serviced and will comply with appropriate standards to ensure that leakage of diesel, oil and lubricants is minimised. Such maintenance will be carried out in areas remote from watercourses. • Foul drainage from site compound etc. will be removed to a suitable treatment facility or discharged to a septic tank system constructed in accordance with EPA guidelines. • An emergency-operating plan shall be established by the Contractor (and approved by the Local Authority) to deal with incidents or accidents during construction that may give rise to pollution of watercourses. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (including oil booms and soakage pads). • Any spillage of fuels, lubricants or hydraulic oils shall be immediately contained and the contaminated soil removed from the site and properly disposed of. • Chainsaws shall not be used within 10 m of a watercourse without prior agreement from the Employer's Representative. • Topsoil stripping near Edermine Stream (at Glebe Bridge) to be carried out under dry weather conditions; **Reduction and Prevention of Suspended Solids Pollution** • Sediment traps and interception channels shall be in place prior to felling to prevent sediment entering watercourses in the case of heavy rain. • The Contractor shall seek approval from the Employer's Representative for all suspended solid mitigation measures prior to commencing felling within 10m of a watercourse. • Vegetation shall be felled away from the river. • Temporary fills or stockpiles shall be covered with polyethylene sheeting.
176.2AR	**General** The contractor shall apply in writing to the Employers Representative, the Inland Fisheries Ireland and the Office of Public Works at least 4 weeks in advance of any proposed works in or over any watercourse for approval of commence work. Approval will be subject to agreement of Inland Fisheries Ireland and the Office of Public works. The application shall include full method statement, layout drawings including minimum horizontal and vertical clearance, fabrication drawings, areas of channel that are proposed to be destocked, design calculations for temporary works, proposed Construction sequence.
176.3AR	**Requirement for Working in the River Channel** The Contractor shall carry out works in accordance with the Fisheries Consolidation Act 1959 as amended and by the Local Government (Water Pollution) Act 1977 as amended.
176.4AR	**Requirement for working in the River Channel** Sufficient plant shall be available at the site to remove any temporary works within the river channel in the following situations: (a) In the event of floods; (b) As instructed by the Employers Representative. No plant or machinery shall be left unattended in the river channel during the Works.
177AR	**Records**
177.1AR	**As Built Record Drawings** The Contractor shall be required to provide as built records drawings for the project upon completion of the Works as detailed in Appendix 1/75. All drawings submitted for formal review shall be provided in AutoCAD DWG format. The following standards shall also apply: All CAD files shall be translated to an acceptable version of AutoCAD DWG format, along with any font, linestyle, block or other necessary definition.

Clause No.	Title and written text
177.1AR contd.	Each transfer shall be fully documented to detail items such as level use cross-referenced files, necessary directory structure, etc. Full details of the programs used to generate the DWG format file shall be attached for reference. Data transfers shall be readable using equipment currently employed by the Employer's Representative. For small transfers this may take the form of cc: Mail attachments; for large transfers e.g. area completion, this may also be on CD format. Generally the current version of all application software, shall be deemed to be standard, as long as it is compliant with the operating characteristics of the Employer's Representative's computer systems.
177.2AR	**Manufacturer's Instructions, Catalogues** The Contractor shall supply to the Employer's Representative the following items, prior to incorporation into the works; i) Details of all proprietary current manufacturer's instructions and explanatory brochures to be used on the project. ii) Test results and certificates for all items and investigations whether the tests or investigations are carried out on Site or off Site. iii) Operating instruction for items. iv) References for all materials and processes used in the works. References shall include origin, comprehensive description, manufacturer, supplier, copies of relevant parts of standards and specification and any other information necessary to reproduce the item.
178AR	**Waste Management**
178.1AR	**Waste Management** The Contractor shall exercise due care in the handling and disposal of any potentially contaminating material. Appropriate site management control shall be demonstrated at all times to minimise the potential for pollution of the environment. The Contractor shall submit a Waste Management Plan to the Employer's Representative for approval, a minimum period of 2 weeks in advance of any works commencing on the site. This shall include details of the following items: All proposed methods of waste disposal (reuse, recycle, landfill, discharge to drain, etc). Details of the proposed licensed waste disposal contractors and licensed disposal sites, to be used by the Contractor. The Contractor shall maintain detailed records and receipts for all movements of waste materials from the site, for inspection by the Employer's Representative.
178.2AR	**Disposal of Surplus Soil and Demolition Rubble** The materials to be disposed off site are classified as "wastes" and are subject to the provisions of the "Waste Management Act" 1996. The facilities at which such materials are discarded must have a waste licence from the EPA or where the EPA decides, must have a waste permit from the Local Authority.
180AR	**General Ecological Mitigation**
180.1AR	**General Environment – Habitats** The Contractor must develop a Standard Site Management practice with Method Statement, so as not to, as a minimum disrupt river banksides or cause pollution events at all bridge sites.
180.2AR	**Specific Mitigation for Bridges: General Ecology** A Method Statement must be prepared and will provide precise details on methods to protect watercourses. It will include standard best practice control measures, including as a minimum: • Measures to protect watercourses from other pollutants: o There will be no mixing of concrete within 100m of any watercourse. o There will be no storage of fuels, oils, greases, hydraulic fluids, concrete, waste piles or other potential pollutants within 100m of the banks of any watercourses. o All fuels, oils, chemicals, cement (including cement mixing) or other potential pollutants will be kept within bunded containers / areas. o No re-fuelling of vehicles or concrete-mixing should take place within 100m of any watercourses.

Clause No.	Title and written text
180.2AR contd.	○ Site compounds (if necessary) will not be located within 25m of any watercourse. ○ On-site emergency spill kits will be of a suitable size for the works required.
180.3AR	**Protection of Fishery Interests** • Contractors will be required to establish contact with Inland Fisheries Ireland before works commence, and there will be ongoing liaison with them throughout the construction process. • Design and construction method statements will be submitted to Inland Fisheries Ireland for approval at least 4 weeks prior to commencement of construction. The details in relation to the timing and methods of dewatering of the streams prior to works and reflooding on completion shall be decided in close consultation with IFI. • In-stream works at Glebe Bridge should be undertaken during the period July – September unless otherwise agreed by the Contractor with Inland Fishers Ireland. • Pumping of excavations shall be directed away from the river and into settling pools or through a filtration system to the approval of the Employers Representative and Inland Fisheries Ireland. • Destocking of the channel at Str04 Ballybing Culvert and Str05 Glebe Bridge will be required for the duration of in-river works. The Contractor is to agree his proposed method with IFI and all destocking to be carried out under supervision of IFI. • At Str05 Glebe Bridge, electrofishing shall be undertaken to remove from the works area all individuals of the species listed below prior to dewatering of Edermine Stream: ○ Sea Lamprey Petromyzon marinus; ○ River Lamprey Lampetra fluviatilis; ○ Brook Lamprey L. planeri; and, ○ Atlantic Salmon Salmo salar. With regard to pressure-grouting and resin-injection of cracks/fissures/crevices in the bridge structure, particular attention shall be paid to the provisions in Paragraphs 10.4.1 to 10.4.7, inclusive, of IFI (2016). The following shall apply in relation to these elements of the works: • At least one member of the Contractor' personnel shall closely monitor for grout and/or resin losses to the stream both upstream and downstream of the bridge structure; and, • The entirety of the area of water over which repair works are to take place shall be protected by a sealed, secure deckingso as to ensure no losses of grout or resin to the water, and any captured material(s) shall be removed for safe disposal. The Contractor shall prepare and implement a Construction Erosion and Sediment Control Plan (CESCP). This plan shall include the following elements: • Limiting of site works to the minimum area and timescale required to undertake the necessary elements of the works; • Formulation of a Dust Minimisation Plan; • Direction of site drainage through a settlement facility prior to discharge and provision of temporary facilities to trap any accidental spillage; • A Method Statement for the works to be submitted to IFI to ensure that the proposed methods satisfy fisheries requirements; • Promotion of awareness of the importance of site management and the freshwater environment amongst site personnel; • Restriction of topsoil stripping near Edermine Stream to dry weather conditions; • Pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents etc. to be completed in the dry; • Storage of oils, fuel, chemicals, hydraulic fluids etc. to be located at least 100 m from the stream on an impervious base within a bund and appropriately secured; • All machinery operating near the stream to be steam-cleaned in advance of works and routinely checked to ensure that there is no leakage of oils or lubricants; and, • All fuelling of machinery to be undertaken a minimum of 100 m from the stream.

Clause No.	Title and written text
180.4AR	**Protection of Bats** Four weeks in advance of any works the Contractor shall organise and procure a bat survey. If bats are found to be present the Contractor shall ensure that all bats have been relocated prior to any site clearance or demolition in general and also prior to the demolition of known bat roosts, as indicated by NPWS. Bats shall only be removed under licence. Bats shall only be removed by the suitably qualified expert appointed by the Contractor. Where bat roosts or potential roosts are recorded, the removal of existing retaining walls or trees will require a derogation licence application. **Protection of Bats** The conditions of this licence, which will depend on the status of any bat roost identified, may require the exclusion of bats (for example from crevices in the bridge structure) and the installation of bat roost replacement habitat in the form of a bat box scheme by the Contractor. Works at night shall be avoided in areas where foraging bats are concentrated. **Glebe Bridge Bat Roost Mitigation** A bat habitat exists in the circumferential crack to the arch barrel located 1m from the interface of the masonry arch and concrete sections of the bridge. The Contractor is required to adhere to the following mitigation measures in executing the works: • The existing bat roost shall not be disturbed by the activities of the Contractor; The crack containing the roost shall not be grouted or repointed; • The location of the crack containing the roost shall be clearly marked and all personnel carrying out works at Glebe Bridge shall be alerted to the location of the roost; • No works shall be undertaken in the immediate vicinity of the roost without prior agreement with the Employer's Representative;
180.5AR	**Birds** Clearance of vegetation should take place outside of the breeding bird season (1st March to 31st August) in accordance with the Wildlife (Amendment) Act (2000). Certain exemptions to these regulations are set out in the Act. To compensate for the loss of habitat for bird species, landscaping proposals will primarily entail the use of locally native trees and shrubs. If tree felling and/or hedgerow clearance takes place outside of this season, care shall be taken to avoid harming birds and/or active nests, as per TII guidance. With regards to works at night, all areas shall be screened to prevent lighting spilling out onto adjacent habitats and lighting used shall be directional onto works.
180.6AR	**Invasive Species Management** The invasive plant species Japanese Knotweed (*Fallopia japonica*) is present on site to the west of the site of Str 03 MacMurrugh Farm Pass (WX-N30-009.00) and on the west embankment at Str 05 Glebe Bridge (WX-N11-003.00). It is an offence under the European Communities (Birds and Natural Habitats) Regulations 49 (2) of 2011, to allow the spread or dispersal of this plant. Japanese Knotweed can spread vegetatively through the dispersal of small pieces of either the plant rhizome or live green material. Prior to site access being made available, the Contractor shall develop a Construction Management Plan (CMP) and forward to the Employer Representative his invasive species management plant. Reference should be made to www.invasivespeciesireland.ie; www.fisheriesireland.ie/Research/invasive-species.html; and the UK Environment Agency document "The Knotweed Code of Practice". The contractor shall develop a CMP to include the following actions to prevent further spread of invasive species Japanese Knotweed at location Str 03 MacMurrugh Farm Pass and Str 05 Glebe Bridge: • Wexford County Council is to be notified by the contractor pre commencement of works and issued a copy of the CMP. • Contractors will ensure personnel are briefed and aware of Japanese Knotweed issues and its location and contractors responsibilities. • The CMP will identify on site and mark out the contaminated area and ensure that vehicles or personnel do not work in the contaminated area. • Access to the site shall be marked with tape avoiding any areas containing Japanese Knotweed.

Clause No.	Title and written text
180.6AR contd.	• The Contractor shall ensure that all personnel and others visiting site clean their boots of any soil prior to leaving site. Reference should be made by the Contractor to "The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads 2010 NRA" in the development and implementation of his CMP.
570AR	**Marker Tape**
570.1AR	The Contractor shall lay marker tape above ESB, Eir and the Public Lighting service ducts, as specified in Appendix 5/2, at a depth of 300mm below finished ground level or at the underside of the sub-base when within the road pavement. The marker tape is to be obtained by the Contractor from the relevant statutory undertakers.
571AR	**Lowering or Raising of Existing Service Ducts or Cables**
571.1AR	**Lowering or Raising of Existing Service Ducts or Cables** Lowering or raising of existing services shall include for hand digging around the ducts and the undermining of the ducts to attain the level of cover required in the Contract. Temporary support to the relevant utility company's apparatus may be required. The Contractor shall liaise with all the utility companies during the works and provide any temporary supports and make good any damage caused to the ducts or cables.
1702.6AR	**Concrete – Ordinary Structural – Constituent Materials** **Non-Shrink Flowing Concrete** "Non-shrink flowing concrete" shall be "Exchem Concrete" or approved equivalent complying with UK Departmental Standard BD 27/86. It shall be stored, batched, mixed, placed, compacted and cured in accordance with manufacturer's instructions.
1770AR	**Concrete Repairs**
1770.1AR	**General** The condition of the concrete deck surfaces at Str3 MacMurrough Island Farm Pass, Str6 Ballintrane Bridge, Str 7 Boggan Bridge and Structure 8 Closh Bridge are not known and it may, therefore, be necessary to carry out concrete repairs to the concrete substrate prior to the application of the proprietary waterproofing system. The general sequence of operations for waterproofing and concrete repair will be carried out in as follows for each traffic management phase; **Waterproofing** • Exposure of concrete substrate • Surface preparation and cleaning • Inspection and testing of concrete substrate • Confirmation by Employer's Representative if any areas require concrete repair measures • Carry out concrete repair including, where necessary, removal of damaged concrete, preparation of exposed reinforcement, crack injection, concrete reinstatement, provision of adequate surface finish • Allow adequate time for curing prior to applying the waterproofing system to the concrete • Carry out testing as required
1770.2AR	**Surface Preparation of Substrate to receive Waterproofing** At Str3 MacMurrough Island Farm Pass, Str6 Ballintrane Bridge, Str 7 Boggan Bridge and Structure 8 Closh Bridge before cleaning commences unless otherwise directed the Contractor shall remove all surface attachments, inserts, and fixings which have been cast in or mortared into pockets or otherwise attached to the concrete from the areas to be repaired. The method of removal shall be such as to avoid unnecessary damage and shall be subject to the approval of the Employer's Representative. The cleaning operation shall remove all dirt, loose material or other contaminants, previous coatings, existing waterproofing systems, laitance, plant growth etc. Before any repairs are carried out on any area the concrete surface shall be prepared by grit blasting (wet, dry or vacuum blasting) and / or scabbling the concrete surface. The Contractors attention is drawn to Clause 2001.5AR of the Specification with regard to bridge deck preparation to receive waterproofing.

Clause No.	Title and written text
1770.2AR contd.	The Contractors proposed method shall be such that no damage is caused to sound concrete. All necessary measures shall be taken to provide protection to the general public, services, street furniture and the fabric of the structure during surface preparations. Where abrasive blasting is being performed within 3m of a lane occupied by traffic, the residue including dust shall be contained and removed immediately after contact between the abrasive and the surface being treated. Removal of the residue shall be performed by a vacuum attachment operating concurrently with the abrasive blasting operation. The Contractor shall make good or rectify any damage caused.
1770.3AR	**Survey and Location of Defects** At Str3 MacMurrough Island Farm Pass, Str6 Ballintrane Bridge, Str 7 Boggan Bridge and Structure 8 Closh Bridge the location, number and extent of concrete repairs on the bridge deck under the surfacing which may be necessary is unknown at present and can only be assessed following close inspection and testing once access has been provided and cleaning completed. Prior to carrying out any repairs to the concrete substrate the Contractor and the Employer's Representative shall carry out a survey of the exposed concrete surfaces to determine the location of defects requiring repair. This survey will include visual inspection, a sounding survey and a covermeter survey. The survey shall be carried out by a Chartered Surveyor or Chartered Engineer who shall be employed by independent consulting engineers, who will be retained and paid by the Contractor. The survey shall include a description of all existing defects together with photographs. Two copies of the survey reports shall be delivered, one to the Employer and one to the Employer's Representative. Areas to be repaired may include; i) cracked areas. ii) spalled areas. iii) hollow sounding areas. iv) areas of reinforcement corrosion. v) areas of uneven surface finish. vi) areas of poor quality concrete. During the course of the survey work photographs shall be taken at locations agreed with the Employer's Representative.
1770.4AR	**Concrete Removal** Where concrete removal is considered necessary the power and size of the equipment shall be appropriate to the scale of the individual repairs and shall be subject to the approval of the Employer's Representative. Where percussive equipment is used particular care shall be taken that damage is not caused to concrete substrate and reinforcement which is to remain in place. The amount of concrete to be removed at any time shall be subject to the restrictions described in the contract and to the approval of the Employer's Representative. The limits of each repair area shall be cut as a series of straight lines at right angles to the surface to a depth of approximately 10mm (5mm for repairs using epoxy mortar) using a disc cutter or similar. The disc cut surfaces shall be roughened prior to reinstatement. Feather edging shall not be permitted. The extent of the concrete removal shall be agreed by the Employer's Representative before any reinstatement works commence. All necessary precautions shall be taken to ensure that dust or falling debris does not constitute a hazard to personnel, equipment, the existing structure, and the general public. Effective means of clearing dust and debris away from the working area shall be continuously implemented. The extent and depth of concrete removal required shall be measured and recorded on drawings by the Contractor as the work proceeds. Where steel reinforcement is exposed, as part of the works the reinforcement shall be thoroughly cleaned of all deleterious material and coated with a suitable protective coating system.
1770.5AR	**Concrete Reinstatement** Before the application of repair compounds begins the Contractor shall satisfy himself that the condition of the surface to be repaired and the weather are such as to allow the work to proceed.

Clause No.	Title and written text
1770.5AR contd.	Repairs shall not proceed if the air temperature or concrete substrate temperature is 5˚C or less and shall cease if the air temperature reaches 5˚C on a falling thermometer unless the planned procedures specified below are implemented. A higher or lower temperature than 5˚C shall be substituted above if required by the instructions of the manufacturer of the repair compounds. Repairs may proceed at low temperatures if specific planned procedures are implemented. These include; (i) provision of heated tenting which envelopes the repair area and which produces an environment with a sustainable air temperature in excess of 5˚C. (ii) warming materials and the substrate to a temperature above 5˚C. The method of warming the substrate shall be such that the substrate is not damaged and is not caused to dry out in the case of cement based repair materials. (iii) insulating the completed or partially completed repairs in accordance with good practice for winter concreting. A higher or lower temperature than 5˚C shall be substituted above if required by the instructions of the manufacturer of the repair compounds. **Preparation** Immediately prior to reinstatement all dust debris and loose material shall be removed from the area of the repair by air blasting with oil-free air, vacuuming or vigorous wire brushing. Water jetting or brushing may be permitted subject to compatibility with the repair medium. When using cement based repair mortars the concrete substrate shall be thoroughly soaked with water for a period of 2 hours to obtain a saturated surface dry condition. Any surplus water shall be removed before reinstatement begins. Once the surface is prepared the concrete should be placed as quickly as possible as flowability decreases with time. Concrete should be poured from one side only to avoid entrapped air and ensure continual free flow of material. **Priming** Concrete surfaces within the repair area shall be treated with a bonding agent or primer in accordance with the manufacturer's instructions. Priming coats or bonding agents shall be thoroughly worked into all hollows and crevices in the prepared surface and around the reinforcement if required. Repair mortar shall be applied "wet on wet" when using a bonding agent or primer unless the manufacturer of the repair system specifies that the bonding agent or primer must dry out before the repair mortar is applied. If at any time the primer or bonding agent completely dries out before overlaying except as permitted above the repair surface shall be re-prepared generally by complete removal of the dried primer or as specified by the manufacturer of the repair materials. **Filling – Curing** The repair shall be cured by the method and for the period recommended by the manufacturer of the repair system. During this process the surface of the mortar shall be protected from strong sunlight and drying winds and the temperature of the material shall not be allowed to drop below 5˚C. Curing membranes shall not be permitted. The Contractor shall discuss with the Employer's Representative methods proposed in order to achieve the surface finish required. **Filling – Crack Injection** All crack injection work shall be carried out by a specialist Contractor with suitable expertise in concrete repairs and crack injection and all relevant technical datasheets for the materials to be used shall be submitted to the Employer's Representative for approval prior to work commencing on site. The area around the crack shall be initially inspected and blasted clean with oil-free compressed air. Application methods vary dependant on materials used and particular site conditions but shall in all cases be in accordance with the manufacturers recommendations and subject to the approval of the Employer's Representative.
1770.6AR	**Testing** Sampling and testing of concrete repair mortars and epoxy resins shall be in accordance with IS EN 14488 and BS 6319 Part 2 unless otherwise specified by the Employer's Representative. All testing shall be carried out by NAMAS accredited laboratories or similar nationally accredited institutions.

Clause No.	Title and written text
1770.6AR contd.	As a minimum, the Contractor shall be required to carry out 3 No pull-off tests carried out in accordance with BS 1881 Part 207 at locations selected by the Employer's Representative. Each pull-off strength result shall be at least 0.8N/mm^2 unless failure occurs within the parent concrete at a lower value.
2001.5AR	**General** Unless the manufacturers of the waterproofing membrane requires a higher standard of finish concrete, surfaces shall be finished as follows; The surfaces of the concrete to be waterproofed shall be vacuum blasted with a "Blastrac" (or approved equivalent machine) vacuum blasting unit to remove laitance/skin from top of deck and to produce a tough "fine sandpaper" type surface on the concrete. Vacuum blasting unit shall use suitable steel shot, automatically recirculated by the machine which shall also pick up all dust, laitance etc. (detached by the shot) by vacuum action. The Contractor shall note that it is not known whether there is an existing waterproofing layer on the full area of the bridge deck. Where present, it will be necessary to remove this layer from the bridge deck prior to the application of the new waterproofing system. The Contractors method of deck preparation shall be sufficient to remove this material as well as all other contaminants. The finished surface shall be: • Finished to an accuracy such that, when tested with a 3m straight edge, the maximum depression does not exceed 6mm, height of any ridge shall not exceed 2mm. • Clean and dry before priming or waterproofing. • Free from membrane curing compounds, ice and projecting tying wires. • Free from honeycombing, surface cavities, laitance, mortar or other surface deficiencies.
2470AR	**Cleaning, Removal of Vegetation and Repair of Masonry**
2470.1AR	**General** All vegetation shall be removed from the masonry in such a manner as to avoid damage to the mortar and stonework in accordance with the below and Appendix 24/3. Ivy growth may be chemically sprayed with a product to be approved by the Employers Representative and left to wilt before removal. Trees shall be cut above ground level and the stumps grubbed out. The stumps of vegetation with a diameter greater than 100mm shall have vertical saw cuts made into the stub to promote natural rotting. Remaining roots less than 0.5m deep shall be dug out and removed. Any roots remaining after the above work shall be treated with a root killer approved by the Employers Representative. Deeply rooted trees and other vegetation which are likely to result in damage to the structure on removal are to be referred to the Employers Representative for further guidance. Mould/fungus/algae are to be removed by a combination of stiff brush, hand scraper and high pressure water hosing. On completion of removal of vegetation the stonework shall be cleaned using a combination of high pressure water hose and/or stiff brush to restore the original condition as far as possible. Due consideration is to be given to run-off and the risk of contaminates entering water courses of affecting the surrounding flora and fauna. Where necessary, run-off shall be contained by water retaining barriers and disposed of at an approved disposal site. Any damage to masonry, mortar or other materials shall be repaired and repointed in accordance with Appendices 24/3.

APPENDIX 0/1
Contract-Specific Additional, Substitute and Cancelled Clauses, Tables and Figures included in the Contract

(ii) List of Substitute Clauses, Tables and Figures

Clause/Table/Figure Number	Title	Written on Page Number following
136.1	Property Conditions Surveys	14

APPENDIX 0/1
Contract-Specific Additional, Substitute and Cancelled Clauses, Tables and Figures included in the Contract

(ii) List of Substitute Clauses, Tables and Figures

Clause / Table / Figure No.	Substitute Clause
136.1SR	The Contractor shall arrange for property condition surveys to be undertaken for all buildings and structures referred to in Appendix 1/73.

APPENDIX 0/1

Contract-Specific Additional, Substitute and Cancelled Clauses, Tables and Figures included in the Contract

(iii) List of Cancelled Clauses, Tables and Figures

Clause/Table/Figure Number	Title	Written on Page Number following
Not Used		

APPENDIX 0/2
Contract Specific Minor Alterations to Existing Clauses etc.

List of Altered Clauses

Clause / Table / Figure No.	Title
117.1	Delete 'Guidance for the Control and management of Traffic at Road Works' and replace with 'Chapter 8 of the Traffic Signs Manual'.

APPENDIX 0/3
List of Numbered Appendices Referred to in the Specification and Included in the Contract

Appendix 0/3 is comprised of two lists, A and B, of numbered appendices as follows:

List 'A' is a complete list of the Numbered Appendices referred to in the Specification for Road Works with those not adopted marked "Not Used". Those identified by the letters to T or C shall be completed by the Tenderer or Contractor respectively.

Guide to types of Numbered Appendices – who compiles / completes

Symbol

(E) Employer's Representative compiles: Identified in the Notes for Guidance examples by the term 'Sample' included in their title.

(E/C) Employer's Representative partially compiles and Contractor completes and returns to Employer's Representative

(E/T) Employer's Representative partially compiles and Tenderers completes and returns with Tender

(C) Contractor completes and returns to the Employer's Representative

(I) For Contractor's information only

(P) This indicates the Appendix is a national proforma and format must not be altered

List "B" gives the list of Contract –specific Numbered Appendices devised for the Contract.

List 'A': List of Numbered Appendices Referred to in the Specification for Road Works

Vol A Part	Completed By	App No.	Title
			INTRODUCTION
2	(E)	0/1	Contract –specific Additional, Substitute and Cancelled Clauses and Tables Included in the Contract
2	(E)	0/2	Contract-specific Minor Alterations to Existing Clauses and Tables included in the Contract.
2	(E)	0/3	List of Numbered Appendices Referred to in the Specification and Included in the Contract
2	(E)	0/4	List of drawings Included in the Works Requirements
			PRELIMINARIES
2	(E)	1/1	Accommodation and Equipment for the Employer's Representative
Not Used	(E)	1/2	Vehicles for the Employer's Personnel
2	(E)	1/3	Communications System for the Employer's Personnel
2	(E)	1/4	Working and Fabrication Drawings
2	(E)	1/5	Testing to be Carried out by the Contractor
Not Used	(E)	1/6	Supply and Delivery of Samples to the Employer's Representative
2	(E)	1/7	Site Extent and Limitations on Use
2	(E)	1/8	Operatives for the Employer's Representative
2	(E)	1/9	Control of Noise and Vibration
Not Used	(E)	1/10	Structures to be Designed by the Contractor
2	(E)	1/11	Structural Elements and Other Features to be Designed by the Contractor
2	(E)	1/12	Setting Out and Existing Ground Levels
2	(E)	1/13	Programme of Works
2	(E)	1/14	Monthly Statements
2	(E)	1/15	Accommodation Works
2	(E)	1/16	Privately and Publicly Owned Services and Supplies
2	(E)	1/17	Traffic Safety and Management
2	(E)	1/18	Temporary Diversions for Traffic
2	(E)	1/19	Routeing of Vehicles
Not Used	(E)	1/20	Recovery Vehicles for Breakdowns
Not Used	(E)	1/21	Information Boards
2	(E)	1/22	Progress Photographs
2	(E)	1/23	Substances Hazardous to Health
2	(E)	1/24	Quality Management Systems
2	(E)	1/25	Product Certification Schemes
2	(E)	1/26	NSAI Agrément Certificates
			SITE CLEARANCE
2	(E)	2/1	List of Buildings, etc. to be Demolished
2	(E)	2/2	Filling of Trenches & Pipes

Vol A Part	Completed By	App No.	Title
2	(E)	2/3	Retention of Material Arising from Site Clearance
2	(E)	2/4	Explosives and Blasting
2	(E)	2/5	Hazardous Materials
			FENCING
2	(E)	3/1	Fencing, Gates and Stiles
2	(E)	3/2	Fencing: NRA Road Construction Details
			ROAD RESTRAINT SYSTEMS
2	(E)	4/1	Road Restraint Systems
2	(E)	4/2	Pedestrian Guardrails
2	(E)	4/3	Safety Barrier Terminals
Not Used	(E)	4/4	Safety Barrier Maintenance
Not Used	(E)	4/5	Anti-Glare Screens
Not Used	(E)	4/6	Safety Barriers: NRA Road Construction Details
2	(E)	4/7	Vehicle Parapet Systems
			DRAINAGE AND SERVICE DUCTS
2	(E)	5/1	Drainage Requirements
2	(E)	5/2	Service Duct Requirements
2	(E)	5/3	Surface Water Channels and Drainage Channel Blocks
Not Used	(E)	5/4	Fin Drains and Narrow Filter Drains and Geotextiles for Filter Drains
Not Used	(E)	5/5	Combined Drainage and Kerb Systems
Not Used	(E)	5/6	Linear Drainage Channel Systems
2	(E)	5/7	Drainage and Service Ducts: NRA Road Construction Details
Not Used	(E)	5/8	Thermoplastic Structural Wall Pipes and Fittings
Not Used	(E)	5/9	Attenuation
			EARTHWORKS
2	(E)	6/1	Requirements for Acceptability & Testing etc. of Earthworks Materials
2	(E)	6/2	Requirements for Dealing with Class U2 Unacceptable Material
2	(E)	6/3	Requirements for Excavation, Deposition, Compaction (Other than Dynamic Compaction)
Not Used	(E)	6/4	Not used
2	(E)	6/5	Geotextiles used to separate earthworks materials
2	(E)	6/6	Fill to Structures & Fill Above Structural Foundations
2	(E)	6/7	Sub-formation & Capping & Preparation & Surface Treatment of Formation
2	(E)	6/8	Topsoiling, Grass Seeding and Turfing
2	(E)	6/9	Earthwork Environmental Bunds, Landscape Areas, Strengthened Embankments
2	(E)	6/10	Ground Anchorages, Crib Walling and Gabions
2	(E)	6/11	Swallow Holes & Other Naturally Occurring Cavities & Disused Mine Workings

Vol A Part	Completed By	App No.	Title
2	(E)	6/12	Instrumentation & Monitoring
Not Used	(E)	6/13	Ground Improvement
			ROAD PAVEMENTS – GENERAL
2	(E)	7/1	Permitted Pavement Options
2	(E)	7/2	Excavation & Reinstatement of Existing Surfaces
2	(E)	7/3	Surface Dressing
Not Used	(E)	7/4	Bituminous Sprays
2	(E)	7/5	Road Pavements: NRA Road Construction Details
2	(E)	7/6	Breaking Up of Perforation of Existing Pavement
Not Used	(E)	7/7	Not Used
Not Used	(E)	7/8	Not Used
2	(E)	7/9	Cold Milling (Planing) of Bituminous Bound Flexible Pavement
Not Used	(E)	7/10	Microsurfacing
Not Used	(E)	7/11	High Friction Surfacing
Not Used	(E)	7/12	Low Energy Bound Mixtures
2	(E)	7/21	Recipe Surface Dressing
			KERBS, FOOTWAYS AND PAVED AREAS
2	(E)	11/1	Kerbs, Footways and Paved Areas
Not Used	(E)	11/2	Access Steps
2	(E)	11/3	Kerbs, Footways and Paved Areas: NRA Road Construction Details
			TRAFFIC SIGNS
2	(E)	12/1	Traffic Signs: General
Not Used	(E)	12/2	Traffic Signs: Marker Posts
2	(E)	12/3	Traffic Signs: Road Markings & Studs
Not Used	(E)	12/4	Traffic Signs: Cones, Cylinders, FTD's and Other Traffic Delineators
Not Used	(E)	12/5	Traffic Signs: Traffic Signals
Not Used	(E)	12/6	Traffic Signs: Special Sign Requirements on Gantries
Not Used	(E)	12/7	Traffic Signs: Preparation and Finish of Metal and Other Surfaces
			ROAD LIGHTING COLUMNS AND BRACKETS
Not Used	(E)	13/1	Information to be Provided by the Employer's Representative When Specifying Lighting Columns & Brackets
Not Used	(C) (P)	13/2	Typical Column and Bracket Data Sheets
Not Used	(P)	13/3	Instructions for Completion of Column and Bracket Data Sheets
Not Used	(E/C) (P)	13/4	Certification for Lighting Columns
Not Used	(E)	13/5	Road Lighting: NRA Road Construction Details
			ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS
Not Used	(E)	14/1	Site Records
Not Used	(E)	14/2	Location of Lighting Units & Feeder Pillars
Not Used	(E)	14/3	Temporary Lighting

Vol A Part	Completed By	App No.	Title
Not Used	(E/C)	14/4	Electrical Equipment for Road Lighting
Not Used	(E)	14/5	Electrical Equipment for Traffic Signs
Not Used	(E)	14/6	Preparation and Finish of Metal and Other Surfaces
			MOTORWAY COMMUNICATIONS
Not Used	(E)	15/1	Motorway Communications
			PILING AND EMBEDDED RETAINING WALLS
Not Used	(E)	16/1	General Requirements for Piling and Embedded Retaining Walls
Not Used	(E)	16/2	Precast Reinforced and Prestressed Concrete Piles and Precast Reinforced Concrete Segmental Piles
Not Used	(E)	16/3	Bored Cast-in-Place Piles
Not Used	(E)	16/4	Bored Piles Constructed Using Continuous Flight Augers and Concrete or Grout Injection Through Hollow Auger Stems
Not Used	(E)	16/5	Driven Cast-in-Place Piles
Not Used	(E)	16/6	Steel Bearing Piles
Not Used	(E)	16/7	Reduction of Friction on Piles
Not Used	(E)	16/8	Non-Destructive Methods for Testing Piles
Not Used	(E)	16/9	Static Testing of Piles
Not Used	(E)	16/10	Diaphragm Walls
Not Used	(E)	16/11	Hard/Hard Secant Pile Walls
Not Used	(E)	16/12	Hard/Soft Secant Pile Walls
Not Used	(E)	16/13	Contiguous Bored Pile Walls
Not Used	(E)	16/14	King Post Walls
Not Used	(E)	16/15	Steel Sheet Piles
Not Used	(E)	16/16	Integrity Testing of Wall Elements
Not Used	(E)	16/17	Instrumentation for Piles and Embedded Walls
Not Used	(E)	16/18	Support Fluid
			STRUCTURAL CONCRETE
2	(E)	17/1	Concrete – Classification of Mixes
2	(E)	17/2	Concrete – Impregnation and Coating Schedule
2	(E)	17/3	Concrete – Surface Finishes
2	(E)	17/4	Concrete – General
2	(E)	17/7	Precast Concrete Products
			STRUCTURAL STEELWORK
Not Used	(E)	18/1	Requirements for Structural Steelwork
			PROTECTION OF STEELWORK AGAINST CORROSION
2	(E/C) (P)	19/1	(Specification for Road Works) Sheet No. Form BE/P1 (New Works) Paint System Sheet
Not Used	(E/C)	19/2	(New Works) Requirements for Other Work
2	(C) (P)	19/3	(Specification for Road Works) Form BE/P2 Paint Data Sheet

Vol A Part	Completed By	App No.	Title
Vol A Part	**Completed By**	**App No.**	**Title**
2	(C) (P)	19/4	(Specification for Road Works) Form BE/P3 Paint Sample Despatch List: Sheet 1
2	(C) (P)	19/4	(Specification for Road Works) Form BE/P3 Paint Sample Despatch List: Sheet 2
2	(E)	19/5	(New Works) General Requirements
Not Used	(E/C) (P)	19/6	(Specification for Road Works) Form BE/PE1 (Maintenance) Paint System Sheet 1
Not Used	(C) (P)	19/6	(Specification for Road Works) Form BE/P1 (Maintenance) Paint System Sheet 2
Not Used	(E/C)	19/7	(Maintenance) Requirements for Other Work
Not Used	(E)	19/8	(Maintenance) General Requirements
			WATERPROOFING FOR CONCRETE STRUCTURES
2	(C) (P)	20/1	Waterproofing for Concrete Structures
			BRIDGE BEARINGS
Not Used	(E/C)	21/1	Bridge Bearing Schedule
			BRIDGE EXPANSION JOINTS AND SEALING OF GAPS
2	(C) (E)	23/1	Bridge Deck Expansion Joint Schedule
2	(E)	23/2	Sealing of Gaps Schedule (other than in bridge deck expansion joints)
			BRICKWORK, BLOCKWORK AND STONEWORK
2	(E)	24/1	Brickwork, Blockwork and Stonework
2	(E)	24/2	Brickwork, Blockwork and Stonework: NRA Road Construction Details
2	(E)	24/3	Requirements for Masonry Repointing and Reconstruction of Historic Structures
			SPECIAL STRUCTURES
Not Used	(E)	25/1	Requirements for Corrugated Steel Buried Structures
Not Used	(E)	25/2	Requirements for Reinforced Earth and Anchored Earth Structures
Not Used	(E)	25/3	Requirements for Pocket Type Reinforced Brickwork Retaining Wall Structures
			MISCELLANEOUS
Not Used	(E)	26/1	Ancillary Concrete
2	E	26/2	Bedding Mortar
Not Used	(E)	26/3	Cored Thermoplastic Node Markers
			WATERMAINS, UTILITIES AND ACCOMMODATION WORKS
2	E	27/1	Requirements for Watermains
2	E	27/2	Watermains: NRA Road Construction Details
			TRENCHLESS INSTALLATION OF ROAD DRAINAGE & SERVICE DUCTS
Not Used	E	28/1	Trenchless and Minimum Dig Techniques
			CCTV SURVEY OF ROAD DRAINAGE SYSTEMS
Not Used	E	29/1	CCTV Survey of Road Drainage Systems

Vol A Part	Completed By	App No.	Title
2	E	55/1	Structural Concrete Repairs

List "B": List of Contract Specific Numbered Appendices Devised for the Contract

Vol A Part	Completed By	App No.	Title
2	(E)	1/71	Works by Other Contractors
2	(E)(C)	1/72	Independent Check Certificate for Temporary Works
2	(E)	1/73	Condition Surveys (Dilapidation Surveys)
2	(E)	1/75	As built records drawings

APPENDIX 0/4
List Of Drawings Included In The Contract

1 Contract-specific Drawings Supplied to Each Tenderer

Drawing No	Title
Structure 1: MacMurrough Island Bridge 1 WX-N30-007.00	
0100-ST01-001	Location Map & Site Layout Plan
200-ST01-001	Site Clearance
1700-ST01-001	General Arrangement Details Sheet 1
1700-ST01-002	General Arrangement Details Sheet 2
1700-ST01-010	Masonry Rehabilitation Details
1700-ST01-020	Restraining Slab Reinforcement Details
Structure 2: MacMurrough Island Bridge 2 WX-N07-008.00	
0100-ST02-001	Location Map & Site Layout Plan
200-ST02-001	Site Clearance
1700-ST02-001	General Arrangement Details Sheet 1
1700-ST02-002	General Arrangement Details Sheet 2
1700-ST02-003	Access Road Retaining Wall General Arrangement Details
1700-ST02-004	Access Road Plan & Profile and Fencing Details
1700-ST02-010	Masonry Rehabilitation Details
1700-ST02-020	Restraining Slab Reinforcement Details Sheet 1
1700-ST02-021	Access Road Retaining Wall Reinforcement Details
Structure 3: MacMurrough Island Farm Pass WX-N30-009.00	
0100-ST03-001	Location Map & Site Layout Plan
200-ST03-001	Site Clearance
1700-ST03-001	General Arrangement Details Sheet 1
1700-ST03-002	General Arrangement Details Sheet 2
1700-ST03-020	Parapet Upstand Reinforcement Details Sheet 1
Structure 4: Ballybing Culvert WX-N25-001.00	
0100-ST04-001	Location Map & Site Layout Plan
0200-ST04-001	Site Clearance
500-ST04-002	Proposed Services Sheet 1
500-ST04-003	Proposed Services Sheet 2
1700-ST04-001	General Arrangement Details Sheet 1
1700-ST04-002	General Arrangement Details Sheet 2
1700-ST04-003	General Arrangement Details Sheet 3
1700-ST04-020	Northern Headwall & Wingwalls R.C. Details
1700-ST04-021	Southern Headwall & Wingwalls R.C. Details
1700-ST04-022	Box Culvert R.C. Details
MacMurrough Island Bridges Safety Barrier Details	

Drawing No	Title
1700-ST-100	MacMurrough Island Bridges Safety Barrier Details and Topsoiling / Grass-seeding Sheet 1
1700-ST-101	MacMurrough Island Bridges Safety Barrier Details and Topsoiling / Grass-seeding Sheet 2
Structure 5: Glebe Bridge WX-N11-003.00	
0100-ST05-001	Location Map & Site Layout Plan
200-ST05-001	Site Clearance
1700-ST05-001	Fencing, Topsoiling & Concrete/ Masonry repairs
1700-ST05-002	Spandrel Wall Stability Works
1700-ST05-010	Riverbed & Embankment Remedial Works
Structure 6: Ballintrane Bridge CW-N80-006.00	
0100-ST06-001	Location Map & Site Layout Plan
200-ST06-001	Site Clearance
1700-ST06-001	Waterproofing, Resurfacing & Joint Details
1700-ST06-002	G.A. details northern parapet
1700-ST06-003	G.A. details southern parapet
1700-ST06-004	Safety Barriers
1700-ST06-010	R.C details edge beams &restraining slabs
Structure 7: Boggan Bridge CW-N80-004.00	
0100-ST07-001	Location Map & Site Layout Plan
200-ST07-001	Site Clearance
1700-ST07-001	Waterproofing & Resurfacing Details
1700-ST07-002	Parapet Details & Embankment Remedial Works
1700-ST07-003	Safety Barriers
Structure 8: Closh Bridge WX-N81-001.00	
0100-ST08-001	Location Map & Site Layout Plan
0200-ST08-001	Site Clearance
1700-ST08-001	Waterproofing & Resurfacing Details
1700-ST08-002	Parapet Details & Embankment Remedial Works
1700-ST08-003	Safety Barriers

The following drawings are included in Volume a Part 4 Project Specific Construction Details.

Eir Chamber

10.165 SD-001 JB4 Service Duct Standard Details

Miscellaneous

RODCD/523 Small Pipe Headwall Outlet to Water Course

RODCD/301 Timber Post Set in Concrete

APPENDIX 0/4
List of Drawings Included In the Contract

2 ***Standard TII Drawings***

2(iii) Brought into the contract by Reference.
The NRA Road Construction Details contain the following drawings brought into the Contract by Reference.
Unless otherwise stated below the whole drawing is brought into the Contract.

Drawing No.	Subject Title	Drawing Title
RCD/300/1	Fencing	Timber Post & Rail Fences Type A and B
RCD/300/3	Fencing	Concrete Post & Rail Fence
RCD/300/6	Fencing	Concrete Post and Mesh
RCD/300/9	Fencing	Steel Single Field Gate
RCD/300/11	Fencing	Timber Single Field Gate
RCD/300/12	Gates	Timber Wicket Gate
RCD/300/13	Gates	Hinges for Timber Field Gates
RCD/300/14	Gates	Standard Gate Stops
RCD/500/20	Drainage	Filter Drains – Trench and Bedding Details
RCD/500/21	Drainage	Surface Water Drains – Trench and Bedding Details
RCD/500/1	Drainage	Chamber Types
RCD/500/2	Drainage	Manhole Type A (Block or Insitu Concrete)
RCD/500/3	Drainage	Manhole Type B (Block or Insitu Concrete)
RCD/500/4	Drainage	Manhole Type C (Precast Concrete Manhole)
RCD/500/8	Drainage	Vertical Backdrop in Manhole
RCD/500/9	Drainage	Catchpit Type F Precast Catchpit
RCD/500/13	Drainage	Chamber Fittings – Ladder, Handhold and Safety Chain
RCD/500/10	Drainage	Precast Concrete Gully
RCD/500/11	Drainage	In-Situ Concrete and Blockwork Gullies
RCD/500/12	Drainage	Gully Gratings
RCD/500/14	Drainage	Typical Chamber Details
RCD/500/23	Drainage	Drainage Channel Blocks Types A, B, C
RCD/500/24	Drainage	Drainage Channel Blocks Types D, E, F
RCD/500/50	Drainage	Rock Armour: Scour Protection
RCD/500/51	Drainage	Self Cleaning Inlet Grid Details
RCD/500/52	Drainage	Outlet Grid Details
RCD/500/53	Drainage	GA of Formed Headwalls 150-1800 Diameter Pipes
RCD/500/60	Ducts	Transverse Ducts
RCD/500/61	Ducts	Trench Cross Sections Under Trafficked Areas
RCD/500/62	Ducts	Trench Cross Sections Under Non-Trafficked Areas
RCD/500/63	Ducts	Duct Crossing Types
RCD/500/64	Ducts	Footway/Verge Draw Pit
RCD/500/65	Ducts	Carriageway Draw Pit: Type A
RCD/500/66	Ducts	Carriageway Draw Pit: Type B
RCD/600/1	Earthworks	Transition Area Between Cut and Fill
RCD/600/2	Earthworks	Interceptor Ditches
RCD/600/3	Earthworks	Rounding of Earthworks Slopes

Drawing No.	Subject Title	Drawing Title
RCD/600/4	Earthworks	Treatment of Abandoned Watercourse and/or Ditch
RCD/600/5	Earthworks	Benching for Embankment on Sloping Ground
RCD/600/7	Earthworks	Rock Cut Slope
RCD/600/8	Earthworks	Fill Against Existing Embankment
RCD/700/1	Pavement	Free Pavement Edge Detail
RCD/700/2	Pavement	Kerbed Pavement Edge Details
RCD/700/3	Pavement	Transverse Joint Between New Construction and Existing Road
RCD/700/4	Pavement	Longitudinal Joint Between New Construction and Existing Road
RCD/700/5	Pavement	Trench Reinstatement
RCD/700/6	Pavement	Access Road / Service Road
RCD/1100/1	Kerbs, Footways and Paved Areas	Precast Kerbs
RCD/1100/2	Kerbs, Footways and Paved Areas	Insitu Concrete Kerb
RCD/1100/3	Kerbs, Footways and Paved Areas	Dropped Kerb Ramp
RCD/1100/4	Kerbs, Footways and Paved Areas	Bituminous Footway
RCD/1100/5	Kerbs, Footways and Paved Areas	Concrete Footway
RCD/1200/010	Signs & Road Markings	Services Sticker Details
RCD/2400/1	Walls	Typical Blockwork Wall
RCD/2400/2	Walls	Typical Dense Concrete Masonry Blockwork Wall
RCD/2400/3	Walls	Typical Masonry Faced Blockwork Wall
RCD/2400/4	Walls	Typical Stonework Wall
RCD/2400/7	Walls	Principles of Stonemasonry
RCD/2700/1	Watermain	Watermain Trench and Bedding Details for Untrafficked Area
RCD/2700/2	Watermain	Watermain Trench and Bedding Details for Existing Roads
RCD/2700/3	Watermain	Watermain Trench and Bedding Details for New Roads
RCD/2700/4	Watermain	Sluice Valve Chamber (mains 300mm dia or less)
RCD/2700/5	Watermain	Twin Sluice Valve Chamber (mains 300mm dia or less)
RCD/2700/6	Watermain	Butterfly Valve Chamber (mains 350mm dia or over)
RCD/2700/7	Watermain	Air Valve or Sluice Hydrant Chamber (mains 400mm dia or less Sheet 1 of 2)
RCD/2700/8	Watermain	Air Valve or Sluice Hydrant Chamber (mains 400mm dia or less Sheet 2 of 2)
RCD/2700/9	Watermain	Offset Hydrant Chamber Sheet 1 of 2
RCD/2700/10	Watermain	Offset Hydrant Chamber Sheet 2 of 2
RCD/2700/11	Watermain	Joints and Lifting Handle
RCD/2700/12	Watermain	Spindle Guides
RCD/2700/13	Statutory Undertakers	Marker Posts and Plates
RCD/2700/51	Statutory Undertakers	Services Protection Slab
RCD/2700/52	Statutory Undertakers	Services Marker Slab
RCD/2700/101	Accommodation Works	Field Access

APPENDIX 1/1
Accommodation and Equipment for the Employer's Representative

1. Temporary Initial Accommodation

1.1 Temporary initial accommodation shall be made available if the Principal Offices are not ready from the date the Contractors commences work on Site and for a maximum of 4 weeks thereafter. The temporary initial accommodation shall be provided with appropriate furnishings and fittings for 2 persons and shall have 1 room with minimum $6m^2$ per person. Male and female toilets shall be provided over and above the room and space requirements. The telephone system shall have 1 outside line plus an extension to the Contractor's main site office. The Contractor shall also provide 1 number GSM mobile telephones for the use of the Employer's Representative on site, until the permanent offices become operational. This mobile telephone shall remain with the Employer's Representative on site once the Principal Offices are occupied and shall become part of the mobile telephone provision listed in Section 3.2 of this Appendix.

1.2 Temporary Mobile Office

The Contractor shall provide temporary mobile office accommodation comprising of those items listed in the schedule entitled "Schedule of Temporary Mobile Accommodation" contained herein. The temporary mobile offices shall be situated at a location provided by the Contractor in the vicinity to the proposed Str 04 Ballybing Culvert works during works at Str04 Ballybing Culvert.

The Employers Representative's Temporary Mobile Office shall be constructed to the same standards as the Employers Representative's Principal Office.

Schedule of Temporary Mobile Accommodation

Item Required	Amount Required	Units
Portable office units 6m x 3m	1	No.
Toilet block with separate male and female units	1	No.
Office desks with lockable drawers on each side minimum surface area: 1.5m x 0.75m	1	No.
Swivel chair with arm rests, independent back and height adjustment	2	No.
4-drawer lock-up steel filing cabinet with keys and suspended filing equipment	1	No.
Upholstered stacking office chair	2	No.
Charger unit for GSM mobile telephone	1	No.
1.5 litre automatic electric kettle	1	No.
2 ring electric cooker	1	No.
1.0 litre saucepan	1	No.
Set of delph comprising 1 No. each of: Soup bowl, side plate, dinner plate, cup, glass and mug	2	No.
Set of cutlery comprising 1 No. of each of: knife, fork, desert spoon, soup spoon, teaspoon	2	No
Waste paper basket	2	No.
Vistaplan trolley, complete with 5 No. A0 size hangers	1	No.

2. Principal Offices

2.1 The location and layout of the offices shall be acceptable to the Employer's Representative on site. The Principal Officer shall be local to the MacMurrough Bridge sites. The offices shall be sub-divided into internal dimensions similar but not less than those given in paragraph 2.8 of this Appendix and shall contain the supplies and equipment hereinafter described. Each office shall be set apart from the Contractor's facilities. They shall be served by roads of

adequate width and have a car park for 2 cars. The roads and car park shall have a bituminous surface. The road access to the Principal offices for the Employer's Representative on site shall be kept clear of mud and debris and shall not be used by construction plant.

2.2 All telecommunication facilities provided for use by the Employer's Representative on site, as described in this Appendix 1/1, shall be completely independent of the Contractor's facilities, to ensure privacy and confidentiality and for invoicing purposes.

2.3 Complete security, privacy and confidentiality shall be ensured at all times in the accommodation which shall be provided for the Employer's Representative on site.

2.4 The offices for the use of the Employer's Representative on site and his staff shall be thoroughly waterproof and shall have an adequate interior lining. All office accommodation shall comply with and be maintained to comply with the Factories Act and any other relevant legislation. They shall be adequately guarded at all times to ensure no unlawful or unauthorised entry. The Contractor shall provide for the insurance against all risks, of the contents of the offices including the property of the Employer's Representative on site and his staff. This includes personal effects required in the normal course of duty.

2.5 Non-portable buildings shall be erected on a level prepared under building consisting of brick or concrete dwarf walls founded on concrete strip footings. Floors shall not be less than 400mm above ground level and separated from the foundations by a damp proof course. Floor shall be timber tongued and grooved covered with a layer of hardboard and with linoleum or vinyl floor covering. External walls shall contain a suitable vapour barrier and a 25mm layer of glass wool or equivalent insulation. Internal walls shall be smooth with coloured oil based paint. Headroom shall be not less than 2.25m. Ceilings shall be plasterboard covered on top with 25mm layer of glass wool insulation and finished with two coats of white water based paint. External doors shall be fitted with draught excluders and mortice locks. Roofs shall be watertight and covered with no less than two layers bituminous felt. All plumbing work shall be lagged.

2.6 Windows to have an area of not less than $2m^2$ for each of $10m^2$ floor area and approximately one-third of windows to open. Storeroom door to be lockable. Sliding glass hatch to reception to be lockable. All windows to be fitted with venetian blinds and external security mesh.

2.7 The offices shall be provided with 240 volt AC electricity supply and 13 amp socket outlets shall be provided on the basis of 1 double socket for each $5m^2$ of office space. The offices shall be adequately provided with electric heating capable of maintaining a uniform room temperature of at least 20°C and shall be lit with electric fluorescent diffused lighting to a standard acceptable for a drawing office.

2.8 The layout of the Principal Offices for use by the Employer's Representative on site shall be to the satisfaction of the Employer's Representative on site and shall provide as a minimum, the dimensions for floor areas as listed in Table 1.1 below.

Table 1.1: Accommodation for the Employer's Representative on Site

Office	Minimum Floor Area per room (square metres)
Principal Office for Employer's Representative on Site	10
Toilets – Men	4
Toilets - Women	4
Shower Closet	4
Kitchen	6
Store Room	6

2.9 The principal office for the Employer's Representative on site shall be required from the starting date of the Works up to the issue of the Defects Certificate plus 3 months thereafter. They shall be available for occupation within 4 weeks of Works commencing.

2.10 All offices shall be properly cleaned and serviced at least once per working day, for so long as they are in use. The main cleaning and servicing shall be performed outside of normal site working hours.

2.11 The offices for the Employer's Representative on site shall include the furniture, fittings, equipment, stores and the like detailed in this Appendix.

3. Telecommunications Equipment for the Employer's Representative on Site

3.1 Telephone System

3.1.1 The telephone system for the Employer's Representative on site Principal Office shall have a minimum of 1 external line. The telephone system shall be a Siemens Saturn 32-key system or similar approved electronic telephone system capable of supporting fax and e-mail facilities. An additional telephone line shall be provided for fax. An ISDN line shall be provided for email use.

3.1.2 The system should have the facility to hold an external caller while making an internal enquiry to another extension without the external party overhearing the internal conversation. It shall be capable of on-hook dialling, hands-free speech, group paging, and have a system memory, call detail recorder, exchange line, lamp indicator, last number re-dial, call hold reminder, call transfer, conferencing facility, line restriction and call restriction on certain extensions, camp-on call back so that number rings when free, 'Do not Disturb' and call forward features.

3.1.3 Applications to the telephone company for provision of telephones shall be made by the Contractor. The Contractor shall remain responsible for supply, maintenance and removal of the internal phone system in the Employer's Representative on site office.

3.2 Mobile Telephone System

3.2.1 The Contractor shall supply 1 No. GSM mobile telephones for the use of the Employer's Representative on site from the Works Starting Date and up to the issue of the Defects Correction Certificate plus 3 months thereafter. The telephones shall be supplied connected to a GSM service provider. Each mobile telephone shall be supplied with the following accessories:

Desk charger and in-vehicle-charging adapter

1 No. vehicle hands-free sets

2 No. 12 hour rechargeable batteries

4. Accommodation, Furnishings and Fittings

The Principal Office for the Employer's Representative on site on site shall contain the following:

Accommodation, furnishings and fittings:

1 number 1.5 metres x 1 metres kneehole desk with locking drawers

1 number padded wheeled desk armchair

1 number drawing tables 3.0 metres x 1.0 metre

1 number Vistaplan trolley with 10 number A1 size hangers

1 number 4-drawer lockable, steel filing cabinet

2 number padded chairs

5 number coat hooks

3 number 3 metres long shelves 225mm x 25mm

1 number telephone extensions

4 square metres of framed cork or strawboard panelling on wall of the office mounted 1 metre above floor level

1 number window mounted powered extractor fan

1 number thin-wire Ethernet port (10base2) connected to LAN

1 number executive telephone

Lockable door

Toilets - Men

1 number WC suites

1 number toilet roll holders and supply of toilet rolls

1 number hand basins complete with taps and hot and cold water supply

1 number towel dispensers laundered and replenished when required

1 number liquid soap dispensers with supply of liquid soap, or supply of soap

1 number wall mirrors

1 number coat hooks

1 number window mounted powered extractor fan

Lockable Door

Toilets - Women

1 number WC suites

1 number toilet roll holders and supply of toilet rolls

1 number hand basin complete with taps and hot and cold water separately

1 number towel dispenser laundered and replenished when required

1 number liquid soap dispenser with supply of liquid soap, or supply of soap

1 number Sanitary bin

1 number wall mirror

1 number coat hooks

1 number window mounted powered extractor fan

Lockable door

Shower

2 number coat hooks

1 number enclosed shower unit with hot and cold adjustable supply

Lockable door

Kitchen

1 number 4 plate electric cooker with grill and oven

1 number stainless steel sink with draining board, complete with cupboards and Formica worktop, hot and cold water supply

1 number 'king size' waste bin complete with supply of liners

1 number wall mounted cupboard 2.0 metres long

1 number base unit 2.0 metres long with drawers and cupboards complete with Formica worktop 3.5m long

1 number electric water urn, with filling facilities

Supply of tea, coffee, milk and sugar (replenished as required)

1 number 2 litre electric kettle with automatic switch-off

1 number 2 litre teapot

1 number filter coffee maker

Crockery, cutlery and cooking utensils for 5 persons as required by the Authority's Representative

Supply of towels and cleansing materials (replenished and laundered when required)

1 number 6 cu ft refrigerator of approved make and type

1 number 600 watt microwave with turntable

1 number fire extinguisher (dry powder)

1 number fire blanket

1 number window mounted powered extractor fan

1 number hard broom

1 number soft broom

1 number dust pan and hard brush

1 number floor mop and galvanised bucket

1 number 3m x 3m table

1 chairs

Store Room

Timber racks to hold surveying equipment

2 number lockable steel cabinets 1.0 metres wide x 2.0 metres high with shelving

10 linear metres of 225mm x 25mm shelving

Clothes drying rack with tubular heater and 6 number coat hooks

Lockable door

5. Surveying Equipment and Other Equipment for the Employer's Representative on Site

The following surveying and other equipment shall be made available to the Employer's Representative on site from the Starting Date to the issue of the Certificate of Substantial Completion plus 3 months thereafter:

1 No. Geodimeter 610 Total Station (Inc. transport case, tribach c/w optical plumb and straps) with AUTOLOCK c/w Tracker (incl. Tracklight), Remote Positioning Target (RMT) and mini prism. The Geodimeter 610 should be capable of up-grading to a fully Robotic Total Station (i.e. one man system).

1 No. Heavy duty external battery.

1 No. Geodimeter battery charger with dual outputs.

1 No. Telescopic prism pole complete with levelling bubble.

1 No. Prism and target assembly.

1 No. Tribrach with optical plumb.

1 No. Tripods.

1 No. Geodimeter to HP200LX-Y Cables

1 No. Geodimeter Tribach adaptor.

1 No. Geodimeter prism foot mount (incl. Prism / target spigot).

1 No. Geodimeter prism carrying case, tall style.

1 No. HP200LX Palmtop (incl. Environment case and straps) with:-

1 No. 2.0 Mb Sundisk

1 No. AutoGRAD software suite

1 No. set of Nickel – Cadmium rechargeable batteries

1 No. HP200LX charger

1 No. HP200LX tripod bracket

1 No. HP200LX to PC data transfer cable

1 No. SURVEY CONTROL CENTRE (SCC386) software suite

Item: The SCC software package may be used to create contoured digital terrain models, to carry out volumetric analysis, conduct slope and intervisibility analysis and to generate longitudinal and cross sections. SCC supports a wide range of data interchange formates including transfer to and from AutoCAD 2000, DOER, MOSS and TopoMOSS. The software package will receive and transfer topographic and setting-out data to and from the AutoGRAD (HP200LX) suite and can deal with particularly large data sets with typical modelling and contouring speeds of up to 2000 points per second.

Item: The AutoGRAD software suite for the HP200LX should include Detail Survey, Tranverse, Free Station, Screen Plotting, Setting Out and Levelling Modules (full AutoGRAD suite).

Item: Ensure ability of AutoGRAD running on the HP200LX to transfer and receive data to and from the Geodimeter 610 total station. Should also be able to transfer collected Detail / Topographical data to the SURVEY CONTROL CENTRE (SCC 386) and into AutoCAD 2000.

1 No. Wild NA2002 level complete with tripod, carrying case, 2 rechargeable batteries, battery charger, reversible bar code staff and NA2002 to HP200LX data cable.

1 No. Sounder meter conforming to BS 5969.
1 No. Optical Squares.
1 No. 30m steel tapes
1 No. 3.0m steel tapes
1 No. 30m jibson tapes
1 No. 2m folding rule
1 No. 2.0 ranging rods
1 No. Tripod Stands for ranging rods
1 No. 1.0m extension pieces for ranging rod
Item: Steel shelving 4m long x 2 m high with 4 no. longitudinal racks.
1 No. Manhole cover lifting keys, brands type 101B
1 No. Manhole cover lifting keys, brand type 143
1 No. 255mm spirit levels.
1 No. Bricklayer's 1.0m spirit level
1 No Waterproof battery operated hand torch (4 No. U4 Batteries)
1 No. Retro-reflective overjacket for highway use
1 No. Retro-reflective Polymesh high visibility waistcoat
1 No. Sets of approved protective clothing each set to consist of:
Safety helmet to BS 5240;
Weatherproof jacket and trousers: "Mascot Amphibian" or similar approved Waterproof coat and trousers 'Heley Hansen' or similar approved;
Pair of safety boots to BS 1870 Part 1 'Tosava' or similar approved;
Pair of safety wellington to BS 1870 : Part 2;
'Dunlop Safety Plus' or similar approved pair of Heavy Duty Rubber Gloves.
Heavy white seaman's socks.
2 No. Pairs of Ear Protectors
1 No. 1 kg lump hammer
1 kg 75 mm pipe nails
1 No. Stick of waterproof marking chalk (4 No. colours required)
1 No. Builders plumb-bob
1 No. Bill hook
1 No. 25 g tin of fluorescent dye
1 No. Digital camera Cannon A80 or equivalent with 1GB SD card
1 No. Charger for camera
10 No. Setting out pegs
1 No. Field Survey books
1 No. Perspex set square 600 mm 30 degree, bevelled edge
1 No. Perspex protractor 300 mm 360 degree
1 No. Perspex set squares 250 mm 45 degrees, bevelled edge

1 No. Perspex set squares 250 mm 30 degrees, bevelled edge

1 No. Adjustable set square 250 mm

1 No. "Aristo" triangular scales, or similar 300 mm metric; 1/5, 1/10, 1/20, 1/25, 1/50, 1/100Scales, fully divided, flat boxwood, white plastic, metric:

1 No. Avongard Crack Ruler or equivalent

IT Equipment

All the equipment and consumables listed in this section shall be provided and maintained by the Contractor from the Starting Date and up to the issue of the Certificate of Substantial Completion plus 3 months thereafter.

The equipment shall be installed and commissioned by a reputable Quality Assured supplier (BS 5750 part 2).

The network and computers systems including hardware and software shall be supported through a Telephone Hotline and/or on-site service operated by the relevant software house with an eight-hour maximum response time for repair or replacement.

The contractor is required to provide and configure a computer network consisting of all required equipment to create the network and establish a data network between all required computer systems and peripherals. Internet access via a broadband connection or similar should also be provided to through the network to all client computers.

Hardware

Notebook Computers: 1 no.

One® Intel™ i7-620M(2.66GHz,4MB,Dual Core,35W)

8GB (2x4GB) 1066MHz DDR3 Memory

1 GB NVIDIA Quadro FX 880M

120GB Solid State Hard Drive

15.4" high resolution SVGA colour monitor

19-in-1 Media Card Reader

16x max DVD+/-RW Drive

1GB LAN Network Card

Laser Scroll USB mouse

High Quality carry case

1 TB external hard drive for backup

Software

Windows® 7 Professional (64Bit)

Recovery, Diagnostics and Drivers CD

Microsoft Office (incl MS Outlook)

AutoCAD Civil 3D 2010 to be installed and configured to run on the hard disk of computers as required.

Antivirus Software

Oasys Mail Manager email filing software or similar to be installed and configured to ensure central storage and universal filing compliance on all client computer and laptops. Full user training should be provided to all users at induction and universal standards of digital file and email storage should be implemented.

All software shall be the current release (unless specified otherwise) with all updates and service packs etc. installed.

All software must be installed, configured and tested on the computer hard disk prior to delivery to site.

All software must be covered under maintenance including any subscriptions required for updates and upgrades. This contract should include agreed Service Level Agreements of no more than 8 business hours on-site response with full system replacement in the event of an extended system failure.

All software shall be licensed to the Employer.

Plotter

1no. A4/A3 Colour Multifunction Device (Copy, Print, Scan) with min 22ppm output

All hardware shall have at least 3 year service and warranty cover.

The Contractor shall supply paper, toner and all other necessary consumables as and when required by the Employer's Personnel.

6. Schedule of Initial Consumable Stores

6.1 The initial consumable stores to be supplied by the Contractor are listed in the schedule entitled "Schedule of Initial Consumable Stores" below.

(a) The items are to be new and unused and shall be supplied at the commencement of the Works.

(b) Where a manufacture's name, type, identification or trademark is quoted equivalent equipment may be provided from another source subject to the approval of the Employer's Representative.

(c) All electrical equipment to be supplied complete with fused plugs.

6.2 The Contractor shall replenish the consumable stores to the offices of the Employer's Representative with the items listed in the schedule entitled "Schedule of Consumable (Monthly Replenishment Requirements)" below, on a monthly basis or at intervals that the Employer's Representative may require.

Schedule Initial of Consumables Stores

Consumable Items	Amount Required	Units
Plain white A4 paper 80 g/m^2	1	ream
Plain white A3 paper 80 g/m^2	1	ream
Blue ball point pen	1	pen
Black ball point pen	1	pen
Red ball point pen	1	pen
Staple - Heavy Duty	20	staple
Staple	20	staple
Pencil	2	pencil
A4 writing pad	2	pad
A5 envelope	50	envelope
A4 envelope	50	envelope
220mm x 100mm envelope	50	envelope
A4 manila folder	10	folder
A4 lever arch folder	10	folder
A4 box folder	5	folder

Schedule Initial of Consumables Stores

Consumable Items	Amount Required	Units
Paperclip	50	clip
Message pad	2	pad
Toner to suit computer printers	2	cartridge
Suspension file	2	file
Field survey book	2	book
Toilet paper	2	roll
Kitchen paper	2	roll
Door mats	1	no
Hand towels	2	packet
Black sack bin liner	2	sack
Battery size AA	2	battery
Battery size AAA	2	Battery
Battery size MN1604 (Duracell ref.)	2	Battery
Battery size MN2400 (Duracell ref.)	2	Battery
Battery size MN1300 (Duracell ref.)	2	Battery
Battery size DL123A (Duracell ref.)	2	Battery

Schedule of Consumables (Monthly Replenishment Requirements)

Consumable Items	Amount Required	Units
Plain white A4 paper 80 g/m^2	2	ream
Plain white A3 paper 80 g/m^2	1	ream
Blue ball point pen	1	pen
Black ball point pen	1	pen
Red ball point pen	1	pen
Staple - Heavy Duty	10	staple
Staple	10	staple
Pencil	2	pencil
A4 writing pad	2	pad
A5 envelope	5	envelope
A4 envelope	5	envelope
220mm x 100mm envelope	5	envelope
A4 manila folder	5	folder
A4 lever arch folder	2	folder
A4 box folder	5	folder
Paperclip	10	clip
Message pad	2	pad
Suspension file	5	file
Field survey book	2	book
Toilet paper	5	roll

Schedule of Consumables (Monthly Replenishment Requirements)

Consumable Items	Amount Required	Units
Kitchen paper	2	roll
Hand towels	5	packet
Black sack bin liner	4	sack
Battery size AA	2	battery
Battery size AAA	2	Battery
Battery size MN1604 (Duracell ref.)	2	Battery
Battery size MN2400 (Duracell ref.)	2	Battery
Battery size MN1300 (Duracell ref.)	2	Battery
Battery size DL123A (Duracell ref.)	2	Battery

APPENDIX 1/3
Communication System for the Employer's Representative

1. The Contractor shall provide telephone system and mobile telephones as described in Appendix 1/1.

2. Radio communication system is not required.

APPENDIX 1/4
Working and Fabrication Drawings

1. Whenever required by the Employer's Representative, the Contractor shall supply calculations, test reports, data sheets, etc. in support of his detailed working and fabrication drawings. Such documents shall remain the property of the Employer's Representative.

2. The Contractor shall submit three copies of all relevant documents to the Employer's Representative at least two weeks in advance of the date on which the Contractor proposes to commence such works.

3. Drawings shall be to an appropriate scale and standard and in sufficient detail to enable the Employer's Representative to assess the Contractor's proposals.

4. The Contractor shall supply to the Employer's Representative the following working and/or fabrication drawings.

Series	Description of Works
300	Boundary Fencing
400	Parapets, Safety Barriers including Transitions, Terminals and Connections Guardrails
500	Drainage Systems
600	Ground Anchors
1700	Precast Units
2700	Watermains and Thrust Blocks

APPENDIX 1/5
Testing to be Carried Out by the Contractor

Notes:

1. Tests comparable to those specified in this Appendix will be necessary for any equivalent work, goods or materials proposed by the Contractor (See sub-Clause 105.4)

2. (IL) indicates that an Irish National Accreditation Board test report or certificate is required.

3. Unless otherwise shown in this Appendix tests for work or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.

4. Cube strength tests are not required for concrete complying with Clause 2602.

5. Unless otherwise shown in this Appendix test certificates for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.

6. Testing to be carried out by the Contractor in accordance with this Appendix 1/5 shall be undertaken in a laboratory approved by the Employer's Representative. The Contractor shall provide details of his proposed laboratory / laboratories to the Employer's Representative within 1 week of the Starting Date.

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 300					
306	Permanent fencing			Required	Quality management scheme applies
	Concrete components	Cover to reinforcement	1 per consignment (maximum 1 per 100 components)		
308	Gates and stiles				Quality management scheme applies
	Reinforced Concrete posts	Cover to reinforcement	1 per consignment (maximum 1 per 100 components) (BS 3470)		
310	Environmental Noise Barriers				
	Post Foundations	Load test on site	As required in Sub-Clause 310.29		Evidence of design calculations required
		Deflection test on site	As required in Sub-Clause 310.28		
	Preservation of Timber	Moisture Content	As required in sub-clause 310.14	Required	Quality management scheme applies*]*
	Vandal resistance	Destruction testing	As required in Appendix 3/2		See sub-clause 310.11
311	Preservation of timber	Moisture content	As required in sub-Clause 311.2	Required for each batch	Quality management scheme applies
Series 400					
407	Anchorages in drilled holes	On-site tensile load test	10%	Required	
	Road restraint system	As required by the system manufacturer	As required by the system manufacturer		As required by the system manufacturer
	Ground Conditions	In situ testing (sub-Clause 404.6 & 7)	As required (sub-clause 407.7)		

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
Series 500						
501	Pipes for drainage and service ducts					
	Vitrified clay					Product certification scheme applies
	Concrete - PC/SRC	not exceeding 900 mm dia.				
	Concrete - Pre-stressed					
	Iron - cast					
	Iron - ductile					
	UPVC					
	Plastics (see Table 5/1)					
	Corrugated steel		(Manufacturer's tests)		Required (AASHTO)	
	Corrugated steel bitumen protection					
	Concrete PC/SRC exceeding 900mm dia		(Manufacturer's tests)	As per Clause 509.10	Required	
	Other materials					NSAI Agreement Certificate or equivalent applies
503	Pipe bedding				Required	
			Grading and fines content (Washing and sieving method to be used)	1 per week(min of 3)		
			Water Soluble Sulphate (WS) content (IN)	5 per source		
			Resistance to fragmentation (IL)	1 per source		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
505	Filter medium backfill				
		Plastic index (IL)	1 per source	Required	
		Grading and fines content (Washing and sieving method to be used)	1 per 500 tonnes		
		Water Soluble Sulphate (WS) content (IL)	5 per source		
		Resistance to fragmentation (IL)	1 per source		
506	Sealing existing drains			Required	
	Concrete				
	Grout				
507	Chambers				
	Precast concrete				Product certification scheme applies
	Corrugated galvanised steel	(Manufacturer's tests)		Required	Product certification scheme applies
	Manhole steps				Product certification scheme applies
	Steel fitments				
	Covers, grates and frames				Product certification scheme applies
	Cover bolts				Quality management scheme applies
508	Gullies and pipe junctions				Product certification scheme applies
	Precast concrete				
	Cast iron and steel				
509	Watertightness of joints	Air test	All pipelines with watertight joints	Required	
512	Backfill to pipe bays	Grading	1 per 50 tonnes (min of 3)		
		Water Soluble Sulphate (WS) content (IL)	5 per source		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
513	Permeable backing to earth retaining structures				
	Granular Material	Piping Ratio (as Cl 513)	1 per 100 tonnes (min of 3)		
		Permeability (as Cl 513)			
	Precast hollow concrete blocks	(Manufacturer's tests)		Required	
514	Fin Drains	(Manufacturer's tests)		Required	INAB (or equivalent) certification applies
515	Narrow Filter Drains				
	Geotextile, pipes and fittings	(Manufacturer's tests)		Required	INAB (or equivalent) certification applies
	Granular fill	Plastic Index (IL)	1 per source	Required	
		Resistance to fragmentation (IL)			
		Water soluble sulphate (WS) content (IL)	5 per source		
		Oxidisable sulphides (OS) content and total potential sulphate (TPS) content (IL)			
		Grading and fines content	1 per week (min of 3)	Required	
		Permeability	1 per soruce		
516	Combined drainage and kerb systems	Load test	A minimum of 1 test per 1000m for each type and source	Required	Certification that the system complies with Clause 516 is required
		(Manufacturer's tests)		Required	
517	Linear drainage systems	Load test	A minimum of 1 test per 1000m for each type and source	Required	Certification that the system complies with Clause 517 is required

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
518	Thermoplastic structured wall pipes and fittings	(Manufacturer's tests)		Required	INAB (or equivalent) certification applies
519	Geotextiles for filter drains	(Manufacturer's tests)	1 per source	Required	Certification that the system complies with Clause 519 is required
Series 600					
601 631 to 633 635 to 637 640	Acceptable material Class: 1 — General granular fill	Grading	Twice a week		
		Uniformity Coefficient	1 test per 500m^3 for each source		
		MCV	2 per 1000m^3 up to a max of 6 per day		
		MC	Daily		
	1C only	LA Coefficient (IL)	1 test per 500m^3 for each source (min of 2 total per source)		
	Class: 2 — General cohesive fill	Grading	Twice a week		[Cross-reference should be made to any requirements in Appendix 6/1]
		Plastic Limit	1 test per 500m^3 for each source		
		MC	1 test per 250m^3 for each source		
		MCV	1 test per 250m^3 for each source		
		Undrained Shear Strength	1 test per 500m^3 for each source (min of 2 total per source)		
		Effective Angle of Internal Friction and Effective Cohesion	1 test per 500m^3 for each source (min of 4 total per source)		

Clause	Work, Goods or Material				Test	Frequency of Testing	Test Certificate	Comments
601 631 to 633 635 to 637 640 contd.		4	Landscape fill		Grading (IL)	1 test per 1,000m^3 for each source		
					MC (IL)	1 test per 1,000m^3 for each source		
					MCV (IL)	1 test per 500m^3 for each source		
		5	Topsoil		Grading	1 test per 250m^3 (min 1 per day during topsoiling works)		
		6	Selected granular fill					
				(Class 6A, 6B & 6C)	Grading	1 test per 500m^3 for each source		
					Uniformity Coefficient	1 test per 500m^3 for each source		
					Plastic Limit (IL)	1 test per 1,000m^3 for each source		
					LA Coefficient (IL)	1 test per 500m^3 for each source (min of 2 total per source)		
				(Class 6C Only)	Moisture Content (IL)	1 test per 1,000m^3 for each source		
				(Class 6A & 6C Only)	Slake Durability (IL)	1 test per 500m^3 for each source (min of 2 total per source)		
				(Class 6F1, 6F2 & 6F3)	Grading	1 test per 250m^3 for each source		
					Optimum MC (IL)	1 test per 250m^3 for each source		
					MC	1 test per 250m^3 for each source		
					LA Coefficient (IL)	1 test per 500m^3 for each source		

Clause	Work, Goods or Material				Test	Frequency of Testing	Test Certificate	Comments
601 631 to 633 635 to 637 640 contd.					Slake Durability (IL)	1 test per 500m^3 for each source		
					Total Sulfur Content (IL)	1 test per source (source approval)		
					Class RA (asphalt) content (IL)	2 per source		
					Bitumen Content (IL)	2 per source		
				(Class 6G)	Grading	1 test per 250m^3 for each source (min of 2 total per source)		
					LA Coefficient (IL)	1 test per 500m^3 for each source (min of 1 total per source)		
				(Class 6H Only)	Grading	1 test per 200m^3 for each source		
					Plastic Limit (IL)	1 test per 500m^3 for each source		
					LA Coefficient (IL)	1 test per 200m^3 for each source		
					MC (IL	1 test per 200m^3 for each source		
					MCV (IL)	1 test per 200m^3 for each source		
					pH Value (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Chloride Ion Content (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Water soluble sulphate content (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		

Clause	Work, Goods or Material				Test	Frequency of Testing	Test Certificate	Comments
601 631 to 633 635 to 637 640 contd.					Oxidisable sulfides (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Resistivity (IL)	1 test per source (source approval)		
					Redox Potential (IL)	1 test per source (source approval)		
				(Class 6I & 6J Only)	Grading	1 test per 200m^3 for each source		
					Uniformity Coefficient	1 test per 500m^3 for each source		
					MC (IL)	1 test per 200m^3 for each source		
					MCV (IL)	1 test per 200m^3 for each source		
					Effective Angle of Internal Friction and Effective Cohesion (IL)	1 test per 200m^3 for each source (min of 1 total per source)		
					Coefficient of friction and adhesion (IL)	1 test per source (source approval)		
					pH Value (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Chloride Ion Content (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Water soluble sulphate content (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Oxidisable sulfides (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		

Clause	Work, Goods or Material				Test	Frequency of Testing	Test Certificate	Comments
601 631 to 633 635 to 637 640 contd.					Resistivity (IL)	1 test per source (source approval)		
					Redox Potential (IL)	1 test per source (source approval)		
					Organic Content (IL)	1 test per source (source approval)		
					Microbial Activity (IL)	1 test per source (source approval)		
					LA Coefficient (IL)	1 test per 200m^3 for each source		
					Slake Durability (IL)	1 test per 500m^3 for each source		
				(Class 6K, 6L & 6M)	Grading	1 test per 200m^3 for each source		
					Plastic Limit (IL)	1 test per 500m^3 for each source		
					Resistivity (IL)	1 test per source (source approval)		
					Water soluble sulphate content (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Oxidisable sulfides (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Chloride Ion Content (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					pH Value (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
				(Class 6K & 6M Only)	Uniformity Coefficient	1 test per 500m^3 for each source		

Clause	Work, Goods or Material				Test	Frequency of Testing	Test Certificate	Comments
601 631 to 633 635 to 637 640 contd.					Optimum MC (IL)	1 test per 200m^3 for each source		
					MC (IL	1 test per 200m^3 for each source		
					MCV (IL)	1 test per 200m^3 for each source		
					LA Coefficient (IL)	1 test per 200m^3 for each source (min of 1 total per source)		
				(Class 6N1, 6N2 & 6P)	Grading	1 test per 200m^3 for each source		
					LA Coefficient (IL)	1 test per 200m^3 for each source		
					Undrained Shear Strength (IL)	2 per source (min of 1 test per week)		
					Effective Angle of Internal Friction and Effective Cohesion (IL)	Source approval and 3 tests per 500m^3 for each source		
					Permeability (IL)	Source approval and 1 test per 500m^3 for each source		
					MC (IL)	1 test per 200m^3 for each source		
					MCV (IL)	1 test per 200m^3 for each source		
					pH Value (IL)	Source approval and 1 test per 500m^3 for each source		
					Water soluble sulphate content (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Oxidisable sulfides (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		

Clause	Work, Goods or Material				Test	Frequency of Testing	Test Certificate	Comments
601 631 to 633 635 to 637 640 contd.					Slope Stability (IL)	Source approval and 1 test per 500m^3 for each source		
					Slake Durability (IL)	1 test per 200m^3 for each source		
				(Class 6Q)	Testing and frequency as per Class 1 Material with the addition of the following:			
					Water soluble sulphate content (IL)	1 test per 200m^3 for each source		
					Oxidisable sulfides (IL)	Source approval and 1 test per 500m^3 for each source (min of 1 test per week)		
					Chloride Ion Content (IL)	1 test per 200m^3 for each source		
					pH Value (IL)	1 test per 200m^3 for each source		
		7	Cohesive Material (Class 7H)		Testing and frequency as per Class 2 Material with the addition of the following:			
					Water soluble sulphate content (IL)	Source approval and 1 test per 500m^3 for each source		
					Oxidisable sulfides (IL)	Source approval and 1 test per 500m^3 for each source		
					Chloride Ion Content (IL)	Source approval and 1 test per 500m^3 for each source		
					pH Value (IL)	Source approval and 1 test per 500m^3 for each source		
		8	Miscellaneous fill		MC	Source approval and 1 test per 500m^3 for each source		
					MCV (IL)	Source approval and 1 test per 500m^3 for each source		
601.11 & 601.12	Fill adjacent to cementitious materials or metallic elements				Water soluble sulfate content (IL) 1	1 test per 200m^3 (min of 1 test per location)		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
601.11 & 601.12 contd.		Oxidisable sulfides (IL)	1 test per 200m^3 (min of 1 test per location)		
602.20	Material within 350mm of designed final surface of road or central reserve.	Frost Heave (IL)	1 test per 200m^3 (min of 1 test per source)		
609	Geotextiles Used to Separate Earthworks Materials	Durability	1 test per source/supplier		
		Tensile Load	1 test per 500m^2 (min of 1 test per source/supplier)		
		CBR Puncture Resistance	1 test per 500m^2 (min of 1 test per source/supplier)		
		Permeability	1 test per 500m^2 (min of 1 test per source/supplier)		
		Pore Size	1 test per 500m^2 (min of 1 test per source/supplier)		
610	Fill to structures	Angle of shearing resistance Ø'	In accordance with Appendix 6/6		
612	Compaction of Fill Material				
		Field Dry Density (IL)	1 test per 400 tonnes		
	Method Compaction End Product Compaction	Optimum MC (IL)	1 test per each class of material and each source		
		Field Dry Density (IL)	1 test per 250m^3		
618	Topsoiling and grass seeding	Rate of spread of fertiliser	1 test per 1,000m^3		
		Rate of spread of seeding			
		Chemical analysis of fertiliser	1 per source		
		Grass seed germination and purity (Manufacturer's test)	1 per source	Required prior to sowing	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
622	Earthworks for reinforced earth and anchored earth structures	Redox Potential	5 locations within the affected area		
	Reinforcing Elements	Coefficient of friction	1 test for each type of element with each type of fill		
	Anchor Elements	Adhesion			
624	Ground Anchorages	Proof Loading	1 anchor	Required	
626	Gabions	Gabion mesh	Source Approval	Required	
642	Earthworks materials adjacent to structures	Constrained soil modulus (M*)	3 on each side of structure		
614	Lime and Cement Improvement - U1	Water soluble sulphate content	Source Approval		
		Organic Content	Source Approval		
		Rate of spread	1 per 500m^2		
Series 800					
801, 802, 804, 805, 806, 807, 808, 809	Unbound mixtures placed within 500mm of cement bound materials, concrete pavements, structures or products	Acid Soluble sulphate content (IL)	1 per 400 tonnes or per location if less than 400 tonnes	Required	
		Water-soluble sulfate (WS) content (IL)	1 per 400 tonnes or per location if less than 400 tonnes		
		Oxidisable sulfides (OS) content (IL)	1 per 400 tonnes or per location if less than 400 tonnes		
	Unbound mixtures placed adjacent to metallic structural elements forming part of the Works	Water-soluble sulfate (WS) content (IL)	1 per 400 tonnes or per location if less than 400 tonnes		
		Oxidisable sulfides (OS) content (IL)	1 per 400 tonnes or per location if less than 400 tonnes		
		Acid Soluble sulphate content (IL)	1 per 400 tonnes or per location if less than 400 tonnes		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
801, 802, 804, 805, 806, 807, 808, 809 contd.	Unbound mixtures	Grading and fines content	1 per 1000 tonnes or minimum of 2 per day		Results of routine control tests from the factory production control system operated by the producer to be provided
		Flakiness index (IL)	1 per week		
		Los Angeles Coefficient (IL)	2 per year		
		Methylene Blue (IL)	1 per week		
		Water absorption (IL) Magnesium Sulphate Soundness (IL))	1 per 2 years	Required	
	Types A, B, C & D granular material	OMC (IL)	2 per year		Declared values from the factory production control system operated by the producer to be provided
		Moisture Content	1 per 1000 tonnes or minimum of 2 per day		
	Types B, C, D & E granular material	Liquid Limit (IL)	1 per week		
	Types A & C granular material	CBR (IL)	1 per week		
		Density (IL)	2 per year		
	Type C granular material	Percentage of crushed or broken particles and of totally rounded particles in coarse aggregates	1 per month		
	Type A granular material	Plasticity index	1 per week		
	Cement Bound Mixtures	Watersoluble Sulphate (WS) Content (IL)	1 per 200m^3 for each source (min of 5 total per source)		See NG808 & 820
		Oxidisable Sulphides (OS) Content (IL)	1 per 200m^3 for each source (min of 5 total per source)	Required	See NG808 & 820
		Testing for control and checking of HBM	Tests specified in Table 8/15 and Table 8/16		See NG 825

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
801, 802, 804, 805, 806, 807, 808, 809 contd.		Coefficient of Linear Expansion (IL)	1 per 200m^3 for each source		See Clause 819
		Tests for laboratory mixture design	As specified in Clause 826	See NG826	
Series900					
2.2, 3, 4, 5, 6, 7.2, 7.3, 8.1, 8.4, 8.6, 9	Constituent materials			Required	Constituent materials include aggregate, binder, fillers, additives, chippings, pre-coated chippings, reclaimed asphalt, and all other materials that comprise the product. For products not covered by a Harmonised Technical Specification, material properties to be tested at the beginning of the contract to verify the values declared. Tables refer to those contained in TII Series 900.
	Bond and tack coats	Requirements per Tables 15	As per Type Test report applicable to the Contract		
	Bituminous mixtures	Requirements per Tables 1, 2, 4, 5, 7, 8, 10, 11 & 14 Clause 4.2.4 for precoated chippings	As per Type Test report applicable to the Contract		
	Aggregate for Surface Courses – Bituminous Mixtures	Friction After Polishing Test (IS EN 12697-49)	1 test per property per source (source approval)		
	Surface dressing	Requirements per Tables 15, 17 & 18	As per Type Test report applicable to the Contract		
	Surface Dressing - Aggregate	Friction After Polishing Test (IS EN 12697-49)	1 test per property per source (source approval)		
	High friction surfacing – binders	Requirements per Table 23a	1 test per property per source (source approval)		
	High friction surfacing – manufactured aggregates	Requirements per Table 23b			
	High friction surfacing – natural aggregates	Requirements per Table 23c			
	Low energy bound mixtures – Paving Grade and Polymer Modified Bitumens	Requirements per Table 14	1 test per property per source (source approval)		
	Low energy bound mixtures – Virgin Aggregates and Virgin Filler	Requirements per Table 24a			

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
2.2, 3, 4, 5, 6, 7.2, 7.3, 8.1, 8.4, 8.6, 9 contd.		Low energy bound mixtures – Cationic Bitumen Emulsions	Requirements per Table 24b			
		Permanent repair material systems	Requirements per Table 26a	1 test per property per source (source approval)		
		Emergency repair material systems	Requirements per Table 28a	1 test per property per source (source approval)		
		Reclaimed asphalt	Requirements per Tables 13a & 13b	As per Type Test report applicable to the Contract		
3, 4, 5, 6, 8.1	Product Composition				Required	IS EN 13108-21 Factory Production Control (FPC) procedures apply. The samples shall be taken in conjunction with the product manufacturer. Portions of the same samples shall be split between the manufacturer, contractor and the Employer's Representative to enable subsequent test results to be compared.
		Bituminous mixtures – All mixtures	Grading (IL) Binder content (IL)	A minimum of 1 per 600 tonnes or minimum 2 per five day period or part thereof whichever is greater.		
		Low energy bound mixtures	Combined grading (IL) Binder content (IL)	1 per day	Required	The samples shall be taken in conjunction with the product manufacturer. Portions of the same samples shall be split between the manufacturer, contractor and the Employer's Representative to enable subsequent test results to be compared.
8.4, 8.6		Permanent repair material systems	Requirements per Table 26b	1 test per property per source (source approval)		
		Emergency repair material systems	Requirements per Table 28b	1 test per property per source (source approval)		
9, 10	Works					
		Bituminous mixtures – All mixtures	Temperature of mixture at time of delivery	Per delivery		

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
9, 10 contd.			Layer thickness	1 pair of cores every 1,000 linear metres laid per lane or fraction thereof per site.		Measurement taken for each core extracted for in situ air void analysis.
			Temperature of mixture at time of rolling	Continuously		
			Air void content (IL)	1 pair of cores every 1,000 linear metres laid per lane or fraction thereof per site.	Required	Cores taken from the wheel tracks. A minimum of three pairs of cores shall be taken.
			Water sensitivity (IL)	1 per Contract		
		Bituminous mixtures – Containing >10% reclaimed asphalt	Recovered penetration (IL)	As required per Series 900	Required	
			Recovered softening point (IL)			
			Indirect tensile strength (IL)			
			Moisture induced sensitivity test conditioning (IL)			Requirement is to make available to the Employer's Representative
			Rheology (IL)			Requirement is to make available to the Employer's Representative
		Bituminous mixtures – Asphalt Concrete base and binder course specific	Permanent Works – In situ air void content within 100mm of joint (IL)	1 pair of cores every 250 linear metres laid or fraction thereof per site	Required	Cores centred 100mm from the final joint position. A minimum of three pairs of cores shall be taken.
			In situ air void content at refusal (IL)	1 pair of cores every 1,000 linear metres laid per lane or fraction thereof per site		Cores taken from the wheel tracks. A minimum of three pairs of cores shall be taken.
			Resistance to permanent deformation (IL)			
			Stiffness (IL)	1 pair of cores per site up to 10,000m^2, 1 pair of cores per 10,000m^2 thereafter		

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
9, 10 contd.		Bituminous mixtures – Asphalt Concrete surface course specific	Macrotexture - Volumetric Patch (IL)	10 over 50 metres lane length or fraction thereof er site.	Required	Refer to Series 900 for requirements regarding minimum test coverage.
		Bituminous mixtures – Hot Rolled Asphalt surface course specific	Resistance to permanent deformation (IL)	6 cores from the first kilometre length or fraction thereof per site of material from each source; 1 core from each subsequent lane kilometre	Required	
			Rate of Spread of Chippings for shoulder-to-shoulder cover	At Contract start		Refer to Series 900 for requirements of repeating measurements.
			Rate of Spread of Chippings for mechanical chipping spreader	1 per 100m or 1 per day		Refer to Series 900 for requirements of repeating measurements.
			Macrotexture - Volumetric Patch (IL)	10 over 50 metres lane length	Required	Refer to Series 900 for requirements regarding minimum test coverage.
		Bituminous mixtures – Stone Mastic Asphalt binder course specific	Resistance to permanent deformation (IL)	6 cores from the first kilometre length of material from each source or fraction thereof per site; 1 core from each subsequent lane kilometre	Required	
		Bituminous mixtures – Stone Mastic Asphalt surface course specific	Macrotexture - Volumetric Patch (IL)	10 over 50 metres lane length or fraction thereof per site	Required	Refer to Series 900 for requirements regarding minimum test coverage.
			Resistance to permanent deformation (IL)	6 cores from the first kilometre length of material from each source or fraction thereof per site; 1 core from each subsequent lane kilometre		
		Bituminous mixtures – Porous asphalt surface course specific	Relative hydraulic conductivity (IL)	Every 1,000 linear metres laid per lane and fraction thereof per site	Required	

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
		Bond and Tack Coat	Rate of spread of binder	1 every 20,000 square metres or 1 ever month per site, whichever is lesser		
			Accuracy of spread of binder	1 every 6 months		
		Surface Dressing	Rate of spread of binder	As required per Series 900		
			Accuracy of spread of binder			
			Rate of spread of chipping			
			Accuracy of spread of chipping			
			Volumetric patch (IL)	10 over 50 metres lane length or fraction thereof per site	Required	Refer to Series 900 for requirements regarding minimum test coverage.
		High friction surfacing	Volumetric patch (IL)	10 over 50 metres lane length or fraction thereof per site.	Required	Refer to Series 900 for requirements regarding minimum test coverage.
			Surface shear strength of installed system (IL)	2 per substrate type		At least 1 test measured in the wheel track zone. Test locations at least 20 metres apart
		Low energy bound mixtures	Moisture content (IL)	1 core every 50 linear metres laid per lane or fraction thereof per site.	Required	
			Relative in-situ density (IL)			
			Air voids content (IL)			
			Indirect tensile stiffness modulus (IL)	1 pair of cores every 250 linear metres laid per lane or fraction thereof per site.		1 core per pair taken from the wheel track zone.
		Repair systems (PRMS, LSRS, ERMS)	Volumetric patch (IL)	1 per discrete area	Required	Methodology described in IS EN 13036-1 should be followed with number of test measurements to suit size of repair.

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1000					
1001	Cement types as stated in sub-Clause 1001.3			Required	Certificate to be provided monthly* for each type of cement. Quality management and product certification schemes apply
	Cements (all types) Ground granulated blastfurnace slag	Chloride content	Monthly		Tests to be carried out by the manufacturer and results included on the test certificates required above
		Sulphate content	Monthly		
		Acid-soluble alkali content	Daily (PC) Weekly (PFA ggbs)		
	Aggregates	Grading and fines content	1 per delivery (min 1 weekly per source)		Results of routine control tests by the manufacturer/ supplier to be provided. Product certification scheme applies
		Shell content (IL) (Only required where marine aggregates are used)	Monthly		
		Flakiness index (IL)	Monthly		
		Resistance to fragmentation (IL)	Every 6 months		
		Chloride ion content (IL)	Daily		
		Acid soluble sulphate content (IL)	Monthly		
	Fine aggregate	Acid-soluble material (IL)	Monthly		
	Water	Tests specified in IS EN 1008			
		Chloride content	Monthly		
		Sulphate content	Monthly		
		Acid-soluble alkali content	Weekly		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1001 contd.	Admixtures	Chloride content	1 per consignment	Required (BS 934-2)	
		Sulphate content	1 per consignment	Required	
		Acid-soluble alkali content	1 per consignment		
1002 1003 1004 1044	Concrete	Air content test (IL)	As required in Table 10/9	Required	
		Density of in situ Concrete cores (IL)	As required in Table 10/9		
		Cube strength (IL)	As required in Table 10/9		
1005	Consistence	Compaction index (IL)	As required in Table 10/9		
		Vebe (IL)			
1011 1012	Dowel bars Tie bars			Required (BS 4449)	Product certification scheme applies
	Dowel bars and supporting cradles	Load test	1 per arrangement		
	Sheathed dowel bars	Bond stress	4 bars		
	Cranked tie bars (coated)	Bend test	4 bars		
		Salt fog cabinet	4 bars		
1015	Joint filler board	Weathering test	3 per source		Normally undertaken by manufacturer
		Compression and recovery	4 per source		
		Extrusion	1 per source		
	Cork filler board	Immersion in water	2 per source		
		Immersion in acid	2 per source		

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
1016 1017	Applied sealants		Initial Penetration	1 per 1000m or 1 per day	Required (BS EN 14188-1, BS 2499-2, BS 5212-1, BS 5212-2), (IS EN 13880-2, IS EN 13880-3, and BS 4254)	
			Resilience	1 per 1000m or 1 per day		
	Compression seals				Required (ASTM D2628), (BS 2752), (BS 4443-4, Method 10 and IS EN ISO 2440), (IS EN ISO 1856), (BS 903: Part A16 or IS ISO 1817)	
			Compression set	1 per type of seal		
			Immersion in oil	1 per type of seal		
	Self expanding cork seal		Tests specified in Clause 1017	1 per type of seal	Required	
1026 1044	Surface macrotexture		BS EN 13036-1 Volumetric Patch Technique (IL)	1 per day (set of 10)	Required	
1027	Aluminised curing compound		Efficiency Index	1 per source		
Series 1100						
1101	Precast concrete kerbs, channels, edgings and quadrants		Bending strength	Minimum of 8 per 1000 units of each product (IS EN 1340)	Required	
1102	In situ asphalt kerbs		Grading	1 test per 500 metres laid	Required	
			Binder Content			
1104	Precast concrete flags		Bending strength	Minimum of 8 per 1000 units of each product (IS EN 1339)	Required	
	Bedding	Granular material				
		Mortar				

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1107	Concrete block paving	Compressive strength	Minimum of 8 per 1000 units of each product (IS EN 13389)	Required	
1108	Clay pavers	Bending strength	Minimum of 8 per 1000 units of each product (IS EN 1344)	Required	
		Skid resistance	Minimum of 8 per 1000 units of each product (IS EN 1344)		
1109	Cellular grass paving systems				NSAI Agrément certificate or equivalent scheme applies
Series 1200					
1202	Permanent traffic signs	Test specified in the Standard/Specification given in Clause 1202		Required	I.S. EN 12899-4 Factory Production Control procedures apply.
1213	Permanent traffic cones and traffic cylinders	Part 7 of I.S. EN 13422		Required	Quality management and product certification schemes apply
1215	Traffic signals				Quality management scheme applies. Statutory approval of equipment applies
	Cables				Product certification scheme applies
	Controllers	Tests specified in Appendix 12/5	Each controller before delivery to Site and again after installation		
	Cabling	Tests a, b, c, e, f, g, h, j as defined in sub-Clause 1424.2	Each traffic signals installation	Required	Certification that the installation complies with the National Rules for Electrical Installations is required.
1216	Thermoplastic road marking materials	Tested for the requirements of the specification in accordance with I.S. EN 1436 initially on application and as detailed during the guarantee period.		Required	Quality management and product certification schemes apply. Sampling procedures shall be as given in the specified Standard / Specification

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1217	Retroreflecting road studs	Test specified in the Standard/ Specification given in Cl 1217		Required (Standard/ Specification given in Cl 1217)	Quality management and product certification schemes apply
Series 1300					
1305	Anchorages for use in drilled holes	Tensile load (Manufacturer's tests)		Required	To provide well attested and documented evidence
1306	Anchorages in drilled holes to columns with flange plates	Loading test on site	1 per 50 anchorages		
1310	Welding	Welding procedures (manufacturer's tests)	(Every seven years)		Quality management scheme applies
		Welding qualification (Manufacturer's tests)	(Every two years)		
		Production testing (Manufacturer's tests)	(Clause 1310 (7.1.4)		
	Welded joints	Destructive testing	See sub-Clause 1310 (7.15)		(IL)
1313	GFRP laminates	Loss on ignition	1 per 200 production columns		
		Colour fastness	1 per batch		
		Electric strength			
		Water absorption			
		Impact strength			
1314	Brackets for laminating GFRP lighting columns				
	Polyurethane foam	Bulk density	1 per batch		
		Surface hardness			
		Apparent bulk density	2 per batch		
		Impact strength			
		Flexural stress			

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1400					
1421	Cable				Product certification scheme applies
1424	Lighting Units	Tests specified in Clause 1424	Each unit	Required	Product certification scheme applies. Certification that the installation complies with the National Rules for Electrical Installations is required
	Networks	Tests specified in Clause 1424	Each network	Required	Certification that the installation with the National Rules for Electrical Installations is required
Series 1500					
1506	Multipair communications cable			Required	Certification that each completed cable complies with the specification given in Appendix 15/1
	Fibre optic communications cable			Required	Certification that each completed cable complies with the specification given in Appendix 15/1
	Power supply cable for communications systems			Required	Certification that each completed cable complies with the specification given in Appendix 15/1
1518	Motorway communications and power cable	Tests specified in the specification given in Appendix 15/1	Each cable (Stage 1). As required in Appendix 15/1 (Stage 2)		
	Motorway optical fibre communications cable	Tests specified in the specification given in Appendix 15/1	Each cable (Stage 1). As required in Appendix 15/1 (Stage 2)		
	CCTV co-axial cable				
1523	Detector loops				
	Cable			Required	Certification that completed cables comply with the specification stated in Appendix 15/1 is required
	Epoxy resin			Required	Certification that the epoxy resin complies with Clause 1523 is required

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
1513 contd.		Feeder cable			Required	Certification that completed cables comply with the specification stated in Appendix 15/1 is required
		Joints	Pull test (4 kgf)	Each crimp		
		Installation	Series resistance	Each loop	Required	Certification in accordance with Clause 1523 is required
			Insulation resistance			
			Inductance			
1530	Pipes for motorway communications ducts					Product Certification Scheme applies. Certificates are provided for in the relevant standard but should normally not be required except for pipes which are not quality marked in accordance with relevant standard.
		UPVC				
		Plastics (see Table 5/1)				
		Other materials			Required	NSAI Agrément Certificate or equivalent required
	Thermoplastic structured wall pipes and fittings		[Manufacturer's Tests]		Required	INAB (or equivalent) certification applies
	Pipe bedding		As Series 500		Required	
			Grading and fines content (Washing and sieving method to be used)	1 per week(min of 3)		[Results of routine control tests from the factory production control system operated by the producer to be provided – see Annex C of IS EN 13242.]
			Water Soluble Sulphate (WS) content (IN)	5 per source		[Minimum to allow for natural variability of sulphur compounds]
			Resistance to fragmentation (IL)	1 per source		[LA Category]
1532	Chambers					
		Precast concrete				Product certification scheme applies
		Corrugated galvanised steel	[Manufacturer's Tests]		Required	Product certification scheme applies
		Manhole steps				Product certification scheme applies

Clause	Work, Goods or Material		Test	Frequency of Testing	Test Certificate	Comments
1532 contd.		Steel fitments				
		Covers, grates and frames				Product certification scheme applies
		Cover bolts				Quality management scheme applies
1533	Cable ducts					
		Mandrel test	Test specified in Clause 1533	Each duct	Required	
		Air test	Test specified in Clause 1533	Each duct	Required	
Series 1600						
1601	Soil samples In situ soil tests		As Series 600	As Series 600	Required	
1602 to 1606 1610 to 1615	Concrete Grout Reinforcement Prestressing Steelwork Welding		As Series 1700 As Series 1700 As Series 1800 Visual Ultrasonic	As Series 1700 As Series 1700 As Series 1800 100% 100% of full strength butt welds for lengthening 20% of fillet welds for channels	Required	
1606	Coatings for protection against corrosion		Adhesion	As required in Appendix 16/6		
1607	Reduction of friction on piles		As required in Appendix 16/7	As required in Appendix 16/7		
1608	Integrity testing		As required in Appendix 16/8	As required in Appendix 16/8		
1616	Dynamic testing		As required in Appendix 16/8	As required in Appendix 16/8		
1609	Static load testing of piles		As required in Appendix 16/9	As required in Appendix 16/9	Required	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1612	Self hardening slurry mixes	As required in Appendix 16/12	As required in Appendix 16/12		
1617	Instrumentation	As required in Appendix 16/17	As required in Appendix 16/17		
1618	Support fluids	As required in Appendix 16/18	As required in Appendix 16/18		
Series 1700					
1702 1703 1704	Cement types as stated in sub-Clause 1702.1			Required	Certificate to be provided monthly* for each type of cement. Quality management and product certification schemes apply.
	Cements (all types) Ground granulated blastfurnace slag	Chloride content	Monthly		Tests to be carried out by the manufacturer and results included on the test certificates required above
		Sulphate content	Monthly		
		Acid-soluble alkali content	Daily (PC) Weekly (PFA ggbs)		
	Aggregates	Petrographic tests	At commencement of contract, at change of source and bi-annually thereafter		
		Grading and fines content	1 per delivery (min 1 weekly per source)		Results of routine control tests by the manufacturer/ supplier to be provided. Product certification scheme applies
		Shell content (IL)	Monthly		Only required where marine aggregates are used
		Flakiness index (IL)	Monthly		
		Resistance to fragmentation (IL)	Every 6 months		
		Drying shrinkage (IL)	Monthly		
		Chloride content (IL)	Daily		
		Sulphate content (IL)	Monthly		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1702 1703 1704 contd.	Blastfurnace slag	Bulk density (IL)	1 per 500 tonnes		
		Stability (IL)	1 per 500 tonnes		
		Sulphur content (IL)	1 per 500 tonnes		
	Water	Tests specified in IS EN 1008	At commencement of contract, at change of source and bi-annually thereafter		
		Chloride content	Monthly		
		Sulphate content	Monthly		
		Acid-soluble alkali content	Weekly		
	Admixtures	Chloride content	1 per consignment	Required (BS 934-2)	Product certification scheme applies
		Sulphate content	1 per consignment	Required	
		Acid-soluble alkali content	1 per consignment		
1707	Concrete	Cube strength (IL)	Prestressed concrete – 2 cubes from 12m^3 or 2 batches whichever represents the lesser volume	Required	Contractor to cast and test sufficient copies to demonstrate cube strength before transfer
			Reinforced Concrete - 2 cubes from 24 m^{3}or 4 batches whichever represents the lesser volume		
			Mass Concrete – 2 cubes from 50 m^3 or 50 batches whichever represents the lesser volume		
			Additional cubes for special purposes		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1707 contd.		Cube strength identity testing as described in Appendix 17/4 (IL)	2 cubes from each of 2 samples of each batch		Refer to Appendix 17/4
		Density	Every cube		Refer to Appendix 17/1
		Modulus of elasticity			
	Fresh concrete	Consistence (IL)	Each batch		Refer to Appendix 17/1 for method
		Air content	Each batch of air entrained concrete		
		Cement content	1 for every 1000 m^3		
		Water/cement ratio			
1709	Silane			Required for each delivery	Certificate that the silane complies with Clause 1709 is required (Cl 1709.2)
		Refractive Index	Three samples		
		Trial panels			
1710	Concrete packing Mortar packing Epoxy resin bonding agent				
	Precast concrete manufactured off Site	Cube strength (Manufacturer's tests)			Contractor to make available records of tests by manufacturer
	Non participating formwork	As required by BS 36	1 per 300 m^2	Required	
	Participating formwork	As required by BS 36	1 per 300 m^2 See Table 17/7	Required	
1711	Grouting and Duct Systems for Post-tensioned Tendons				CARES Scheme for Supply and Installation of Post-tensioned Systems In Concrete Structures or an equivalent scheme is required. Quality management and product certification schemes for cement apply
		Full Scale Trials			See sub-Clause 1711.1 and Appendix 17/6

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1711 contd.		Air Pressure Tests			See sub-Clause 1711.3 and Appendix 17/6
		Duct assembly verification tests			See sub-Clause 1711.3 and Appendix 17/6
		Wall thickness of ducts after tensioning			See sub-Clause 1711.3 and Appendix 17/6. Contractor should provide evidence of testing
		Fluidity	See Table 17/7		See sub-Clause 1711.8 and sub-Clause 1711.9 and Table 17/8
		Bleeding			
		Volume change			
		Cube strength			
		Sieve			
		Sedimentation			
		Free Expansion			Only applicable if an expanding agent is used
	Admixtures			Required	Quality management and product certification schemes apply Data on their suitability, including previous experience should be made available. See sub-Clause 1711.10
1712	Reinforcement				Product certification scheme applies
	Steel bars			Required (BS 4449)	
	Steel wire			Required (BS 4482)	
	Steel fabric			Required (BS 4483)	
	Stainless steel			Required (BS 6744)	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1713	Fabricated reinforcement			Required	Certification that fabricated reinforcement complies with the routine inspection/testing requirements of BS 8666 is required if the fabrication is not covered by a product certification scheme listed in Appendix 1/25
1716	Reinforced jointing systems	Permanent elongation Characteristic strength (Manufacturer's tests)		Required for each type of connection	NSAI Agrément certificate or equivalent scheme to apply
1717	Reinforcement metal arc welding	Welding procedure approval (BS 7123)	As required in BS 7123		Tests should be carried out by an independent testing body specified in BS 8666
		Welder approval (BS 7123)			
1718	Prestressing Tendons				Product certification scheme applies
	Steel wire			Required (BS 5896)	
	Steel bar			Required (BS 4486)	
	Seven-wire Strand			Required (BS 5896)	
	Pre-stressing steel (all types)	Proof load Breaking load Elongation Ductility Relaxation Modulus of elasticity	*[As required]*		
	Super strand to BS 5896 or other than lowest strength 3-7 mm dia wires to BS 5896	0.1% proof load Breaking load	Each reel		
1724	Post-tensioning anchorages	Tests in accordance with IS EN 13391 (Manufacturer's tests)		Required (BS EN 13391)	Product certification scheme applies

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1726	Stainless steel bar			Required (BS 6744)	Product certification scheme applies
1727	Inspection and testing of structures and components	As required by Appendix 17/4	As required in Appendix 17/4	Required	
	Inspection and testing of structures and components of GRC planks and verge areas	Skid resistant pendulum test to pr EN 13036-4 and BD29 Minimum slip resistance to be equal to mean corrected pendulum test value of 45 using a standard skid resistant pendulum test (EN 14036-4)	4 per 100 m^2	Required	The Contractor shall forward a complete record of test results to the Employers Representative in advance of processing GRC panels
Series 1800					
1805.2	Metallic products	Inspection documents to EN10204	All Metallic Products	Required according to IS EN 1090-2:2008+A1:2011, Table 1	
1805.3.4	Special properties of constituent products	Testing to identify internal discontinuities or cracks in zones to be welded as specified in Appendix 18/1	As required in Appendix 18/1		
1806.4.4	Check of the capability of cutting processes that are likely to produce local hardness	Testing in accordance with IS EN ISO 6507	As required		
1806.5.4 d)	Check of the hardness and geometry of hollow section components subject to bending by cold forming	Check of the hardness, testing in accordance with IS EN ISO 6507	As required		
1807.4.1.2	Qualification of welding procedures (Processes 111, 114, 12, 13 and 14)	Tests specified in IS EN ISO 15614-1 or IS EN ISO 15613	As required in IS EN ISO 15614-1 or IS EN ISO 15613		Results to be reported in accordance with IS EN ISO 15614-1 or IS EN ISO 15613

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1807.4.1.2 (3)	Qualification of welding procedures for joints with restricted access	Tests specified in IS EN ISO 15613	As required in IS EN ISO 15613		Results to be reported in accordance with IS EN ISO 15613
1807.4.1.3	Qualification of welding procedures for other welding processes	Tests specified in the standards listed in IS EN 1090-2:2008+A1:2011, Table 13	As required in the standards listed in IS EN 1090-2:2008+A1:2011, Table 13		Results to be reported in accordance with the standards listed in IS EN 1090-2:2008+A1:2011, Table 13. Note the requirement in IS EN 1090-2:2008+A1:2011, 7.5.12 relating to stud weld procedure testing.
1807.4.1.4	Validity of welding procedure qualification	Additional tests specified in ISEN 1090-2:2008+A1:2011, 7.4.1.4 for a welding procedure qualified in accordance with IS EN ISO 15614-1, which is undertaken by a welding process that has not been used	As required in IS EN 1090-2:2008+A1:2011, 7.4.1.4		Results to be reported in accordance with IS EN ISO 15614-1
1807.4.1.4 (1)	Validity of welding procedure qualification	Welding production test in accordance with the qualification standard for the process concerned	As required		Results to be reported in accordance with the qualification standard for the process concerned
1807.4.2	Qualification of welders and welding operators	Tests specified in IS EN ISO 9606-1 (welders) or IS EN ISO 14732 (welding operators)	As required in IS EN ISO 9606-1 or IS EN ISO 14732 as appropriate	Required	Certificate to be in accordance with IS EN ISO 9606-1or IS EN ISO 14732 as appropriate
1807.4.2	Qualification of welders of hollow section branch connection with angles less than 60º	Specific qualification test. Tests specified in IS EN ISO 9606-1.	As required		
1807.4.2 (1)	Qualification of welders of joints with restricted access	Specific qualification test. Tests specified in IS EN ISO 9606-1.	As required		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1807.5.1.1	Verification that joint preparation in steel grades higher than S460 are free from cracks	Testing in accordance with IS EN ISO 3452-1 (penetrant) or IS EN ISO 17638 (Magnetic particle)	As required		
1807.5.1.1 (1)	Qualification of welding procedures where prefabrication primers are to be left on the fusion faces.	Tests specified in IS EN ISO 15614-1 or IS EN ISO 15613 using such prefabrication primers	As required in IS EN ISO 15614-1 or IS EN ISO 15613		Results to be reported in accordance with IS EN ISO 15614-1 or IS EN ISO 15613
1807.5.4 (1)	Welding of joints in hollow sections, full penetration butt welds with restricted access	Pre-production weld test conforming to IS EN ISO 15613.	As required		
1807.5.6 (3)	Verification of ground surface are free of cracks following removal of temporary welded attachments	Testing in accordance with IS EN ISO 17638 (Magnetic particle)	As required		
1807.5.9.2 (1)	Verification of the absence of surface cracking in continuity welds in permanent steel backing	Testing in accordance with IS EN ISO 3452-1 (penetrant) or IS EN ISO 17638 (Magnetic particle)	As required		
1807.5.18	Welding of bridge decks	Production tests in accordance with IS EN 1090-2:2008+A1:2011, 12.4.4 c)	As required		
1808.5.3 (1)	k value check for the Torque method	Test in accordance with IS EN 1090-2:2008+A1:2011, Annex H	Daily		
1808.5.4 (2)	k value check for the combined method	Test in accordance with IS EN 1090-2:2008+A1:2011, Annex H	Daily		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1808.5.5 (1)	Preload check for HRC method	Test in accordance with IS EN 1090-2:2008+A1:2011, Annex H	Each assembly lot		
1808.9	Use of special fasteners and fastening methods	Procedure tests for special fasteners and fastening methods as specified in Appendix 18/1	As required in Appendix 18/1		
1810.1 (5)	Slip resistant connections	Slip factor test in accordance with IS EN 1090-2:2008+A1:2011, Annex G	As required in Appendix 18/1		
1810.1 (10)	Verification of the preparation carried out before overcoating galvanized components	Test as specified in Appendix 18/1	As required in Appendix 18/1		
1812.2.1 (1)	Specific testing of constituent products not covered by standards.	Tests as specified in Appendix 18/1	As required in Appendix 18/1		
1812.2.1 (2)	Mechanical fasteners	Sample testing as specified in 1812.2.1 (2)	As required in 1812.2.1 (2)		Results to be reported in accordance with 1812.2.1 (2). Testing not required if mechanical fasteners supplied by a NHSS 3 registered Organisation. See 1800.5.2
1812.2.1 (3)	Mechanical fasteners	Suitability testing as specified in 1812.2.1 (3)	As required in 1812.2.1 (3)		Results to be reported in accordance with 1812.2.1 (3).
1812.4.1	Inspection before and during welding	None destructive testing methods selected in accordance with IS EN ISO 17635	As required in IS EN 1090-2:2008+A1:2011, 12.4.1		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1812.4.2.2	Inspection after welding – Scope of inspection	Supplementary none destructive testing determined by the manufacturer, according to the nature of the work in normal production.	As required in IS EN 1090-2:2008+A1:2011, 12.4.2.2		See 1812.4.2.2 (6)
1812.4.2.2 (1)	Inspection after welding - Specific inspection of welds	Supplementary none destructive testing in accordance with 1812.4.2.2	As required by 1812.4.2.2 (1) to (5)		
1812.4.3 (1)	Welded shear studs	Production tests as specified in IS EN ISO 14555, 14.2	As required in 1812.4.3 (1)		Results to be documented in accordance with 1812.4.3 (4)
1812.4.3 (2)	Welded shear studs	Hammer test as specified in 1812.4.3 (2)	Every welded shear stud		
1812.4.3 (3)	Welded shear studs	Simplified production tests as specified in IS EN ISO 14555, 14.3	As required in 1812.4.3 (3)		Results to be documented in accordance with 1812.4.3 (4)
1812.4.4 (1)	Production tests on welding	Production tests on welding as specified in 1812.4.4 (1)	As required in 1812.4.4 (1)		Results to be reported in accordance with the relevant standard
1812.4.4 (2)	Production tests on welding using run-off coupon plates	Production tests on run-off coupon plates as specified in 1812.4.4 (2)	As required in 1812.4.4 (2)		
1812.7.4	Other acceptance tests	Test requirements for components erected to a specific load as specified in Appendix 18/1	As required in Appendix 18/1		
	Air tightness test	Air-tightness test on main bridge fabricated box girders	7 per box girder	Required	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 1900					
1903	Abrasives	Grading	1 per batch		
		Hardness			
1909	Galvanized Coatings	Test specified in EN ISO 1461	1 set of tests per delivery load		
	Thermally sprayed aluminium metal coatings	Tests specified in IS EN ISO 2063	1 set per 100m^2 of coating		
	Aluminium coating material			Required in accordance with IS EN ISO 14919	
1910	Thermally sprayed aluminium metal coating	Pull off adhesion test in accordance with IS EN ISO 4624, IS EN ISO 2063 or 'ASTM D4541-Type III'	At the start of the works and every 50m^2		
	Thermally sprayed aluminium metal coating (excepted areas)	Grid test specified in IS EN ISO 2063	1 set per 100m^2 of coating		
1911, Table 19/2B	Hot dip galvanised coating to fasteners	Tests specified in IS EN ISO 10684	1 per 200 fasteners		
1912	Paints				
	'A' and 'B' Samples	Provision of samples for 'A' and 'B' sample tests			Samples selected in accordance with Clause 1912
		Specific gravity	As required by rate of 'A' and 'B' sampling		See NG 1912, 7; Appendix 19/4, Note 4
		Colour match	As required by rate of 'A' and 'B' sampling		See NG 1912, 7

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1914	Coating System				
	Minimum film thicknesses	Minimum dry film thickness measurements In accordance with IS EN ISO 2808	Required – representative testing		
	Adhesion	Pull off adhesion test in accordance with IS EN ISO 4624, IS EN ISO 2063 or ASTM D4541 – Type III	Required – representative testing		
	Defects	Visual assessment supplemented by appropriate testing	Required		*[Any additional tests should be scheduled in Appendix 1/5]*
	Defects – pin-holing or porosity	Low or high voltage detectors in accordance with ASTM G62-07	Required – representative testing excluding corners, bolted joints or welds		
1972	Abrasives	Grading	1 per batch		
		Hardness			
1974	Thermally sprayed aluminium metal coatings	Tests specified in IS EN ISO 2063	1 set per 100m^2 of coating		
	Aluminium coating material			Required in accordance with IS EN ISO 14919	
1975	Thermally sprayed aluminium metal coating	Pull off adhesion test in accordance with IS EN ISO 4624, IS EN ISO 2063 or 'ASTM D4541-Type III'	At the start of the works and every 50m^2		
	Thermally sprayed aluminium metal coating (excepted areas)	Grid test specified in IS EN ISO 2063	1 set per 100m^2 of coating		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
1978	Paints				
	'A' and 'B' Samples	Provision of samples for 'A' and 'B' sample tests			Samples selected in accordance with Clause 1978
		Specific gravity	As required by rate of 'A' and 'B' sampling		See NG 1978, 7; Appendix 19/4, Note 4;
		Colour match	As required by rate of 'A' and 'B' sampling		See NG 1978, 7
Series 2000					
2003	Permitted waterproofing systems				NSAI Agrément Certificate or equivalent applies
	Additional bituminous protection	Tests specified in IS EN 13108-4	1 per 15 tonnes*		Sampling to comply with IS EN 13108-4
	Stability value	Tests specified in BS 594897	1 per 15 tonnes*		
	Combined waterproofing and slip resistant wearing course	Skid resistance pendulum test in accordance with BD29 minimum slip resistant shall be equivalent to mean corrected pendulum test value of 45 units using a standard skid resistance pendulum test IEN 13036-4)	2 per 100m^2	Required	
2004	Permitted waterproofing systems				NSAI certification or equivalent applies
2008 2009	Waterproofing membrane	Tensile strength, elongation at break (BS ISO 37)	2 tests per deck		Tests results to be provided to the Employer's Representative
		Tear strength (BS ISO 34-1)	2 tests per deck		

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
2008 2009 contd.		Deck adhesion (Clause 2008.5)	Three tests per 500m^2 of sprayed membrane or deck whichever is the lesser		
		"Holiday Test"	Three tests per 500m^2 of sprayed membrane or deck whichever is the lesser		
Series 2100					
2101	Complete Bridge bearings				
	Elastomeric bearings	Hardness	As required in Appendix 21/1	Required (BS 5400: Section 9.2)	
		Tensile strength			
		Elongation			
		Ageing			
		Compression set			
		Ozone resistance			
	Complete bearings	Tests specified in Appendix 21/1	As required in Appendix 21/1		
Series 2400					
2401	Masonry cement			Required (IS EN 413-2)	Quality management scheme applies
		Chloride content	Monthly		Test to be carried out by the manufacturer and results included on the test certificate
2402	Sand			Required per consignment (IS EN 13139)	
		Chloride content	Monthly		Test to be carried out by the manufacturer and results included on the test certificate
2404	Mortar admixtures			Required (IS EN 934-3)	Product certification scheme applies

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
2405	Lime			Required (IS EN 459-1)	
2406	Bricks				Product certification scheme applies
	Clay	Active soluble salt content (IS EN 772-5) Compressive strength (IS EN 772-1) Water absorption (IS EN 772-7) Freeze/thaw resistance			*[Tests/samples (in accordance with IS EN 771-1 should be scheduled as required]*
	Calcium silicate			Required IS EN 771-2)	
	Concrete			Required (IS EN 772-2)	
2407	Blocks				
	Concrete			Required (IS EN 772-2)	
2408	Manufactured Stone	In accordance with IS EN 771-5		Required	
2410	Stainless Steel				
2411	Wire/fabric			Required (IS EN 10088-1)	
	Bars			Required (BS 6744)	

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
Series 2500					
2501	Materials for corrugated steel buried structures				Type approval applies
	Steel plate			Required as appropriate to the standard or specification listed in NRA BD 12 and Appendix 25/1.	
	Nuts and bolts				
	Metal coating				
	Protective coating				NSAI Agrément Certificate or equivalent applies
	Paved invert system				
2502	Materials for reinforcing elements, prefabricated facing and capping units, and washers				NSAI Agrément Certificate or equivalent applies
	Carbon steel strip			Required (IS EN 10025-1 and IS EN 10025-2)	Silicon content and mechanical properties to be stated on the certificate
	Stainless steel strip			Required (IS EN 10029, IS EN 10048, IS EN 10051 and IS EN ISO 9445)	Mechanical properties to be stated on the certificate
	Reinforcing bar for anchor elements			Required (IS EN 10080 and BS 4449)	Tests scheduled for welding and galvanizing of anchor elements under Series 1700 and Series 1900 respectively are required.
	Materials for fasteners				
	Steel alloy			Required (IS EN ISO 898-1, IS EN ISO 4016, IS EN ISO 4018 and IS EN ISO 4034)	Tests for galvanizing scheduled under Series 1900 are required

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
2502 contd.	Stainless steel			Required (IS EN 10088-1, IS EN ISO 3506-1 and IS EN ISO 3506-2)	
	Bolts, screws and nuts			Required (IS EN ISO 898-1 and IS EN ISO 4016, IS EN ISO 4018 and IS EN ISO 4034)	Tests for galvanizing scheduled under Series 1900 are required
2503	Materials for Reinforced Clay Brickwork Retaining Walls of Pocket-type and Grouted Cavity Construction				
	Clay bricks	Compressive strength (IS EN 772-1) Water absorption (IS EN 772-7) Freeze/thaw resistance	1 set of tests per type of brick*		*[Tests/samples (in accordance with IS EN 771-1 should be scheduled as required]*
Series 2600					
2601	Bedding mortar materials			Required for each batch	Certification in accordance with Clause 2601 is required
	Bedding Mortar	Flow cone test	Each batch		
		Flow between glass plates			
		Compressive strength			
		Expansion test			
		Water absorption			
		Elastic stability	1 per source		
		Flow cone test Compressive strength	Each load		Site control tests

Clause	Work, Goods or Material	Test	Frequency of Testing	Test Certificate	Comments
2604	Plastic coating to fencing posts, gates and ancillaries	Impact test Adhesion Retention of adhesion Salt spray Accelerated weathering (Manufacturer's tests)		Required (BS 1722-16)	Records of all tests to be available for inspection
Series 2700					
2703	Polyethelene Pipes				
	Butt fusion joints	Tensile test to WIS 4-32-08	Each joint		Test Report to be made available to the Employer's Representative
	Electrofusion joints	Double cantilever cleavage test to WIS 4-32-08	Each joint		Test Report to be made available to the Employer's Representative
2708	Integrity of pipes, joints and fittings	Pressure drop test to IS EN 815	Each diversion		Test Records to be made available to the Employer's Representative
2709	Watermain disinfection	Chlorine residual test	Each diversion		Test Records to be made available to the Employer's Representative
		Bacteriological testing	Each diversion		Test Records to be made available to the Employer's Representative

APPENDIX 1/7
Site Extent and Limitations on Use

Extent of the Site

1. The extent of each Site is as shown on the drawings included in the Works Requirements.

2. In addition and subject to the agreement of the Local Authority and approval of the Employer's Representative, the Extent of the Site shall include areas required for advance coning and temporary traffic signing by the Contractor in compliance with Clauses 117 and 118 of the Specification where approved.

3. The Extent of the Site for the installation of plant for statutory or other bodies outside of the land acquisition boundary will be limited by the terms of the wayleaves acquired by the statutory or other bodies for execution of the Works.

4. The Contractor shall keep open and maintain access facilities to properties for all landowners during the course of the Works.

5. The Contractor is limited to the use of access routes by means of public roads to the site as stated in Appendix 1/19.

6. In addition to the extent of site, additional areas may be temporally occupied by the Contractor to allow construction of the permanent works subject to agreement by the Contractor with the Relevant Authority.

Limitations on the Use of the Site

1. The Contractor is not permitted to move personnel, plant or machinery across any of the National Primary or Secondary routes or Regional roads without approval of the Local Authority.

2. Prior to entering parcels of land not acquired in their entirety, the Contractor shall erect suitable temporary fencing taking into account adjacent land usage to maintain site security and to exclude the general public.

3. The Contractor shall undertake the Works in such a manner as to avoid degradation of the water quality of any of the watercourses affected by the Works by pollution as a consequence of site operations as required by Clause 133, 170AR, 176AR, 180.2AR and 180.3AR of this Specification.

4. The contractor shall maintain adequate routes for traffic in accordance with appendices 1/17 and 1/18.

5. The Contractor shall ensure that all areas of land, which have been temporarily occupied, are reinstated to the satisfaction of the affected landowner, occupier and the relevant Authorities.

6. Accommodation Works and works to lands behind the proposed boundary walls and fences are to be completed as soon as possible so that inconvenience to the property owners is minimised. No site accommodation is to be erected on such lands or close to entrances to such lands unless agreed otherwise with the Landowner.

7. The Contractor shall undertake the Works in such a manner as to avoid degradation of any stream or river water quality by pollution as a consequence of site operations.

8. Equivalent parking facilities are required to be maintained during the works and access for pedestrians, cyclists and vehicular traffic is to be maintained to all properties along the route and along each carriageway.

9. The Contractor shall keep open and maintain access to properties and lands for all landowners, occupiers and property owners along the course of the works at all times.

Construction Compounds

1. The contractor shall be responsible for making all arrangements for providing any land required for offices and other temporary site facilities.

APPENDIX 1/8
Operatives for the Employer's Representative

Table 1/8 Operatives for the Employer's Representative

Operatives Required	No	Period Required
Chainman / Driver	1 No.	From the Works Starting Date up until issue of the Certificate of Substantial Completion

Note:
Operatives for the Employer's Representative are not required before 8.30am or after 5.30pm of working days.

APPENDIX 1/9
Control of Noise and Vibration

1 Noise

1.1 It is for the Contractor to decide whether to seek the Local Authority's formal consent to his proposed methods of work and to the steps he proposes in order to minimise noise.

1.2 The normal working hours within the site shall be Monday to Friday between 08.00 hours and 19.00 hours and Saturday between 08.00 and 16.30 hours and as described in Appendix 1/17 with no working on Public Holidays. Exceptionally, the Employer's Representative's may give consent for work outside these hours. 7 days notice is required from the Contractor when seeking same.

1.3 The noise levels (see Note (i) below) in Schedule 1/9/1 for periods outside the normal working hours will only be permitted when consent has been given to exceptional working.

1.4 The ambient noise level, L_{Aeq} (see Note (ii) below), from all sources measured 2.0m above the ground at noise control stations (the Contractor shall provide for a minimum 4 No. Noise Monitoring Stations to be in operation at any one time at the bridge site and their location to be determined by the Employer's Representative) shall either not exceed the appropriate level given in the Schedule or not exceed by more than 3dB(A) the existing ambient noise level, L_{Aeq} (see note (iii) below), at the control station measured over the same period, whichever level is greater. The maximum sound level at any noise control station shall not exceed the level given in the Schedule. Exceptionally the Contractor may be given permission to carry out works which exceed the noise levels in the Schedule, provided that 14 days notice of the date and timing of these works is given to the Employer's Representative and the Contractor demonstrates that he intends to take all reasonable measures to mitigate the noise nuisance. After consultations with the Employer and any other interested bodies a decision will be given within 7 days of receipt of the notice. The Contractor shall provide 2 No. noise monitoring stations continuously during the works at each structure location.

1.5 The Contractor shall employ the best practical means to minimise noise produced by his operations including plant maintenance, and shall comply with the recommendations in BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.

1.6 All vehicles and mechanical plant used on the works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order for the duration of the works in compliance with BS 5228. The Contractor shall remove from the works any item of plant, which in the opinion of the Employer's Representative is ineffectively silenced. All compressors shall be "sound reduced" models fitted with properly lined and sealed acoustic covers and shall be kept closed whenever the machines are in use. Any ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers. Pumps and mechanical static plant shall be enclosed by acoustic sheds or screens where directed by the Employer's Representative.

1.7 Any plant such as generators and pumps which is required to work outside the hours of 08.00 hours to 19.00 hours, Monday to Friday, shall be surrounded by an acoustic enclosure to the approval of the Employer's Representative which shall restrict the noise level to not less than 5dB(A) below the levels quoted in Schedule 1/9/1.

1.8 The Contractor shall organise his operations with regard to the positioning of plant and the location of haul routes etc. so that it minimises construction noise to adjacent properties.

1.9 The use of explosives is not permitted.

1.10 The contractor shall carry out noise monitoring in accordance with the standards referenced to in this Appendix.

1.11 The period referred to as night shall be from 2200hrs to 0500hrs.

1.12 When permitted by the Employers Representative any work on Sunday and on official Public Holidays shall occur between the hours of 0900hrs and 1600 hrs.

Schedule 1/9/1: Noise Levels

Schedule Period	Hours	Total Noise Levels at Control Stations		
		Ambient Noise level, L_{Aeq} measured at Control Station dB(A)	Period of Hours over which L_{Aeq} is applicable	Maximum Sound Level (see Note (iv) below measured at Control Station: dB(A)
Monday to Friday	0700 – 1900	70	1	80
Monday to Friday	1900 – 2200	60	1	65
Saturdays	0800 – 1630	65	1	75
Sundays and Public Holidays	0900 – 1600	60	1	65
All unattended plant outside normal working hours	1900 – 2200	60	1	65
Nighttime working	2200 – 0500	50	1	55

Notes:

(i) Noise levels relate to free field conditions. Where noise control stations are located 1 metre from façades of buildings, the permitted noise levels can be increased by 3dB(A).

(ii) The ambient noise level, L_{Aeq}, at a specific location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period.

(iii) The existing ambient noise level, L_{Aeq}, at a specific location is the total L_{Aeq} from all the noise sources in the vicinity over the specified period prior to the commencement of the Works.

(iv) Maximum sound level is the highest value indicated on the sound level meter which meets the requirements of IS EN 61672.

2 Vibration

2.1 Vibration generated by the Contractor's activities shall not adversely affect the structural and serviceability performance of any structure inside or outside the boundaries of the site including the existing bridge structures. In addition, the maximum permitted peak particle velocity generated by the construction of the Works shall not exceed the peak particle velocities at locations described and for the frequencies given in Tables 1/9/1 and 1/9/2 below.

Table 1/9/2: Limits for Intermittent Vibration

Structure Type	Max PPV (mm/sec) – Intermittent Vibration		
	Frequency <10 Hz	Frequency 10 – 50 Hz	Frequency 50 – 100 Hz
Residential Properties, similar Structures and adjacent to masonry elements of bridges	5	10	15
Residential Properties (occupied)	4	8.5	10
Steel and Reinforced Concrete Structures	15	30	40
Robust Underground services (*)	15	30	60
Elderly & Dilapidated Services (**)	10	20	40

(*) and (**) refer to Appendix Series1600 for further governing limits.

Table 1/9/3: Limits for Continuous Vibration

Structure Type	Max PPV (mm/sec) – Continuous Vibration		
	Frequency <10 Hz	Frequency 10 – 50 Hz	Frequency 50 – 100 Hz
Residential Properties, similar Structures and adjacent to masonry elements of bridges	2.5	5	7.5
Residential Properties (occupied)	2.0	4.5	5.0
Steel and Reinforced Concrete Structures	7.5	15	20
Robust Underground services	7.5	15	30
Elderly & Dilapidated Services	5.0	10	20

2.2 Groundborne vibrations shall not be permitted at sites of freshly placed concrete, i.e. concrete less than 48 hours old.

2.3 The Contractor shall employ the best practical means to minimise vibration produced by his operations, including plant maintenance, and shall comply with the recommendations in BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.

2.4 To ensure compliance with the specified vibration limit, monitoring shall be undertaken by the Contractor using a digital seismograph as described in paragraph 2.6 of this Appendix. Such monitoring shall include locations outside the limits of the Site. The Contractor shall provide for at least 4 No. separate vibration monitoring stations to be in operation at each site at any one time.

2.5 The Contractor shall monitor ground vibrations at selected locations specified by the Employer's Representative to the approval of the Employer's Representative on site during the progress of the works. Each vibrograph shall be certified as being in proper working order and shall unless otherwise approved, record vibrations in three directions simultaneously with a print-out showing the amplitude and frequency of the vibrations.

Vibration Monitoring Equipment

2.6 The type of instrumentation suitable for monitoring vibration shall be a digital seismograph having the following minimum specification:

(ii) Minimum sampling rate 1000 samples/second/channel;

(iii) Capable of recording Peak Particle Velocity (Directly), Peak Acceleration (Calculated), Peak Displacement (Calculated), Frequency at the Peak Velocity (Calculated);

(iv) Dual Mode instrument having (a) Self Triggering Mode and (b) Continuous Monitoring Mode;

(v) Transducer - 3 orthogonally mounted transducers on one mounting unit

(vi) Frequency Range - 4.5 to 200Hz;

(vii) Minimum Resolution - 0.05mm/second, velocity;

(viii) Range - 0 to 100mm/second, velocity;

(ix) Record of Events - hard copy printout and storage on solid state memory or disc for subsequent printout; and

(x) Power – 120 volts mains for continuous unattended operation on construction site plus internal battery with minimum of 24 hours capacity.

Control of Dust

2.7 The contractor shall provide, use, maintain and keep available plant and equipment necessary to minimise the formation and accumulation of dust arising from the works, normally in dry weather conditions.

APPENDIX 1/11
Structural Elements and Other Features to be Designed by the Contractor

All structural elements to be designed in accordance with Eurocodes as amended by the Irish National Annexes.

Structural Element	Location	Design Specification
Road Restraint Systems	Str1 MacMurrough Island Bridge 1 WX-N30-007.00	Series 400
Road Restraint Systems	Str2 MacMurrough Island Bridge 2 WX-N07-008.00	Series 400
Road Restraint Systems	Str3 MacMurrough Island Farm Pass WX-N30-009.00	Series 400
Road Restraint Systems	Str4 Ballybing Culvert WX-N25-001.00	Series 400
Road Restraint Systems	Str 6 Ballintrane Bridge CW-N80-006.00	Series 400
Road Restraint Systems	Str 7 Boggan Bridge CW-N80-004.00	Series 400
Road Restraint Systems	Str 8 Closh Bridge CW-N81-001.00	Series 400
Ground Anchors	Str 5 Glebe Bridge WX-N11-003.00	Series 600
Traffic Signs, Passively Safe Post and Corresponding Foundation	Str4 Ballybing Culvert WX-N25-001.00	Series 1200
Information Signs, Passively Safe Post and Corresponding Foundation	Str 6 Ballintrane Bridge CW-N80-006.00	Series 1200
Thrust Blocks and Watermain Diversions	Str4 Ballybing Culvert WX-N25-001.00	Series 500 and Series 2700
Expansion Joints	Str4 Ballybing Culvert WX-N25-001.00	Series 2300
Expansion Joints	Str6 Ballintrane Bridge CW-N80-006.00	Series 2300
Stainless Steel Ties to Masonry	Str2 MacMurrough Island Bridge 2 WX-N07-008.00	Series 2400

APPENDIX 1/12
Setting Out and Existing Ground Levels

1. Not Used.

2. The Contractor shall set out the Works by reference to ordnance datum ordnance survey digital data and to which all levels quoted on the drawings refer.

3. The Contractor shall verify existing kerb alignments at tie-in points and notify the Employer's Representative of any discrepancy so that the alignments may be adjusted to provide a smooth transition to existing.

4. The Contractor shall confirm the existing carriageway levels at all tie-in points to ensure that the existing vertical alignment of the carriageway is maintained upon completion of the refurbishment works.

5. Where the Contractor establishes subsidiary permanent control markers, such markers shall be of a substantial type and construction, to the approval of the Employer's Representative. A schedule of all such subsidiary markers, detailing colour coding or any other distinguishing features shall be supplied to the Employer's Representative.

6. The Contractor shall not destroy any Permanent Ground Marker (PGM) or Permanent Bench Mark (PBM) until a replacement subsidiary permanent control marker has been established in a position agreed with the Employer's Representative.

Co-ordinates are to the Irish Transverse Mercater Grid. All levels are in metres to ordnance datum malin.

Structure	PGM ID	Northing	Easting	Elevation
Str1 MacMurrough Island Bridge 1 WX-N30-007.00	STN MT7	X/E=674492.726	Y/N=630319.307	Z/H=33.969
	STN MT71	X/E=674480.942	Y/N=630334.341	Z/H=38.690
Str2 MacMurrough Island Bridge 2 WX-N07-008.00	STN MT5	X/E=674139.113	Y/N=630414.200	Z/H=33.083
	STN MT51	X/E=674121.925	Y/N=630401.727	Z/H=33.054
Str3 MacMurrough Island Farm Pass WX-N30-009.00	STN MT2	X/E=673822.300	Y/N=630475.765	Z/H=30.196
	STN MT3	X/E=673923.97	Y/N=630451.955	Z/H=31.064
Str4 Ballybing Culvert WX-N25-001.00	STN DT1	X/E=711993.012	Y/N=611472.088	Z/H=14.808
	STN DT2	X/E=711850.239	Y/N=611512.077	Z/H=13.039
	STN DT3	X/E=711710.338	Y/N=611534.514	Z/H=14.633
Str5 Glebe Bridge WX-N11-003.00	STN S1	X/E=698296.561	Y/N=634464.853	Z/H=9.59
	STN S2a	X/E=698230.202	Y/N=634575.713	Z/H=8.395
	STN S3a	X/E=698161.994	Y/N=634700.677	Z/H=9.723
	STN S4	X/E=698114.369	Y/N=634811.048	Z/H=10.982
Str6 Ballintrane Bridge CW-N80-006.00	STN S1	X/E=679451.433	Y/N=667740.032	Z/H=81.107
	STN S2a	X/E=679618.86	Y/N=667769.594	Z/H=81.369
	STN S3a	X/E=679709.45	Y/N=667773.302	Z/H=81.768
	STN S4	X/E=679845.686	Y/N=667804.51	Z/H=82.629
Str7 Boggan Bridge CW-N80-004.00	STN S1	X/E=684857.795	Y/N=665438.362	Z/H=79.113
	STN S2a	X/E=684922.321	Y/N=665313.599	Z/H=79.067
	STN S3a	X/E=685011.763	Y/N=665191.162	Z/H=79.28
	STN S4	X/E=685112.78	Y/N=665090.12	Z/H=81.475

Structure	PGM ID	Northing	Easting	Elevation
Str7 Boggan Bridge CW-N81-001.00	STN S1	X/E=684677.012	Y/N=665791.329	Z/H=79.944
	STN S2a	X/E=684679.632	Y/N=665941.838	Z/H=78.039
	STN S3a	X/E=684719.128	Y/N=666088.24	Z/H=77.799
	STN S4	X/E=684814.531	Y/N=666217.154	Z/H=79.519

Co-ordinates are to the Irish Transverse Mercater Grid. All levels are in metres to ordnance datum malin.

Establishment of Ground Control Points

7. The Contractor shall reinstate control stations and permanent ground markers on site to facilitate the execution of the works. A minimum of 3 No. Control Stations shall be established at each site at locations to be agreed with the Employer's Representative. Control Stations shall be sufficiently robust to ensure adequate dimensional control for the scheme. For the duration of the works the Contractor shall employ a suitably qualified Surveyor to establish the Control Stations. Details of the proposed Surveyor shall be submitted to the Employer's Representative prior to the establishment of the Control Stations.

8. When survey ground markers, reference pegs or Works bench marks lie outside the limits of the Area Provided by the Employer for the Works, the Contractor shall make all arrangements with the landowners and occupiers for entry and maintenance and shall pay fees in that connection. Upon completion of the Works or when directed by the Employer's Representative, the contractor shall remove such markers, pegs and bench marks and reinstate the ground to the satisfaction of the Employer's Representative.

APPENDIX 1/13
Programme of the Works

1. General

1.1 The Works Programme

The Contractor shall submit his programme of Works in compliance with the following requirements.

The Contractor shall provide the programme in a form of a bar chart produced as a result of a "*critical path analysis"* which must incorporate the constraints stated or implied in the Contract. It shall show the level of detail appropriate to each stage of the Works and all activities and restraints, each of which shall be given a short title. All events shall be numbered and annotated with earliest and latest event dates. The critical path should be clearly shown on the programme. The programme shall be submitted electronically by the Contractor together with a paper copy at the size that is appropriate to the information contained on such programmes.

The programme shall also contain a schedule of outputs and resources to support the activities shown.

2. Schedule of Stated Constraints

This list of Constraints is not exhaustive and all other constraints suggested or implied by the Contract Documents or considered prudent by the Contractor following his inspection of the Site shall be taken into account by him in formulating his programme.

i. The work to Privately and Publicly Owned Public Services and Supplies in Appendix 1/16 of the Specification. Many of the proposed alterations to existing services require works to be undertaken by the Contractor prior to undertaking such alterations. In some cases the services may need to be altered temporarily for a period before the permanent alterations can be undertaken.

ii. "*Traffic Safety and Management"* requirements are outlined in Clause 117 of the Specification and the requirements for "*Temporary Diversions for Traffic"* are outlined in Clause 118 of the Specification. The requirements of these clauses and of Appendices 1/17 and 1/18 are to be considered in the preparation of the programme.

iii. The "Permitted Access Routes" to and from the Site are outlined in Appendix 1/19 of the Specification. The contractor shall allow for the construction of access routes to site and restrictions on access to and from the site in his programme of works.

iv. Provision of environmental protection measures prior to main construction operations.

v. Trials and demolition in advance of main construction.

vi. Compliance with technical approval procedures in relation to structural elements designed by the Contractor including quality approvals, resubmissions and modifications.

vii. The Contractor will be required to obtain approval from the relevant Local Authority, the Gardai and the Employers Representative of his proposals for traffic management, including the traffic management measures for controlling access to and from the Site of his construction traffic, in accordance with Appendices 1/17, 1/18 and 1/19 of the Specification.

viii. Existing drainage runs that clash with end supports shall be diverted, removed and backfilled prior to commencing the bridge works.

ix. Before opening any section of newly constructed road to public traffic, adequate road markings are to be in place.

x. The Contractor is required to submit independent check certificates for temporary works for elements of work in accordance with Clause 174 AR.

xi. The Contractor is required to complete condition surveys in accordance with Clause 136 and Appendix 1/73 of this Specification.

xii. Particular environmental constraints as identified in Clauses 170AR, 176AR and 180AR.

xiii. The Contractor shall facilitate other contractors, local authorities and utility undertakers.

xiv. New temporary signs shall be in place prior to taking down any existing signage to allow construction of the works.

xv. Before any works to services are carried out, proposals for protection, diversions and temporary support to services are to be agreed and approved by the relevant utility provider.

xvi. Works to be undertaken to facilitate adequate working space.

xvii. Constrained nature of the site.

xviii. Services that require diversion will be complete prior to demolition works.

xix. Maintenance of access for traffic, pedestrians and cyclists during the works.

xx. Traffic diversions at each bridge site shall not be longer than stated in Appendix 1/17 or otherwise agreed with the Employers Representative.

xxi. The Contractor is required to consult and comply with the requirements of the National Parks and Wildlife Service (NWPS). Where required tree felling shall not be carried out between 1st March to 31st August without prior approval of the NWPS.

xxii. In river works are not to be carried out at Str 05 Glebe Bridge WX-N11-003.00 before July 1st 2017 unless otherwise agreed and confirmed in writing to the Employer's Representative with Inland Fisheries Ireland and the National Parks and Wildlife Service.

3. Level of Detail

(i) Mobilisation, advance notification of Authorities such as OPW, Inland Fisheries Ireland, Transport Infrastructure Ireland, relevant local authorities, Utility Companies, NWPS, precondition surveys, etc.

(ii) Traffic Management measures including operation of site accesses, plant crossing, overrun, temporary diversions for traffic and traffic safety and management measures.

(iii) Roadworks under the following headings for each site for mainline and access roads:

a) Fencing
b) Access to site
c) Site clearance
d) Demolition
e) Topsoil strip
f) Drainage
g) Excavation and Filling
h) Sub-base
i) Roadbase
j) Surfacing
k) Ducting
l) Lighting
m) Road Signs
n) Road Markings

(iv) Surface water and Foul Water Sewers for each site:

a) Gullies and connecting pipes

(v) Privately and publicly owned services and supplies including diversions and protection measures for each site.

(vi) Accommodation works for each site.

(vii) Bridge works under the following headings

1. Str1 MacMurrough Island Bridge 1 WX-N30-007.00

- Substructure end supports
  - Rehabilitation of masonry
- Superstructure main span
  - Drainage and service ducts
  - Excavation
  - Formwork
  - Reinforcement
  - Concreting
- Finishings
  - Road restraint system (vehicle and pedestrian)
  - Pavement
  - Kerbs, footways and paved areas
  - Waterproofing

2. Str2 MacMurrough Island Bridge 2 WX-N07-008.00

- Substructure end supports
  - Rehabilitation of masonry
- Superstructure main span
  - Drainage and service ducts
  - Excavation
  - Formwork
  - Reinforcement
  - Concreting
- Finishings
  - Road restraint system (vehicle and pedestrian)
  - Pavement
  - Kerbs, footways and paved areas
  - Waterproofing
- Retaining Wall
  - Excavation and Earthworks
  - Formwork
  - Reinforcement
  - Concreting
  - Waterproofing
  - Masonry
  - Fencing and Finishings

3. Str3 MacMurrough Island Farm Pass WX-N30-009.00

- Sub-structure and supports and main span
  - Drainage and service ducts
  - Excavation
  - Formwork
  - Reinforcement
  - Concreting
- Finishings
  - Road restraint system (vehicle and pedestrian)
  - Pavement

- Kerbs, footways and paved areas
- Waterproofing

4. *Str4 Ballybing Culvert WX-N25-001.00*
   - Substructure end supports and mainspan
     - Temporary stream diversions
     - Removal of existing culvert
     - Drainage and service works
     - Watermains and watermain diversions
     - Earthworks
     - Headwalls
       - Formwork
       - Reinforcement
       - Concreting
     - Culvert
       - Culvert units
   - Finishings
     - Road restraint system (vehicle and pedestrian)
     - Pavement
     - Kerbs, footways and paved areas
     - Waterproofing
     - Brickwork, blockwork and stonework
5. *Str5 Glebe Bridge WX-N11-001.00*
   - Sub-structure end supports and main span
     - Vegetation Clearance
     - Earthworks
     - Wall Stabilisation Works
     - Masonry Repair
     - Concrete Crack Injection
     - In-stream works
       - Bed-check weirs;
       - Bank stabilisation;
   - Finishings
     - Fencing
6. *Str6 Ballintrane Bridge CW-N80-006.00*
   - Sub-structure and supports and main span
     - Drainage and service ducts
     - Excavation
     - Formwork
     - Reinforcement
     - Concreting
   - Finishings
     - Road restraint system (vehicle and pedestrian)
     - Pavement
     - Kerbs, footways and paved areas
     - Waterproofing
7. *Str7 Boggan Bridge CW-N80-004.00*
   - Sub-structure and supports and main span
     - Drainage and service ducts

- Excavation
- Gabions

- Finishings
  - Road restraint system (vehicle and pedestrian)
  - Pavement
  - Kerbs, footways and paved areas
  - Waterproofing
  - Masonry

8. Str8 Closh Bridge CW-N31-001.00

- Sub-structure and supports and main span
  - Fencing
  - Drainage and service ducts
  - Excavation
  - Gabions
- Finishings
  - Road restraint system (vehicle and pedestrian)
  - Pavement
  - Kerbs, footways and paved areas
  - Waterproofing
  - Masonry

(viii) Privately and publicly owned services and supplies including diversion for each structure.

(ix) Traffic management measures including operation of site accesses and temporary diversions of traffic.

(x) Reinstatement of boundary walls / fencing

(xi) Accommodation works

(xii) Landscaping works

Further breakdown of items and other details may be required.

4. Format of Reports

4.1 All programmes and reports specified herein shall be submitted to the Employer's Representative, unless expressly stated otherwise.

4.2 The size, number of copies and electronic format of copies of the programmes and reports to be submitted by the Contractor as specified herein shall be as agreed with the Employer's Representative.

All programmes shall be submitted electronically by the Contractor together with a paper copy at a size that is appropriate to the information contained on such programmes.

APPENDIX 1/14
Monthly Statements

The monthly statements submitted to the Employer's Representative in accordance with Sub-Clause 11.1.1 of the Conditions by the Contractor shall, whenever dealing with matters covered by the Bills of Quantities, be set out under Part and Section headings similar to those in the Bill of Quantities and shall separately identify each item and specify quantity, unit, rate and value.

APPENDIX 1/15
Accommodation Works

1. Accommodation Works are listed in the Schedules of this Appendix.

2. The Contractor shall complete Accommodation Works as early as possible within the period for completion of the Works. Notwithstanding this, private access must be provided across to adjoining landowners and affected parties to the same level as that which will be provided by the Accommodation Works until such time as the Accommodation Works are complete.

3. The Accommodation Works shall be carried out in accordance with a stated programme of which each owner shall be kept informed.

4. Before any construction is started in the vicinity of any property the Contractor shall, at his own cost, engage an independent engineer to prepare a written and photographic record of the condition of each property.

5. All services, for example water, electricity, telephone and drainage, that are interrupted or interfered with during the Works shall be repaired and reinstated without unreasonable delay, maintained in effective condition during the Works and finally restored to as good a condition as before commencement of the Works.

6. All ditches, open drains, water courses and field drains interfered with by the Works shall, as far as possible, be maintained in effective condition during the Works and finally be restored to as good a condition as before commencement of the Works. Particular care shall be taken to ensure that the minimum amount of damage or disturbance to land drains is caused. The position of all land drains cut or disturbed during excavation shall be permanently marked by pegs on both sides of the acquisition strip immediately following their location. Any permanently severed pipes shall be connected into a new drain and any pipe disturbed by the works shall be re-laid to ensure free discharge into the new drain. Disused ends of interrupted land drains shall be adequately sealed.

7. Details of Accommodation Works are shown in Schedule 1/15-1 of this Appendix.

SCHEDULE 1/15-1
Schedule of Accommodation Works

(1)

Owner:	**John J. Murphy** **Angela Murphy**
Townland: **CPO Plot Ref No. : NA**	**McMurrough Bridge 2 – Refer to drawing 1700-ST02-003**

Description of Property:	Existing embankment to south of N30 carriageway and west of existing access road
Description of Accommodation Works :	Replacement of existing boundary fencing and planting of a row of semi-mature evergreen trees to the rear of the proposed retaining wall outside proposed replacement boundary fencing. The exact variety of the proposed trees is to be agreed with the Employer.
Fencing Details:-	Timber post and rail fence to RCD/300/1 with concrete footings
Field Gates:-	
Walling Details:-	N/A
Access Details:-	N/A
Drainage / Ducting Details:-	All drainage to be made good
Miscellaneous Details :-	• Landscaping with top soil and grass seeded as described on the drawings. Row of semi-mature evergreen trees as described on the drawings.

APPENDIX 1/16
Privately and Publicly Owned Services and Supplies

1. Details of preliminary arrangements that have been made with Statutory Undertakers and others for the alteration of services affected by the Works are listed in this Appendix. No arrangements have been made in respect of temporary alterations of service and supplies necessary for the execution of the works. The Contractor shall make arrangements with the Statutory Undertakers for such temporary alterations of service or supplies.

2. The Contractor shall make arrangements with the Statutory Undertakers and others concerned for the co-ordination of his work with all work, which needs to be done by them or their Contractors concurrently with the Works. Compliance with the periods of notice given in this Appendix does not relieve the Contractor of his obligations.

3. Private services to individual properties have not generally been listed or shown on the Drawings. The Contractor shall make arrangements with the Statutory Undertakers and others concerned for the phasing of all necessary disconnections and diversions of private services affected by the Works.

4. The Contractor only with the prior consent of the Authority concerned shall remove disconnected service/apparatus.

5. The Contractor shall consult with all the relevant Public Utility and Private Service owners before commencing any work in their vicinity, and shall satisfy himself as to the exact position of existing services which may affect or be affected by the construction of the Works.

6. The Contractor shall agree, in advance of any works, the exact location of any service diversion requirements on site with the relevant Local Authority, Public Utility and Private Utility Service bodies.

7. The Contractor shall take all measures required by any statutory undertaker for the support and full protection of all services or supplies in accordance with the relevant code of practice or special requirement. He shall keep the Employer's Representative informed of such liaison and measures.

8. Disconnected apparatus shall be removed by the Contractor only with the prior consent of the Authority concerned.

9. Should any leakage or damage be discovered, the Contractor shall immediately notify the Employer's Representative and the owners of the service and the Contractor shall afford every facility for repair or replacement of the apparatus affected.

10. Construction traffic, including all traffic at site accommodation areas, shall only be permitted to transverse buried services after protective measures to be agreed with the Employer's Representative have been implemented.

11. The names, addresses and telephone numbers of the authorities serving in the locality are listed in the table below. This list is not exhaustive and should the Contractor encounter a service, they should verify the provider and contact them accordingly.

Names	Address and Phone	Contact
Wexford County Council	Road Drainage, Water Services, Wexford County Council Carricklawn, Wexford Town Tel: 053 919 6000	Mark Collins Mark.Collins@wexfordcoco.ie

Names	Address and Phone	Contact
Wexford County Council	Roads & Traffic, Wexford County Council Carricklawn, Wexford Town Tel: 053 919 6000	Darragh Cullinane daragh.cullinan@wexfordcoco.ie
Irish Water	P.O. Box 860, South City Delivery Office, Cork City, Cork.	Brian O'Leary broleary@water.ie Tadhg Coffey tadcoffey@water.ie
Carlow County Council	Roads & Traffic, Carlow County Council, County Buildings, Athy Road, Carlow	Henry Ritchie hritchie@laoiscoco.ie
Eir	Plant Alterations, Eir HQ, Desk 2B-39, Hueston South Quarter, St John's Road, Dublin 8.	Structures 1,2 and 3: John Scully Scullyj@eircom.ie; Noel Cumiskey Noel.Cumiskey@openeir.ie Structure 4: Willie Walker: Pole Services 085 1741633 WJWALKER@Eircom.ie Willie Innes: General Enquiries - 085 1741578 plantalterations@eircom.net
ESB	Central Site, ESB Networks, St. Margaret's Road, Finglas, Dublin 11. Tel: 1850 928 960	Sean.Wallace@esb.ie Ger.Whelan@esb.ie dig@esb.ie

APPENDIX 1/16
Privately and Publicly Owned Services and Supplies

Table 1/16-1: SCHEDULE OF WORKS TO SERVICES AT STR01 MACMURROUGH ISLAND BRIDGE 1 WX-N30-007.00

Service Provider	Description	Group	Drawing No.	Notice Required to Commence*	Time for Completion+
Eir	The Contractor shall protect existing underground Eir services over the length of the works and raise the existing Eir chamber to suit the new surface levels. The Contractor shall liaise with Eir to agree his proposals for the protection of these cables throughout the works and raising the chamber in accordance with the requirements of the Specification. The Contractor will be required to comply with the requirements of Eir including those required by their Plant Alteration Process.	E	1700-ST01-002	4 weeks	4 weeks

Notes: * The period of notice required to commence is the period after;
- a) Liaising with the relevant personnel within the Statutory Authority including technical meetings on-site and
- b) Agreement has been reached with the Statutory Authority on the extent of the works operation and measures to be taken for traffic control measures and safe working and
- c) Formal notice has been issued by Contractor following completion of items (a) and (b)

\+ The time for completion is on the assumption that only one activity per each Statutory Authority is being undertaken at any one time. If a Statutory Authority is scheduled to complete more than one activity at any one time, the time for completion of the two or more activities is the period for the longest activity plus 50% of the period of each of the other concurrent activities.

Group Descriptions

- A Work expected to be completed before commencement of the Works.
- B Work required in the Contract, which does not require prior work by the Contractor.
- C Work required in the Contract, which does require prior work by the Contractor.
- D Work expected to be under construction at the commencement of Works.
- E Work required to be carried out jointly by the Contractor (all civil works) and the Statutory Undertaker (cabling only) in close liaison and co-operation with each other.
- F Work to be carried out wholly by the Contractor (in liaison with the Statutory Undertaker / Local Authority).
- G Services for which work is not required but due care and attention is required to protect the services during the execution of the Works

APPENDIX 1/16
Privately and Publicly Owned Services and Supplies

Table 1/16-2: SCHEDULE OF WORKS TO SERVICES AT STR02 MACMURROUGH ISLAND BRIDGE 2 WX-N30-008.00

Service Provider	Description	Group	Drawing No.	Notice Required to Commence*	Time for Completion+
Eir	The Contractor shall protect the existing underground Eir services over the length of the works. The Contractor shall liaise with Eir to agree his proposals for protection of these cables throughout the works in accordance with the requirements of the Specification. The Contractor will be required to comply with the requirements of Eir including those required by their Plant Alteration Process.	E	1700-ST02-002	4	4

Notes: * The period of notice required to commence is the period after;
- a) Liaising with the relevant personnel within the Statutory Authority including technical meetings on-site and
- b) Agreement has been reached with the Statutory Authority on the extent of the works operation and measures to be taken for traffic control measures and safe working and
- c) Formal notice has been issued by Contractor following completion of items (a) and (b)

\+ The time for completion is on the assumption that only one activity per each Statutory Authority is being undertaken at any one time. If a Statutory Authority is scheduled to complete more than one activity at any one time, the time for completion of the two or more activities is the period for the longest activity plus 50% of the period of each of the other concurrent activities.

Group Descriptions

- A Work expected to be completed before commencement of the Works.
- B Work required in the Contract, which does not require prior work by the Contractor.
- C Work required in the Contract, which does require prior work by the Contractor.
- D Work expected to be under construction at the commencement of Works.
- E Work required to be carried out jointly by the Contractor (all civil works) and the Statutory Undertaker (cabling only) in close liaison and co-operation with each other.
- F Work to be carried out wholly by the Contractor (in liaison with the Statutory Undertaker / Local Authority).
- G Services for which work is not required but due care and attention is required to protect the services during the execution of the Work

APPENDIX 1/16
Privately and Publicly Owned Services and Supplies

Table 1/16-3: SCHEDULE OF WORKS TO SERVICES AT STR03 MACMURROUGH ISLAND FARM PASS WX-N30-009.00

Service Provider	Description	Group	Drawing No.	Notice Required to Commence*	Time for Completion+
Eir	The Contractor shall carefully excavate around the following existing underground Eir services by hand over the length of the bridge, temporarily support the services and then relocate the services in the new footpath as indicated on the drawings 2 x 100mm Eir ducts with 1 fibre optic within the southern verge of the Bridge. The Contractor shall liaise with Eir to agree his proposals for the temporary diversion and permanent relocation of these cables throughout the works to be carried out by the Contractor. The Contractor will be required to comply with the requirements of Eir including those required by their Plant Alteration Process. The Contractor shall provide 2 new JB4 chambers for Eir constructed around the existing ducts, 1 at each end of the bridge.	E	1700-ST03-002	4	4

Notes: * The period of notice required to commence is the period after;
a) Liaising with the relevant personnel within the Statutory Authority including technical meetings on-site and
b) Agreement has been reached with the Statutory Authority on the extent of the works operation and measures to be taken for traffic control measures and safe working and
c) Formal notice has been issued by Contractor following completion of items (a) and (b)
+ The time for completion is on the assumption that only one activity per each Statutory Authority is being undertaken at any one time. If a Statutory Authority is scheduled to complete more than one activity at any one time, the time for completion of the two or more activities is the period for the longest activity plus 50% of the period of each of the other concurrent activities.

Group Descriptions

A Work expected to be completed before commencement of the Works.
B Work required in the Contract, which does not require prior work by the Contractor.
C Work required in the Contract, which does require prior work by the Contractor.
D Work expected to be under construction at the commencement of Works.
E Work required to be carried out jointly by the Contractor (all civil works) and the Statutory Undertaker (cabling only) in close liaison and co-operation with each other.
F Work to be carried out wholly by the Contractor (in liaison with the Statutory Undertaker / Local Authority).
G Services for which work is not required but due care and attention is required to protect the services during the execution of the Works

APPENDIX 1/16
Privately and Publicly Owned Services and Supplies

Table 1/16-4: SCHEDULE OF WORKS TO SERVICES AT STR04 BALLYBING CULVERT WX-N25-001.00

Service Provider	Description	Group	Drawing No.	Notice Required to Commence*	Time for Completion+
Eir	There are existing underground Eir cables crossing from the west to the east on the north side adjacent to Ballybing Culvert. The Contractor shall carefully excavate around existing underground Eir services by hand over the length of the proposed structure and approaches and provide a temporary diversion and permanent reinstatement in the new verge following installation of the proposed culvert: 2x100 Eir duct within the northern verge. The Contractor shall provide a new JB4 chamber to replace the existing buried chamber. The Contractor shall liaise with Eir and agree his proposals for the temporary protection/support diversion and permanent relocation of these cables throughout the works to be carried out by the Contractor until such time the Contractor has completed the permanent diversion in conjunction with Eir in accordance with the requirements of the Specification. The Contractor where necessary, will be required to follow the Eir Plant Alteration Process.	E	0500-ST04-002	4 weeks	4 weeks
Irish Water / Wexford County Council Water Services	The Contractor shall carefully excavate around the following existing underground water services by hand over the length of the culvert and both approaches on the southern side of the N25, temporary divert and then provide new replacement sleeved watermain; 1 x 150mm PVC Watermain service with scour valve – to be replaced with 100mm dia watermain, scour valve and sluice valves in a sleeve 1 x 300mm asbestos concrete with hydrant – to be replace with 250mm dia watermain, new hydrant and sluice valves in a sleeve Contractor to ensure that disruption to the service is minimised throughout the Works. The Contractor shall liaise with Wexford County Council Water Services on behalf of Irish water and agree proposals for the temporary diversion of the water services to be carried out by the Contractor throughout the works prior to any works on site. The Watermain services, sluice valves, scour valve and hydrant are to be replaced over the extents described on the drawings in accordance with the requirements of Wexford County Council and Irish Water. 8 No. chambers to be provided by the Contractor.	F	0500-ST04-002 and 003	4 Weeks	4 weeks

Service Provider	Description	Group	Drawing No.	Notice Required to Commence*	Time for Completion+
Wexford County Council Road Drainage	The Contractor shall liaise with Wexford County Council and locate existing surface water drainage runs and gullies. The Contractor shall excavate by hand to expose the surface water drainage runs and gully connections to the watercourse and provide new runs and new gullies and permanent diversion to the culvert drainage system. The existing will be removed to tip off site by the Contractor and backfilled in accordance with the Specification.	F	0500-ST04-002	4 Weeks	4 weeks
Unknown service provider	The Contractor shall liaise with service providers to ascertain the identity of the unknown overhead line running parallel to the carriageway above the south parapet. The Contractor shall take all necessary precautions to avoid coming into contact with the overhead service throughout the works and adhere to all relevant industry codes of practice and guidelines in this regard.	G	0500-ST04-002	4 Weeks	NA

Notes: * The period of notice required to commence is the period after;
a) Liaising with the relevant personnel within the Statutory Authority including technical meetings on-site and
b) Agreement has been reached with the Statutory Authority on the extent of the works operation and measures to be taken for traffic control measures and safe working and
c) Formal notice has been issued by Contractor following completion of items (a) and (b)
+ The time for completion is on the assumption that only one activity per each Statutory Authority is being undertaken at any one time. If a Statutory Authority is scheduled to complete more than one activity at any one time, the time for completion of the two or more activities is the period for the longest activity plus 50% of the period of each of the other concurrent activities.

Group Descriptions

A Work expected to be completed before commencement of the Works.
B Work required in the Contract, which does not require prior work by the Contractor.
C Work required in the Contract, which does require prior work by the Contractor.
D Work expected to be under construction at the commencement of Works.
E Work required to be carried out jointly by the Contractor (all civil works) and the Statutory Undertaker (cabling only) in close liaison and co-operation with each other.
F Work to be carried out wholly by the Contractor (in liaison with the Statutory Undertaker / Local Authority).
G Services for which work is not required but due care and attention is required to protect the services during the execution of the Works

APPENDIX 1/16
Privately and Publicly Owned Services and Supplies

Table 1/16-5: SCHEDULE OF WORKS TO SERVICES AT STR06 BALLINTRANE BRIDGE CW-N80-006.00

Service Provider	Description	Group	Drawing No.	Notice Required to Commence*	Time for Completion+
Irish Water	The Contractor shall protect the existing watermain throughout the works. Where necessary, the Contractor shall carefully excavate around the buried portion of the watermain by hand over the extents necessary to facilitate wingwall heightening works. The Contractor shall liaise with Irish Water to agree his proposals for protection and support of the main throughout the works in accordance with the requirements of the Specification. The Contractor will be required to comply with the requirements of Irish Water.	G	1700-ST06-002	4	NA
ESB	The Contractor shall take all necessary precautions to avoid coming into contact with the overhead service throughout the works and adhere to all relevant industry codes of practice and guidelines in this regard.	G	1700-ST06-004	4	NA

Notes: * The period of notice required to commence is the period after;
a) Liaising with the relevant personnel within the Statutory Authority including technical meetings on-site and
b) Agreement has been reached with the Statutory Authority on the extent of the works operation and measures to be taken for traffic control measures and safe working and
c) Formal notice has been issued by Contractor following completion of items (a) and (b)
+ The time for completion is on the assumption that only one activity per each Statutory Authority is being undertaken at any one time. If a Statutory Authority is scheduled to complete more than one activity at any one time, the time for completion of the two or more activities is the period for the longest activity plus 50% of the period of each of the other concurrent activities.

Group Descriptions

A Work expected to be completed before commencement of the Works.
B Work required in the Contract, which does not require prior work by the Contractor.
C Work required in the Contract, which does require prior work by the Contractor.
D Work expected to be under construction at the commencement of Works.
E Work required to be carried out jointly by the Contractor (all civil works) and the Statutory Undertaker (cabling only) in close liaison and co-operation with each other.
F Work to be carried out wholly by the Contractor (in liaison with the Statutory Undertaker / Local Authority).
G Services for which work is not required but due care and attention is required to protect the services during the execution of the Works

APPENDIX 1/16
Privately and Publicly Owned Services and Supplies

Table 1/16-6: SCHEDULE OF WORKS TO SERVICES AT STR07 BOGGAN BRIDGE CW-N80-004.00

Service Provider	Description	Group	Drawing No.	Notice Required to Commence*	Time for Completion+
Eir	The Contractor shall carefully excavate around the existing underground 110mm Eir service by hand over the length of the bridge, temporarily support the service during waterproofing works and then reinstate it in its original location. The Contractor shall liaise with Eir to agree his proposals for protection and support of the service throughout the works in accordance with the requirements of the Specification. The Contractor will be required to comply with the requirements of Eir.	G	1700-ST07-001	4	4

Notes: * The period of notice required to commence is the period after;
- a) Liaising with the relevant personnel within the Statutory Authority including technical meetings on-site and
- b) Agreement has been reached with the Statutory Authority on the extent of the works operation and measures to be taken for traffic control measures and safe working and
- c) Formal notice has been issued by Contractor following completion of items (a) and (b)
- \+ The time for completion is on the assumption that only one activity per each Statutory Authority is being undertaken at any one time. If a Statutory Authority is scheduled to complete more than one activity at any one time, the time for completion of the two or more activities is the period for the longest activity plus 50% of the period of each of the other concurrent activities.

Group Descriptions
- A Work expected to be completed before commencement of the Works.
- B Work required in the Contract, which does not require prior work by the Contractor.
- C Work required in the Contract, which does require prior work by the Contractor.
- D Work expected to be under construction at the commencement of Works.
- E Work required to be carried out jointly by the Contractor (all civil works) and the Statutory Undertaker (cabling only) in close liaison and co-operation with each other.
- F Work to be carried out wholly by the Contractor (in liaison with the Statutory Undertaker / Local Authority).
- G Services for which work is not required but due care and attention is required to protect the services during the execution of the Works

APPENDIX 1/16
Privately and Publicly Owned Services and Supplies

Table 1/16-7: SCHEDULE OF WORKS TO SERVICES AT STR08 CLOSH BRIDGE CW-N81-001.00

Service Provider	Description	Group	Drawing No.	Notice Required to Commence*	Time for Completion+
Irish Water	The Contractor shall carefully excavate around the following existing services by hand over the length of the bridge, temporarily support the service during waterproofing works and then reinstate them in their original location. 180mm diameter watermain and associated valves in east verge; 100mm diameter watermain in west verge; The Contractor shall liaise with Irish Water to agree his proposals for protection and support of the services throughout the works in accordance with the requirements of the Specification. The Contractor will be required to comply with the requirements of Irish Water.	G	1700-ST08-001	4	4
Eir	The Contractor shall take all necessary precautions to avoid coming into contact with the overhead services throughout the works and adhere to all relevant industry codes of practice and guidelines in this regard.	G	1700-ST08-001	4	NA

Notes: * The period of notice required to commence is the period after;
- a) Liaising with the relevant personnel within the Statutory Authority including technical meetings on-site and
- b) Agreement has been reached with the Statutory Authority on the extent of the works operation and measures to be taken for traffic control measures and safe working and
- c) Formal notice has been issued by Contractor following completion of items (a) and (b)

\+ The time for completion is on the assumption that only one activity per each Statutory Authority is being undertaken at any one time. If a Statutory Authority is scheduled to complete more than one activity at any one time, the time for completion of the two or more activities is the period for the longest activity plus 50% of the period of each of the other concurrent activities.

Group Descriptions

- A Work expected to be completed before commencement of the Works.
- B Work required in the Contract, which does not require prior work by the Contractor.
- C Work required in the Contract, which does require prior work by the Contractor.
- D Work expected to be under construction at the commencement of Works.
- E Work required to be carried out jointly by the Contractor (all civil works) and the Statutory Undertaker (cabling only) in close liaison and co-operation with each other.
- F Work to be carried out wholly by the Contractor (in liaison with the Statutory Undertaker / Local Authority).
- G Services for which work is not required but due care and attention is required to protect the services during the execution of the Works

APPENDIX 1/17
Traffic Safety and Management

1. Traffic Safety and Management Requirements

1.1 The Contractor shall be responsible for the planning, design, implementation, maintenance and removal of traffic safety and management measures required in order to facilitate the work. This includes the costs associated with road closures, speed restrictions and advertisements as required.

1.2 The Contractor shall comply at all times with the requirement of the Department of Transport Traffic Signs Manual, Wexford County Council, Carlow County Council, Kildare County Council, Transport Infrastructure Ireland, the Garda Síochana and any additional requirements detailed in the DMRB.

1.3 Where there is any conflict between the Traffic Signs Manual produced by the Department of the Environment and published by the Stationary Office and Chapter 8 of the Traffic Signs Manual published for the Highways Agency, the Irish and UK standards in respect of such for sign faces and the like the Irish standard shall prevail. Where there are any other conflicts between the Irish and the UK standards the solution that provides for the safest and most conservative solution or highest quality and service shall prevail.

1.4 The Contractor shall, within two weeks of the commencement of work on Site or Off site areas provide the Employer's Representative with detailed traffic management plans showing the sequence of Construction, within the programme constraints of Appendix 1/13, including the following information as a minimum:

1.4.1 Phasing of the Works at each location;

1.4.2 Drawings showing the temporary traffic management layout, including:

(a) Geometric design;
(b) Width of lanes;
(c) Working areas;
(d) Safety zones;
(e) Access and exit locations for construction vehicles;
(f) Barriers;
(g) Signing;
(h) Road markings;
(i) Temporary lighting;
(j) Provision for pedestrians;
(k) Provision for Emergency services;
(l) Crossovers.
(m) Timing of activity.
(n) Road lighting

1.4.3 The Contractor shall appoint a Chartered Engineer, suitably experienced in Traffic Management and who is to be approved by the Local Roads Authority and the Employer's Representative to prepare traffic management plans.

The Contractor shall phase the construction of any work which affects the public traffic in a manner acceptable to the Local Road Authority, the Gardaí, and the Employer's Representative. At least three weeks prior to carrying out any works which will affect public traffic, the Contractor shall consult with the relevant Local Road Authority, the Gardaí, Bus Éireann and AA Roadwatch.

1.5 Drawings showing the Contractor's temporary traffic management schemes shall be to a scale not less than 1/2500, supplemented by drawings at 1/1000 or 1/500 scales as

necessary, or as required by the Employer's Representative.

1.6 The Contractor's traffic management proposals shall ensure that construction joints in the wearing course comply with the Specification for Road Work.

1.7 The erection and removal of any traffic management or temporary diversion shall not be carried out during the following hours:

Monday to Saturday - 07.00 to 10.00 hours and 16.00 (15.30 on Fridays) to 19.00 hours and on any local or national public holiday.

1.8 The Contractor shall be subject to all Legal Requirements in relation to temporary closures.

1.9 The period of closure shall be the minimum to facilitate Construction of the works. All applications relating to road closures, Lane Occupations, signs or signals shall be submitted to Wexford County Council, Carlow County Council, Transport Infrastructure Ireland and the relevant Authorities for the individual site in writing and require the following notice:

(a) requests for road closures, Lane Closures or traffic diversions: 6 weeks;

(b) authorising of regulatory signs: 3 weeks;

(c) authorising temporary traffic signals: 3 weeks; and

(d) moving signs to be compatible for Road Works with the state of the Works as described in Clause 117.11 of the Specification for Road Works: 3 weeks.

1.10 The Contractor shall supply, erect and maintain all signs, driver information signs, lighting and barriers to affect the closure and any necessary diversionary routes to the satisfaction of the Employer's Representative, Transport Infrastructure Ireland and the relevant Local Authority. The Contractor shall supply and erect information signs informing the public of the proposed road closures at least three weeks in advance of any proposed road closure date. These information signs shall state the road closure date and be erected in locations to be approved by the Employer's Representative and comply with Clause 117 of the Specification for Road Works.

1.11 Where road lighting exists over a length of road covered by a traffic management system then this shall be maintained or modified such that the standard of lighting is equal to that existing.

1.12 The Contractor shall, in accordance with Clause 117 of the Specification for Road Works, be responsible for the maintenance of all public roads, site access roads and temporary diversions within the Site and off Site until the issue of the relevant Maintenance Certificate. The Contractor shall constantly monitor the public roads while any lane and/or carriageway occupations are in force during the execution of the Works. Any Defects identified shall be rectified immediately to the satisfaction of the Employer's Representative.

1.13 The Contractor shall keep a daily record of all defects, the times when they were identified or reported to it, the action taken to correct the defects, and the times when they were successfully corrected. A copy of this record shall be forwarded to the Employer's Representative on the following day, until the completion of those Works requiring the lane or carriageway occupation.

1.14 In the event of a traffic accident occurring adjacent to any of the Works, the Contractor shall immediately contact the Gardaí, the Local Authority and the Employer's Representative informing them of the following:

Location of the accident; and

The seriousness of the accident and whether any persons are trapped, whether the collision involves vehicles carrying inflammable, corrosive or hazardous substances, whether there is a possibility of ignition from leaking fuel or chemicals.

1.15 The Contractor shall provide telephone numbers of a minimum of 3 No. personnel who can be contacted by the Gardaí and/or Employer's Representative both during and outside normal working hours, and who shall be responsible for initiating whatever action shall reasonably be

required in the event of an emergency.

1.16 All drivers including those delivering plant and materials shall be given clear instructions regarding the traffic arrangements applicable at any particular time.

1.17 The Contractor shall be responsible for maintaining the running traffic carriageway and any Pedestrian routes adjacent to the Works in a clean and safe condition at all times.

1.18 The Contractor shall assist the Gardaí in moving wide/abnormal loads through the Works by modifying the signing/coning as necessary. Signs/cones so moved shall be replaced immediately the abnormal loads have passed through the Works.

1.19 Regular meetings on at least a monthly basis between the Employer's Representative, Contractor, the Gardaí, the relevant Local Authorities and Transport Infrastructure Ireland shall be arranged and take place throughout the duration of the Works.

1.20 Heavy commercial vehicles used on Site and off site areas by the Contractor, its sub-contractors or suppliers shall be fitted with an audible reversing warning device and have roof mounted amber flashing lamp, as required by sub-Clause 117.14 of the Specification for Road Works.

1.21 Where the work is carried out on or adjacent to a road open to vehicles, the Contractor shall ensure that the work force and site supervisory staff at all times wear jackets complying with Class A in BS.6629, incorporating the recommendations of Appendix G of BS.6629 except that where protected by a safety zone Class A or Class B in BS 6629. The Contractor shall ensure that the person in charge of the work force is readily distinguishable from the remainder of the work force.

1.22 Stage 2 and Stage 3 Road Safety Audits will be required to be carried out on all temporary traffic management layouts and diversions.

1.23 For a Stage 2 Road Safety Audit, the Contractor shall submit to the Employers Representative two signed copies of a Road Safety Audit Certificate for each audited traffic layout stage, not less than fourteen days before implementation of the traffic management stage. One copy will be returned to the Contractor signed in acknowledgement of receipt by the Employers Representative within seven days of receipt.

1.24 For a Stage 3 Road Safety Audit, the Contractor shall submit to the Employers Representative, two signed copies of a Road Safety Audit Certificate for each audited stage no less than three days before implementation of the traffic management or diversion. One copy will be returned to the Contractor signed in acknowledgement in receipt by the Employers Representative within seven days of receipt. No awaited temporary traffic management or diversion stage shall be put into operation until a Road Safety Audit Certificate has been signed by the Designer and the Contractor.

1.25 Suitable locations shall be agreed with the Gardaí and the Bus Service operators for temporary bus stops where existing facilities are affected by the Works.

1.26 The Contractor shall appoint a Traffic Safety and Control Officer as required by Clause 117 of the Specification who shall make all arrangements necessary for traffic safety and control. The Traffic Safety and Control Officer shall have a number of nominated deputies. The Contractor shall provide the Employer's Representative with the names of this Officer and his nominated deputies and with telephone numbers or details of other means by which they or at least one of them can be contacted at any time. The Traffic Safety and Control Officer or his nominated deputy shall be on Site at all times when work is proceeding and shall be readily available at any time of the day or night to deal with matters related to traffic safety and control.

The Traffic Safety and Control Officer or his nominated deputy shall be in a position to put into immediate effect any traffic measures necessary to ensure the safety of the public.

The Traffic Safety and Control Officer, or in his absence his deputy, shall be entirely responsible for:

(i) Liaison with the Employer's Representative, Transport Infrastructure Ireland, Relevant Authority and the Gardaí in all matters relating to traffic management;

(ii) The management of traffic during periods when traffic restrictions are necessary, and ensuring that all traffic management requirements are met;

(iii) Immediately notifying the Gardaí and the Employer's Representative of any accidents or emergencies;

(iv) Ensuring the safe working of plant, machinery and personnel, and ensuring that all personnel engaged on the works are aware of the Contractor's obligations and duties in respect of site safety when working on or adjacent to a live carriageway;

(v) Notifying the Employer's Representative of any deterioration in traffic management equipment and trafficked road surfaces;

(vi) Submitting to the Employer's Representative weekly information sheets detailing all traffic management operations, traffic incidents, breakdowns and removal of broken down or damaged vehicles occurring within the site.

1.27 The Contractor shall be responsible for maintaining the running traffic carriageway and any pedestrian routes adjacent to the Works in a clean and safe condition at all times.

1.28 It will be a requirement of this Contract that the Contractor shall employ a 1.25m high vertical barrier system to delineate and segregate the pedestrian walkways from the trafficked lane and the Contractor's working area during construction. Minimum containment level shall be N2. The Contractor shall programme the works with the aim of ensuring the safety of pedestrians / cyclists at all times and keeping disruption to vehicular traffic / pedestrians / cyclists to an absolute practical minimum and shall submit to the Employers Representative a method statement to demonstrate how this will be achieved.

Details of this barrier system shall be submitted to the Employer's Representative with the detailed Traffic Management Plans.

2 Maintenance Requirements

2.1 The Contractor shall, in accordance with Clause 117 of the Specification for Road Works, be responsible for the maintenance of all public roads, Site and off site areas access roads and temporary diversions within the Site and off site areas until issue of each Maintenance Certificate for the Other Works. In addition, maintenance of public roads outside the Site and off site areas may be required, as directed by the Employer's Representative.

2.2 The Contractor shall make arrangements whereby it can quickly call out personnel outside the normal working hours to carry out work needed for an Emergency. The Employer's Representative shall be provided with a list of names, addresses and telephone numbers of the Contractor's staff who are responsible for the organising of emergency work.

2.3 In the event of an accident occurring within the Site and off site areas, and once broken down or damaged vehicles and debris have been removed, the Contractor shall restore the road surface to its original condition, reinstate safety fencing and anchorages to the satisfaction of the Employer's Representative.

2.4 The Contractor shall ensure that all signs, cones, barriers, delineators and bollards used in connection with the Works shall be inspected regularly, at intervals not greater than twenty-four hours, and any defective shall be replaced immediately. The Contractor shall ensure that all reflective patches and sleeves on cones or other delineators are replaced at intervals of not greater than seven days, unless agreed in writing with Wexford County Council, Carlow County Council, Kildare County Council and TII..

3 Site and Off Site Areas Vehicles, Personnel and Plant

3.1 No vehicles shall exceed 20mph when travelling within the working areas of the Site and off site areas and a maximum 10mph speed limit is to be observed adjacent to works in progress, accommodation or standing plant. Temporary site speed limit signs are to be

erected as appropriate.

3.2 No vehicles are permitted to drive against the normal flow or to face oncoming traffic, except when agreed in writing in advance by the Employer's Representative for the performance of essential activities.

3.3 Vehicles shall only enter or leave the working areas of the Site and off site areas via approved accesses and egresses. Construction vehicles, or the vehicles of the Contractor's sub-contractors or suppliers, shall not be permitted to use roads, accesses or temporary carriageways within the Site and Off site areas while they are open to use by public vehicles.

3.4 Non-essential vehicles, particularly private cars, shall not enter the working areas. The Contractor shall make provision for parking of employees' cars, and other non-essential vehicles, at a location away from the working areas and shall provide transport to the Site and off site areas as necessary.

3.5 Contractors vehicles shall not be permitted to park on public roads adjacent to the works. All Contractors vehicles shall park in designated parking areas.

3.6 All vehicles and plant engaged in the Works, or entering/exiting the working areas shall have roof mounted amber flashing lamp, as required by sub-Clause 117.14 of the Specification for Road Works. The lamp shall be used in the circumstances stated in sub-Clause 117.14 of the Specification, or as otherwise approved in writing by the Employer's Representative or the Garda Síochána. Hazard warning lights shall not be used as an alternative to the roof mounted amber flashing lamp.

4 Roads, Private Roads and Other Ways Affected by the Works

4.1 The contractor shall provide a 1.5m wide pedestrian access at each site at all times for the period of the construction works for members of the public. A 1.25m pedestrian guardrail is to be provided to separate pedestrians from construction traffic.

Details of roads, private roads and other ways affected by the works are provided in the table below:

Description	Predicted AADT Values	Speed Limits (kph)	Special Facilities	Whether to be Kept Open or Closed
N11	15,000	100	-	Open
N25	8000	100	-	Open
N30	15,000	100	-	Open
N80	14,000	100	-	Open
N81	2,500	100	-	Open
Private access and right of way adjacent to Str02 MacMurrough Island Bridge 2 WX-N30-008.00	200	N/A	-	Open
Private accesses adjacent to Str04 Ballybing Culvert WX-N25-001.00	50	N/A	-	Open
Private access to residence adjacent to Str06 Ballintrane Bridge CW-N80-006.00	50	N/A	-	Open
Private access to business premises adjacent to Str06 Ballintrane Bridge CW-N80-006.00	200	N/A	-	Open

Description	Predicted AADT Values	Speed Limits (kph)	Special Facilities	Whether to be Kept Open or Closed
Private field access northeast of Str07 Boggan Bridge CW-N80-004.00	50	N/A	-	Open
Private field access northwest of Str07 Boggan Bridge CW-N80-004.00	50	N/A	-	Open

See also paragraph 1.4 in this Appendix.

Where traffic flows are stated in this Appendix these are approximate and for guidance only, and may change as and when other roads in the contract are opened or closed to traffic.

The Contractor shall carry out an inspection of all proposed access routes to the site in conjunction with the Employer's Representative. He shall prepare a photographic record demonstrating the existing condition of the road on commencement of the Contract. Any damage caused to the public road network during construction shall be reinstated by the Contractor to the satisfaction of the Employer's Representative.

Roads, including footpaths, cycletracks, and other traffic routes are the responsibility of the Local Authority and Transport Infrastructure Ireland.
Two lanes shall be maintained at all times on the N11, N80, N81, N25 and N30 with a minimum 3.0m width per lane except as described below:

4.2 Str04 Ballybing Culvert WX-N25-001.00

Two lanes shall be maintained at all times on the N25 except as described below;

- Single shuttle working will be permitted for a period of up to ten days to allow removal of the existing culvert and installation of the proposed culvert.

The Contractor shall provide a minimum of two flagmen during any single lane running including weekends and public holidays from 06.00 to 22.00 on site for the purposes of adjusting the traffic management phasing and clearing delays noting the proximity of the active Rosslare Port. The Contractor's Traffic Management plan for Ballybing Culvert shall take account of additional traffic volumes associated with ferry departures and arrivals at Rosslare Port. Flagmen shall provide variable green time commensurate with actual demand. The Contractor shall provide experienced personnel solely for traffic management duties. Intervisibility between flagmen and traffic signals shall be provided.

Where Traffic management (Traffic lights or stop & go) is being left in place out of working hours the contractor shall be required to have a minimum of two flagmen on site (for the purposes of adjusting the traffic management system and clearing delays) until such time as the delays on the N25 are continuously less than 10 minutes in each direction.

4.3 Str03 MacMurrough Island Farm Pass WX-N30-009.00

Two lanes shall be maintained at all times on the N30 except as described below:

- Single shuttle working will be permitted for a period of up to ten days to allow removal and reinstatement of bridge deck waterproofing.

The Contractor shall provide a minimum of two flagmen during any single lane running including weekends and public holidays from 06.00 to 22.00 on site for the purposes of adjusting the traffic management phasing and clearing delays. Flagmen shall provide variable green time commensurate with actual demand. The Contractor shall provide experienced personnel solely for traffic management duties. Intervisibility between flagmen and traffic signals shall be provided.

4.4 Str02 MacMurrough Island Bridge 2 WX-N30-008.00

Two lanes shall be maintained at all times on the N30 except as described below:

- Single shuttle working will be permitted for a period of up to two days to facilitate resurfacing of the bridge deck.

The Contractor shall provide a minimum of two flagmen during any single lane running including weekends and public holidays from 06.00 to 22.00 on site for the purposes of adjusting the traffic management phasing and clearing delays. Flagmen shall provide variable green time commensurate with actual demand. The Contractor shall provide experienced personnel solely for traffic management duties. Intervisibility between flagmen and traffic signals shall be provided.

4.5 Str06 Ballintrane Bridge CW-N80-006.00

Two lanes shall be maintained at all times on the N80 except as described below:

- Single shuttle working will be permitted for a period of up to ten days to allow removal and reinstatement of bridge deck waterproofing.

The Contractor shall provide a minimum of two flagmen during any single lane running including weekends and public holidays from 06.00 to 22.00 on site for the purposes of adjusting the traffic management phasing and clearing delays. Flagmen shall provide variable green time commensurate with actual demand. The Contractor shall provide experienced personnel solely for traffic management duties. Intervisibility between flagmen and traffic signals shall be provided.

4.6 Str07 Boggan Bridge CW-N80-004.00

Two lanes shall be maintained at all times on the N80 except as described below:

- Single shuttle working will be permitted for a period of up to ten days to allow removal and reinstatement of bridge deck waterproofing.

The Contractor shall provide a minimum of two flagmen during any single lane running including weekends and public holidays from 06.00 to 22.00 on site for the purposes of adjusting the traffic management phasing and clearing delays. Flagmen shall provide variable green time commensurate with actual demand. The Contractor shall provide experienced personnel solely for traffic management duties. Intervisibility between flagmen and traffic signals shall be provided.

4.7 Str08 Closh Bridge CW-N81-001.00

Two lanes shall be maintained at all times on the N80 except as described below:

- Single shuttle working will be permitted for a period of up to ten days to allow removal and reinstatement of bridge deck waterproofing.

The Contractor shall provide a minimum of two flagmen during any single lane running including weekends and public holidays from 06.00 to 22.00 on site for the purposes of adjusting the traffic management phasing and clearing delays. Flagmen shall provide variable green time commensurate with actual demand. The Contractor shall provide experienced personnel solely for traffic management duties. Intervisibility between flagmen and traffic signals shall be provided.

4.8 At local roads below Str01 MacMurrough Island Bridge 1 WX-N30-007.00 and below Str02 MacMurrough Island Bridge 1 WX-N30-008.00, single lane shuttle working with a reduction to one footpath will be permitted for a period of up to 10 days to allow rehabilitation of stonework.

4.9 Access shall be maintained on the access track below MacMurrough Island Farm Pass.

4.10 At Str02 MacMurrough Island Bridge and Str04 Ballybing Culvert private access and right of way shall be maintained.

4.11 Details of Events that could have a Bearing on the Works

The Contractor shall take into account special events within the duration of the Contract in his Programming of the Works. The Garda Síochána, the Local Authorities and the Automobile

Association (AA) shall be consulted to ascertain details of any events or works outside the Site that could have a bearing on the Works.

5 Publicity

5.1 At least 2 weeks in advance with daily repeat in the week prior to the proposed traffic safety and management and diversions, the Contractor shall advise AA Roadwatch to make daily notices on national and local radio and both a national and local paper to advertise to the general public the proposed works and estimated period for traffic management and diversions. The Contractor shall also provide advance warning VMS signs at each site, in both directions for 1 week in advance of the works and continuing for the duration of the works. The contractor shall also take advertisements in the local (Wexford Echo / Carlow Nationalist) and national press.

APPENDIX 1/18
Temporary Diversions for Traffic

1. Temporary Diversion for Traffic Specified by the Employer's Requirements

1.1 General Requirements

The Contractor shall provide for the design and construction of all temporary roadways that are deemed necessary for the temporary diversion of traffic where construction interferes with existing public or private roads or other ways over which there is a public or private right of way, whether vehicular or pedestrian.

Before proposing any temporary traffic diversions, the Contractor shall consult with TII, Wexford County Council, Carlow County Council, Kildare County Council, the Gardaí and Bus Éireann and shall then submit an outline of his requirements to the Employers Representative for his comments. Following this, the Contractor shall submit a formal application to the appropriate Authority for any statutory orders required to be made or notices required to be published. The Contractor shall allow a period of 6 weeks for the orders to be made and notices to be published.

1.2 Temporary Diversion of Traffic

Temporary diversions shall include carriageway closure and lane diversions to complete the works including design, construction and maintenance and removal of contraflows.

1.3 Construction Standards

All Roads

The Contractor shall provide for the construction and maintenance of all temporary roadways or modifications to existing that are deemed necessary for the temporary diversion of traffic in accordance with the requirements of TII, Wexford County Council, Carlow County Council and Kildare County Council.

The Contractor shall comply with the following provisions for constructing temporary roadways:

(i) Temporary diversions of lanes from one carriageway to another are to have a geometric design conforming to the standard for a design speed of 30kph as per NRA Design Manual for Roads and Bridges unless agreed otherwise with the Employer's Representative and relevant Authorities.

(ii) Temporary roadways shall be constructed to an alignment and design approved by the Employer's Representative with a pavement consisting of not less than 100mm thick dense bitumen macadam on 150mm thick sub-base to Clause 804 on a firm foundation.

(iii) Where single file traffic is necessary on a public road by reason of the construction of the works, the Contractor shall, subject to the approval of the Employer's Representative, provide and maintain a minimum carriageway width in accordance with the requirements of Appendix 1/17 except where otherwise agreed with the Employer's Representative.

(iv) Suitable locations shall be agreed with the Gardaí and the bus service operators for temporary bus stops where existing facilities are affected by the works.

(v) Suitable drainage is to be provided.

(vi) Temporary road markings, traffic signs and barriers are to be provided as necessary.

(vii) The diversion must be constructed within the boundaries of the site unless otherwise agreed with the Employers Representative.

(viii) The temporary road pavement shall be maintained during the construction of the works until such time as the traffic diversion is no longer required.

(ix) When the diversion is no longer required, the diversion materials are to be removed and the area treated as per the requirements of the Contract.

(x) The standard of construction and lighting of diversion shall be suitable in all respects for the class and or class of traffic using the existing carriageway.

The Contractor shall supply to the Employer's Representative details of the following for each temporary road diversion:

i) phasing of the Works;

ii) drawings showing traffic management layouts including as follows:

- position of traffic signs and signals;
- width of lanes;
- parking areas;
- safety zones; and
- entry points for Site and Off site areas vehicles, and the like

The Contractor shall provide and maintain access to all existing properties adjacent to the Works for residents, service vehicles, delivery vehicles, emergency vehicles and any other vehicle required to access individual properties.

Temporary traffic lights powered by a generator shall not be permitted within 100 meters of any occupied property.

1.4 Maintenance Requirements

The Contractor shall be responsible for all repairs necessary, including accidental or wilful damage, to any temporary diversion for the full period the diversion is in operation up to the date of Defects Certificate.

1.5 Temporary Diversions for Traffic Specified by the Employer's Representative

The requirement for the temporary diversion of traffic specified by the Employer's Representative as part of the proposed Works are given in Table 1/18-A below:

Table 1/18-A Temporary Diversions for Traffic Specified by the Employer's Representative

Description	Existing Usage	Construction / Design Requirements *	Maintenance Requirements (including timescale for responsibility)	Remarks (including constraints and reinstatement details)
Str03 N25 MacMurrough Island Farm Pass WX-N30-008.00	National Road	Diversion of existing lanes within the carriageway boundary to allow waterproofing replacement	Refer to Appendix 1/17	See Section 1.1 to 1.4
Str04 N25 Ballybing Culvert WX-N25-001.00	National Road	Closure of existing lanes (single shuttle working) to allow for the removal of the existing culvert and installation of a new box culvert	Refer to Appendix 1/17	See Section 1.1 to 1.4
Str06 Ballintrane Bridge CW-N80-006.00	National Road	Closure of existing lanes (single shuttle working) to allow removal and reinstatement of bridge deck waterproofing	Refer to Appendix 1/17	See Section 1.1 to 1.4

Description	Existing Usage	Construction / Design Requirements *	Maintenance Requirements (including timescale for responsibility)	Remarks (including constraints and reinstatement details)
Str07 Boggan Bridge CW-N80-004.00	National Road	Closure of existing lanes (single shuttle working) to allow removal and reinstatement of bridge deck waterproofing	Refer to Appendix 1/17	See Section 1.1 to 1.4
Str08 Closh Bridge CW-N81-001.00	National Road	Closure of existing lanes (single shuttle working) to allow removal and reinstatement of bridge deck waterproofing	Refer to Appendix 1/17	See Section 1.1 to 1.4

2. Temporary Diversions Proposed by the Contractor

2.1 Notice Requirements – At least 4 weeks before proposing any temporary traffic diversions, the Contractor shall consult and comply with TII, Wexford County Council, Carlow County Council, Kildare County Council and An Garda Síochána and shall then submit his detailed traffic management plan to the Employer's Representative. The Contractor shall supply to the Employer's Representative, TII, Wexford County Council, Carlow County Council, Kildare County Council and An Garda Síochána details of the following for each temporary road diversion:

i) phasing of the Works;

ii) drawings showing traffic management layouts including as follows:

- position of traffic signs (including variable message signs) and signals;
- width of lanes;
- parking areas;
- safety zones; and
- entry points for Site and Off site areas vehicles, and the like

2.2 Details of any Constraints- The Contractor shall comply with the following provisions for constructing temporary roadways:

i) Any temporary diversions of regional or local roads shall be designed in accordance with the NRA Design Manual for Roads and Bridges (DMRB) to a design speed of 30km/h unless otherwise agreed in writing by TII and relevant Local Authority;

ii) The standard of construction and lighting of diversions shall be suitable in all respects for the class or classes of traffic using the existing carriageway;

iii) Suitable drainage is to be provided;

iv) Temporary road markings, traffic signs and barriers are to be provided as necessary;

v) Temporary fencing/barriers shall be provided to separate pedestrians from vehicular traffic;

vi) The road pavement shall be maintained by the Contractor during the Construction until such time as the traffic diversion is no longer required;

vii) The Contractor shall provide and maintain access to all existing properties adjacent to the Works;

viii) Temporary traffic lights powered by a generator shall not be permitted within 100 metres of any occupied property.

3. Publicity

3.1 At least 3 weeks in advance with weekly repeat and daily repeat in the week prior to any proposed diversion the Contractor shall advise AA Roadwatch to provide notice on local and national radio to advertise to the general public the proposed diversion and place advertisements in both local and national newspapers.

4. Details of Events that Could Have a Bearing n the Works

4.1 The Contractor shall not be permitted to implement agreed diversions during a weekend where there is increased traffic flow on the N11, N80, N81, N25 or N30 resulting from sporting events or pubic gatherings.

APPENDIX 1/19
Routeing of Vehicles

1 General Requirements

1.1 The Contractor shall provide, erect and maintain such traffic signs, lamps, barriers, and the like, complying with Clause 117 of the Specification for Road Works as may be required to ensure the observance of the requirements and restrictions detailed in this Appendix.

1.2 The Contractor shall restrict the passage of constructional plant, equipment and materials, to and from the Site and off site areas, to Permitted Access Routes.

1.3 The Contractor shall establish and comply with the requirements of the local authority in respect to loaded dump trucks using public roads.

1.4 Site and off site areas access/egress points shall be designed taking into account existing traffic volumes and anticipated type and volumes of site generated traffic.

1.5 The permitted access routes shall not be used for the transportation of earthworks materials in cut to fill activities unless offsite stockpiling has been approved by the Employer's Representative.

2 Permitted Access Routes To and From the Site

2.1 The Contractor subcontractors and suppliers shall use only the Permitted Access Routes for all purposes in connection with the Works (including the import of acceptable and disposal of unacceptable materials) unless otherwise agreed by the Employer's Representative.

2.2 The Permitted Access Routes to and from the Site and off site areas are as follows:

Str01 MacMurrough Island Bridge 1 (WX-N30-007.00) – N30

Str02 MacMurrough Island Bridge 2 (WX-N30-008.00) – N30

Str03 MacMurrough Island Farm Pass (WX-N30-009.00) – N30

Str04 Ballybing Culvert (WX-N25-001.00) – N25

Str05 Glebe Bridge (WX-N11-003.00) – N11

Str06 Ballintrane Bridge (CW-N80-006.00) – N80

Str07 Boggan Bridge (CW-N80-004.00) – N80

Str08 Closh Bridge (CW-N81-001.00) – N81

3 Prohibited Access Routes

3.1 The Contractor, his sub-contractors and suppliers shall not use any other Road within 0.5km of the Site and off site areas either as access points or access routes to or from the Site or off site areas except as provided hereunder.

3.2 Access to or from the Site or off site areas shall only be permitted via other roads with the prior approval of the Employer's Representative and shall be subject to such conditions as may be required by the Employer's Representative. Such conditions shall be at the Contractors expense and may include, without limitation, requirements to carry out prior works of road improvement to any proposed access route, measures to maintain road standards and safety during use of the route by the Contractor, its sub-contractors and suppliers, and measures to be carried out by the Contractor following such use.

3.3 Prohibited access routes shall be signed "No Site Access" on an orange background sign.

4 Movement of Machinery and Plant across Public Roads

4.1 The provisions for the Contractor's haul route crossings of public roads detailed in this Appendix shall be read in conjunction with the requirements of Appendix 1/17 of the Specification.

4.2 The Contractor shall, where he proposes to move machinery and plant across public roads,

seek the approval of TII and the local authority. In seeking Approval the Contractor shall submit details of the layout of the crossing, and all proposed signing, safety equipment and controls proposed.

4.3 At any Site and off site areas haul route crossing of a public or private right of way, a speed limit of 10mph shall be enforced on the haul route within 50 metres of the crossing.

5 Temporary Structures for Construction Traffic Spanning Areas Used by the Public

5.1 Any temporary structures for construction traffic proposed by the Contractor spanning areas used by the public shall be subject to the requirements of TII and the local authority. The Contractor shall liaise as necessary with the local authority to secure approval for its proposals and to demonstrate to the Employer's Representative that such approvals have been obtained prior to commencement of the construction of the relevant Works.

6 The Use of Permanent Works by Construction Traffic

6.1 The finished pavement forming part of the Works may be used to carry construction traffic only when measures approved by the Employer's Representative have been taken to protect the Works from damage.

6.2 The Contractor shall submit its proposals at least three weeks before it is proposed to use any of the finished pavement forming part of the Works to carry construction traffic. The proposal shall include supporting calculations, details of any loadings, proposed protective measures, and any other information required by the Employer's Representative in order to fully assess the proposal. The proposals shall not be implemented by the Contractor without the written approval of the Employer's Representative.

6.3 The approval of the Employer's Representative to proposals to use finished pavement forming part of the other Works for construction traffic shall not relieve the Contractor of his other responsibilities under the Contract.

APPENDIX 1/22
Progress Photographs

Record photographs shall be taken to record progress of the Works. As a minimum, photographs shall be taken of each part and location of the works to record;

1. As directed by the Employer's Representative, progress photographs shall be taken from the ground or from a hoist as indicated in the Schedule to this Appendix.

2. Progress photographs shall be obtained using a professional industrial photographer approved by the Employer's Representative.

3. A set of ground photographs shall be taken prior to the commencement of the Works at the bridge sites and thereafter at 1 week intervals, or as agreed by the Employer's Representative. Each set of ground photographs shall comprise 20 no. digital photos

Each set shall be delivered to the Employer's Representative within one week of being taken with an introduction describing the detail on progress of works at the time when the photographs were taken.

4. Additional photographs shall be taken as directed by the Employer's Representative.

Table 1/22/1 Schedule of Progress Photographs

Location	Type	Aerial / Ground	No.	Frequency Required	Remarks
Str1 – MacMurrough Island Bridge 1 WX-N30-007.00	Digital – taken at high resolution on 10Megapixel camera or higher	Ground	15 per set	Prior to commencement of the Works and at 1 week intervals until completion	Additional sets as directed by the Employer's Representative
Str2 – MacMurrough Island Bridge 2 WX-N30-008.00	Digital – taken at high resolution on 10Megapixel camera or higher	Ground	15 per set	Prior to commencement of the Works and at 1 week intervals until completion	Additional sets as directed by the Employer's Representative
Str3 – MacMurrough Island Farm Pass WX-N30-009.00	Digital – taken at high resolution on 10Megapixel camera or higher	Ground	15 per set	Prior to commencement of the Works and at 1 week intervals until completion	Additional sets as directed by the Employer's Representative
Str4 – Ballybing Culvert WX-N25-001.00	Digital – taken at high resolution on 10Megapixel camera or higher	Ground	15 per set	Prior to commencement of the Works and at 1 week intervals until completion	Additional sets as directed by the Employer's Representative
Str05 Glebe Bridge WX-N11-003.00	Digital – taken at high resolution on 10Megapixel camera or higher	Ground	15 per set	Prior to commencement of the Works and at 1 week intervals until completion	Additional sets as directed by the Employer's Representative

Location	Type	Aerial / Ground	No.	Frequency Required	Remarks
Str06 Ballintrane Bridge CW-N80-006.00	Digital – taken at high resolution on 10Megapixel camera or higher	Ground	15 per set	Prior to commencement of the Works and at 1 week intervals until completion	Additional sets as directed by the Employer's Representative
Str07 Boggan Bridge CW-N80-004.00	Digital – taken at high resolution on 10Megapixel camera or higher	Ground	15 per set	Prior to commencement of the Works and at 1 week intervals until completion	Additional sets as directed by the Employer's Representative
Str08 Closh Bridge CW-N81-001.00	Digital – taken at high resolution on 10Megapixel camera or higher	Ground	15 per set	Prior to commencement of the Works and at 1 week intervals until completion	Additional sets as directed by the Employer's Representative

APPENDIX 1/23
Substances Hazardous To Health

1 General

1.1 The Contractor shall be required to provide temporary screening to protect members of the general public, including motorists and other road users, in close proximity to the works.

1.2 The screening shall be of sufficient construction to protect the public from any substances potentially hazardous to health, which are either being used by the Contractor or are a result of the works.

1.3 Once erected, the screening shall reduce the concentrations of these substances within the air to levels which are below European Union guidelines. Any monitoring necessary shall be the responsibility of the Contractor.

1.4 It is anticipated that screening may be required in the vicinity of each of the 4 sites.

1.5 The following list details materials which may require such particular precautions:

(a) Concrete dust
(b) Cement dust
(c) Bituminous dust arising from planning
(d) Spray applied waterproofing
(e) Volatile materials (i.e.; primers, paints, sealants etc.)
(f) Stonework dust
(g) Materials containing asbestos (watermains at Str04 Ballybing Culvert)
(h) Waterproofing systems used for concrete
(i) Preparation for and galvanising of steel elements

This list is not fully comprehensive and further materials will fall within the scope of this requirement.

1.5 The Contractor shall submit to the Employer's Representative his proposals and monitoring regime for complying with the above requirements 14 days in advance of the use of the potentially hazardous material.

1.6 All work shall be carried out with due regard to the Health, Safety and Welfare at Work (Construction) Regulations or any subsequent relevant legislation.

1.7 The Contractor shall provide the Employer's Representative with a copy of his Safety Statement and shall revise it as necessary in the light of any revised or additional obligations required by law. The statement shall include the Contractor's detailed procedures to be followed in the event of any accident including minor incidents.

APPENDIX 1/24
Quality Management System

The Contractor shall prepare method statements. Each method statements shall be submitted to the Employer's Representative a minimum of four weeks prior to commencement of the relevant Works.

The following is a list of accepted quality management schemes referred to in sub-Clauses 104.3 and 104.4.

Scheme

1. Description: Supply of Vehicle Safety Fences

Certification Bodies:
Certification bodies have been accredited by UKAS to issues certificates against the Sector Scheme Document (SSD) for the Supply, Erection and Repair of Vehicle Safety Fences published by the Vehicle Safety Fence Sector Scheme Advisory Committee.

Specification:
Safety fencing shall be in accordance with the Series 400 of the Specification, the Drawings referred to in the contract and BS 7669 Part 3.

Note 1: This scheme requires training on an approved course run by the National Fencing Training Authority (NFTA). All vehicle safety fences erectors and lead erectors are required to carry registration cards indicating what types of fencing they have been trained to erect.
Note 2: At October 1996 five certification bodies have been accredited to issue certificates. Confirmation of the accreditation status of certification bodies can be obtained from UKAS.
Note 3: Copies of SSD are available from accredited certification bodies on request.
Note 4: A register of Assessed Companies is available from and maintained by NFTA on behalf of the advisory committee. A small charge will be made for the document.

2. Description: Manufacture of Industrial Fasteners and Associated Items

Certification Bodies:
British Standards Institute
389 Chiswick High Road, London W4 4AL, UK

Llyod's Register Quality Assurance Ltd.
Hiramford, Middlemarch Office Village, Siskin Drive, Coventry CV3 4FJ, UK

National Standards Authority of Ireland
Glasnevin, Dublin 9

Specification:
Nuts, bolts and fixings shall be in accordance with the 300, 400, 1300, 1800, 2200 and 2500 Series of Specification and shall be manufactured to the requirements of the following Standards.

BS 4320	Specification for metal washers for general engineering purposes;
IS EN 14399 Pts 1 to 10	High-strength structural bolting assemblies for preloading;
IS EN ISO 898	Mechanical properties of fasteners;
IS EN ISO 4014	Hexagonal head bolts Product Grades A and B
IS EN ISO 4016	Hexagon head bolts Product grades C
IS EN ISO 4017	Hexagon head screws Product grades A and B
IS EN ISO 4018	Hexagon head screws Product grades C
IS EN ISO 4032	Hexagon nuts, style 1 Product grades A and B
IS EN ISO 4034	Hexagon nuts Product grades A and B

Alternatively nuts, bolts and fixings shall be manufactured to the dimensions and tolerances of the Standards listed above, using materials to the following Standards:

BS 6105	Specification for corrosion resistant stainless steel fasteners
ASTM A325-89	Specification for high strength bolts for structural steel joints

Note 1: Where the Contractor can demonstrate that the fastener required is made by fewer that three firms within this scheme, the requirement to conform with the scheme shall not apply.

Note 2: Where the Contractor obtains fasteners from a stockist, the stockist shall be registered under Part 1 of the BSI Registered Stockist System, or equivalent. The system requirement shall be 'Level A, Quality Assured Material with Lot Traceability (P00012). Where the Contractor can demonstrate that the fastener required is supplied by fewer that three stockists within this system, the requirement to comply with the System shall not apply.

3. Description: Supply of Bridge Parapets and Cradle Anchorages

Certification Bodies:
British Standards Institute
389 Chiswick High Road, London W4 4AL, UK

Llyod's Register Quality Assurance Ltd.
Hiramford, Middlemarch Office Village, Siskin Drive, Coventary CV3 4FJ, UK

National Standards Authority of Ireland
Glasnevin, Dublin 9

Specification:
The supply of metal bridge parapets shall comply with the 2200 Series of Specification and Standard BD 52.

The list of drawings of parapet designs exempted from the dynamic test requirements is given in BS 6779: Part 1.

4. Description: Traffic Sign Manufacture

Certification Bodies:
National Standards Authority of Ireland
Glasnevin, Dublin 9

Specification:
Signs to TS4 and to Series 1200 of the Specification for Road Works.

5. Description: The Manufacture, supply and verification of Lighting Columns and Bracket Arms

Certification Bodies:
British Standards Institute
389 Chiswick High Road, London W4 4AL, UK

National Standards Authority of Ireland
Glasnevin, Dublin 9

Specification:
The manufacture, supply and verification of lighting columns and bracket arms shall comply with Series 1300 of the Specification and Standards BD 26 and NRA BD 2.

6. Description: Manufacture and Application of Road Markings

Certification Bodies:
The Certification & Inspection Department, National Standards Authority of Ireland
Eolas, Glasnevin, Dublin 9.

Specification:
Road marking materials shall be in accordance with the 1200 Series of the Specification and shall be manufactured to comply with all of the appropriate requirements of the following Standards:

IS EN 1436 Road marking materials – Road marking performance for road users.

IS EN 1871 Road marking materials – Physical properties.

IS EN 1423 Road marking materials — Drop on materials — Glass beads, antiskid aggregates and mixtures of the two.

IS EN 1424 Road marking materials — Premix glass beads.

IS EN 1790 Road marking materials – Preformed road markings.

7. Description: Manufacture of Portland Cement

Certification Body:
British Standards Institute
389 Chiswick High Road, London W4 4AL

Or

The Certification & Inspection Department, National Standards Authority of Ireland
Eolas, Glasnevin, Dublin 9

Specification: Cement shall be in accordance with the 500, 900, 1000, 1700, 2400 Series of the Specification and shall be manufactured to comply with all of the appropriate requirements of one of the following Standards.

IS EN 197-1	Composition, specifications and conformity criteria for common cements
IS EN 197-4	Cement. Composition, specifications and conformity criteria for low early strength blastfurnace cements
BS 1370	Specification for low heat Portland cement
BS 4027	Specification for sulphate – resisting Portland cement
BS 4246	Specification for high slag blast furnace cement
BS 6588	Specification Portland pulverised fuel ash cements.

8. Quality Plan

The Contractor shall establish and implement quality assurance procedures for establishing quality assurance systems for himself and any sub-contractors.

The Contractor shall submit a Quality Plan to the Employers Representative for acceptance not later than 21 days after the Contract date. The Quality Plan shall include inter allia the following details:

(i) Contractor's Organisation and Management.

Including the organisation of the Contract, line command and communication links between parties involved in the Contract on and off site.

Names, roles, responsibilities and authority of principals and key personnel.

(ii) Identification of the parts of the Contractor's Quality Management System relevant to the Works.

(iii) Supply Chain Management.

Including details of control and communication processes, assessment of the supplier's and sub-contractor's quality management systems and quality control capabilities, monitoring arrangements, review and acceptance of work items being undertaken by the sub-contractor or supplier.

(iv) Document Control

Controls relevant to the Works, including the control and processing of testing results, materials and workmanship certification and quality records.

The management of quality records in accordance with IS EN 9001.

The control and scheduling of all documentation to be submitted to the Employers Representative as required by the Specification throughout the Works.

(v) Resource Management

Including details of relevant skills and experience of personnel involved in the Works.

The relevant training and/or competency assessment certificates and/or registration/skills cards.

(vi) Method Statements

Method Statements for initial items of work and scheduling for all other method statements required.

APPENDIX 1/25
Product Certification Schemes

The following is a list of both marked and unmarked product certification schemes accepted in the Contract and referred to in Clause 104 of the Specification.

1. Marked Schemes

	a. Kitemark	b. Irish Standard Mark ISM
Certification Body:	British Standards Institute 389 Chiswick High Road, London W4 4AL	National Standards Authority of Ireland Glasnevin Dublin 9

BS No., Equivalent Irish Standard or Euronorm	Title	Specification Series
IS EN 197	Cement: - Composition, Specifications and Conformity Criteria for common cements	500 900 1000 1600 1700 2400 2600
IS EN 12620	Aggregates for concrete	500 900 1000 1600 1700 2400
IS EN 124	Gully tops and manhole tops for vehicular and pedestrian areas. Design requirements, type testing, marking, quality control.	500
IS EN 295	Specification for vitrified clay pipes, fittings and ducts	500
IS EN 588-1	Fibre-cement pipes for sewers and drains. Pipes, joints and fittings for gravity systems	500
IS EN 598	Ductile iron pipes, fittings, accessories and their joints for sewerage applications. Requirements and test methods	500
IS EN 877	Cast iron pipes and fittings, their joints and accessories for the evacuation of water from buildings. Requirements, test methods and quality assurance	500
IS EN 1916	Concrete pipes and fittings, unreinforced, steel fibre and reinforced.	500
IS EN 13101	Steps for underground man entry chambers. Requirements, marking, testing and evaluation of conformity	500
IS EN 1401	Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticized poly(vinylchloride) (PVC-U). Specifications for pipes, fittings and the system	500
IS EN 1452-1	Plastics piping systems for water supply. Unplasticized poly(vinyl chloride) (PVC-U). General	500
IS EN 1452-2	Plastics piping systems for water supply. Unplasticized poly (vinyl chloride) (PVC-U). Pipes	500
IS EN 1452-3	Plastics piping systems for water supply. Unplasticized poly (vinyl chloride) (PVC-U). Fittings	500

BS No., Equivalent Irish Standard or Euronorm	Title	Specification Series
BS 437	Specification for cast iron spigot and socket drain pipes and fittings	500
BS 3506	Specification for unplasticised PVC pipe for industrial purposes	500
BS 4962	Specification for plastics pipes and fittings for use as sub-soil field drains	500
BS 5911	Part 1: Precast concrete pipes, fittings and ancillary products	500
BS 5911	Part 3: Precast concrete pipes, fittings and ancillary products. Specification for un-reinforced and reinforced concrete manholes and soakaways.	500
BS 5911	Part 4: Precast concrete pipes, fittings and ancillary products. Specification for un-reinforced and reinforced concrete inspection chambers.	500
BS 5911	Part 5: Concrete pipes and ancillary concrete products. Specification for prestressed non-pressure pipes and fittings with flexible joints	500
BS 5911	Part 6: Precast concrete pipes, fittings and ancillary products. Specification for road gullies and gully cover Slabs	500
IS EN 1463-1	Road marking materials - Retroreflecting road studs - Part 1: Initial performance requirements	1200
IS EN 1463-2	Road marking materials - Retroreflecting road studs - Part 2: Road test performance specifications	1200
IS EN 1423	Road marking materials. Drop on materials. Glass beads, antiskid aggregates and mixtures of the two	1200
IS EN 1436	Road marking materials. Road marking performance for road users	1200
IS EN 1871	Road marking materials – physical properties	1200
IS EN 1790	Road markings materials – performed road markings	1200
IS EN 60920	Specification for ballasts for tubular fluorescent lamps. General and safety requirements	1400
IS EN 60921	Specification for ballasts for tubular fluorescent lamps. Performance requirements	1400
IS EN 60922	Specification for general and safety requirements for ballasts for discharge lamps (excluding tubular fluorescent Lamps)	1400
IS EN 60923	Ballasts for discharge lamps (excluding tubular fluorescent lamps). Performance requirements	1400
IS EN 61347-1	Lamp controlgear. General and safety requirements	1400
IS EN 61347-2-8	Lamp controlgear. Particular requirements for ballasts for fluorescent lamps	1400
IS EN 61347-2-9	Lamp controlgear. Particular requirements for ballasts for discharge lamps (excluding fluorescent lamps)	1400
IS EN 61048	Specification for capacitors for use in tubular fluorescent and other discharge lamp circuits. General and safety requirements	1400
IS EN 61049	Specification for capacitors for use in tubular fluorescent and other discharge lamp circuits. Performance requirements	1400
BS 1370	Specification for low heat Portland Cement	1700

2 Safety Mark

Certification Body: British Standards institute 389 Chiswick High Road, London W4 4AL or The Certification & Inspection Dept National Standards Authority of Ireland, Eolas, Glasnevin, Dublin 9

BS No., Equivalent Irish Standard or Euronorm	Title	Specification Series
IS EN 60155	Glow starters for fluorescent lamps	1400
IS EN 60598	Luminaires for road and street lighting	1400

3 Other Marked Schemes

i) Electric Cables

Certification Body: British Approvals Service Inspection Dept for Cables (BASEC) 360 Salisbury Boulevard, Milton Keynes, Bucks MK9 2AF or The Certification & Inspection Dept National Standards Authority of Ireland, Eolas, Glasnevin, Dublin 9

BS No., Equivalent Irish Standard or Euronorm	Title	Specification Series
BS 5467	Specification for cables with thermosetting insulation for electricity supply for rated voltages of up to and including 600/1000V and up to and including 1900/3300V	1400 1500
BS 6004	Specification for PVC-insulated cables (non-armoured) for Electric power and lighting	1400
BS 6346	Specification for PVC-insulated cables for electricity supply	1400

ii) Reinforcing and Prestressing Steel

Certification Body: UK Certification Authority for **or** Inspecting Dept Reinforcing Steels (CARES), Pembroke House, 21 Pembroke Road, Sevenoaks, Kent TN13 1XR The Certification & Inspection Dept National Standards Authority of Ireland, Eolas, Glasnevin, Dublin 9

BS No., Equivalent Irish Standard or Euronorm	Title	Specification Series
BS 4449	Specification for carbon steel bars for the reinforcement of concrete	1000 1700 2500
BS 4482	Steel wire for the reinforcement of concrete - Specification	1000 1700
BS 4483	Specification for steel fabric for the reinforcement of concrete	1000 1700
BS 5896	Specification for high tensile steel wire and strand for the prestressing of concrete	1700
BS 6744	Stainless steel bars for the reinforcement and use in concrete requirements and test methods	1700

BS No., Equivalent Irish Standard or Euronorm	Title	Specification Series
BS 8666	Specification for scheduling, dimensioning, bending and cutting of steel reinforcement for concrete. (Except that the Contractor or the manufacturer of pre-cast concrete products may opt to obtain straight bars from a firm within the Scheme and cut and bend them on the Site or at the pre-casting works respectively provided the levels of inspection and quality assurance specified in BS 4466 are maintained)	1700
IS EN 13391	The production and supply of Prestressing Anchorages for Post-tensioning Systems	1700

4. Non-Marked Schemes

i) Ready Mixed Concrete

Certification Body: The Quality Scheme for Inspection Dept Ready Mixed Concrete, Wolsey House, 3 High Street, Hampton, Middx TW12 2SQ

The Certification & Inspection Dept National Standards Authority of Ireland, Eolas, Glasnevin, Dublin 9

Specification: The supply of ready mixed concrete shall comply with the Specification for Road Works, in particular the 1000 Series and 1700 Series Specification.

BS No., Equivalent Irish Standard or Euronorm	Title	Specification Series
IS EN 197	Part 1: Cement: - Composition, Specifications and Conformity Criteria for common cements. Part 2: Cement Conformity evaluation Part 4:Cement composition, specifications and conformity criteria for low early strength blastfurnace cements	500 900 1000 1700
IS EN 12620	Aggregates for concrete	500 900 1000 1600 1700 2400 2600
IS EN 12878	Pigments for the colouring of building materials based on cement and/or lime. Specifications and methods of test	500 900 1000 1600 1700 2400 2600
BS 1305	Specification for batch type concrete mixers	500 900 1000 1600 1700 2400 2600

BS No., Equivalent Irish Standard or Euronorm	Title	Specification Series
IS EN 12350-7	Testing fresh concrete. Air content. Pressure methods	500 900 1000 1600 1700 2400 2600
IS EN 1008	Mixing water for concrete. Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete	500 900 1000 1600 1700 2400 2600
IS EN 13055-1	Lightweight aggregates. Lightweight aggregates for concrete, mortar and grout	1700
IS EN 450	Fly ash for concrete	500 1000 1700
BS 4027	Specification for sulphate-resisting Portland cement	500 900 1000 1600 1700 2400 2600
IS EN 197-4	Cement – Part 4: Composition, Specifications and Conformity Criteria for Low Early Strength Blastfurnace Cements	1700
IS EN 480	Admixtures for concrete, mortar and grout. Testing Part 1: reference concrete and reference mortar for testing Part 2: Determination of setting time Part 3: Determination of water soluble chloride content Part 11: Determination of air void characteristics in hardened concrete Part 12: Determination of the alkali content of admixtures	500 900 1000 1600 1700 2400 2600
IS EN 206	Concrete Specification, Performance, Production and Conformity	500 900 1000 1600 1700 2400 2600
IS EN 15167	Ground granulated blastfurnace slag for use with concrete, mortar and grout Part 1: Definitions, specifications and conformity criteria Part 2: Conformity evaluation	500 900 1000 1600 1700 2400 2600

APPENDIX 1/26
Irish Agrément Board Roads and Bridges Certificates

1. Table 1/26 contains a list of types of work, goods or materials for which proprietary products are required to have either an Irish Agrément Board Roads and Bridges Certificate or a British Board of Agrément Certificate.

Table 1/26: Requirements for Agrément Certificates

Description	Specification Series
Road Restraint Systems	400
Pipes for Drainage and/or Service Ducts other than those listed in Tables 5/1	500
Permanent Shuttering for Road Gullies	500
Prefabricated Temporary Road Marking Material	1200
Reflecting Road Studs	1200
Traffic Signal and Control Equipment	1200
Concrete Coating Material	1700
Paint Formulation	1900
Waterproofing for Bridge Decks	2000
Bridge Deck Expansion Joints	2300

Details of products conforming with the above requirements are listed in the Index of Current Publications which may be obtained from the Publications Department, Irish Agrément Board.

Where types of work, goods or material for which proprietary products are required to have an Irish Agrément Board Roads and Bridges Certificate, a British Agrément Board certificate shall be acceptable.

APPENDIX 1/71
Works by Other Contractors

1. Maintenance works on the surrounding road network at the structures may be ongoing. The Contractor shall liaise with other Contractors and provide unrestricted access to allow ongoing maintenance works.

2. Utility providers may need to access the site to carry out maintenance work. Refer also the requirements of Appendix 1/16.

3. The Contractor shall liaise with the other Contractors and provide unrestricted access to facilitate works.

APPENDIX 1/72
Independent Check Certificate for Temporary Works

Name of Project _____

Name of Structure _____

Name of Checking Organisation _____

1. We certify that reasonable skill and care has been used in the checking of the design of the temporary works comprising (insert description) with a view to securing that:

ii. The design has been carried out in accordance with:
(Insert design standards)

iii. The design proposal shall not be detrimental to the works and secure the safety of the contractor, public, third parties, third party property and permanent works during the construction of the permanent works described below:
(Describe the permanent works)

iv. The design of the temporary works has been accurately translated onto the following drawings:

(Insert the drawing and schedule numbers)

Signed (Checker) _____

Name _____

Title _____

Date _____

2. Receipt of this Certificate is acknowledged and consent to proceed is given.

Signed: _____
on behalf of the Employer's Representative

Name: _____

Date: _____

APPENDIX 1/73
Condition Surveys (Dilapidation Surveys)

1. Condition Survey

As required by Clause 136 of the TII Specification for Roadworks, the Contractor shall carry out condition surveys of the buildings and structures within 50m of the lands made available by the Employer and as shown in Figures 1/73/1 to 4 inclusive following:

Fig 1/73/1 Str01 MacMurrough Island Bridge 1 WX-N30-007.00

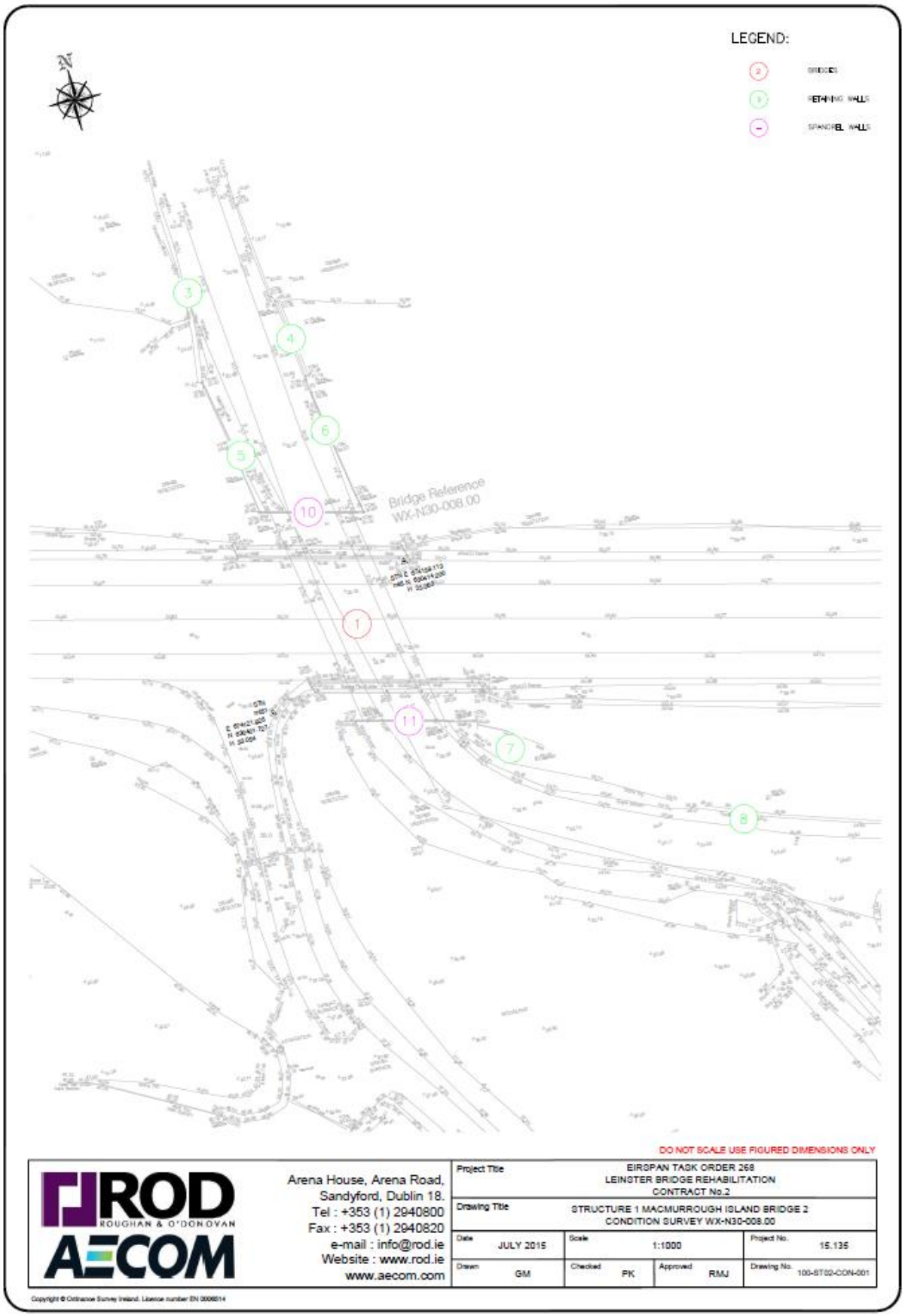

Fig 1/73/2 Str02 MacMurrough Island Bridge 2 WX-N30-008.00

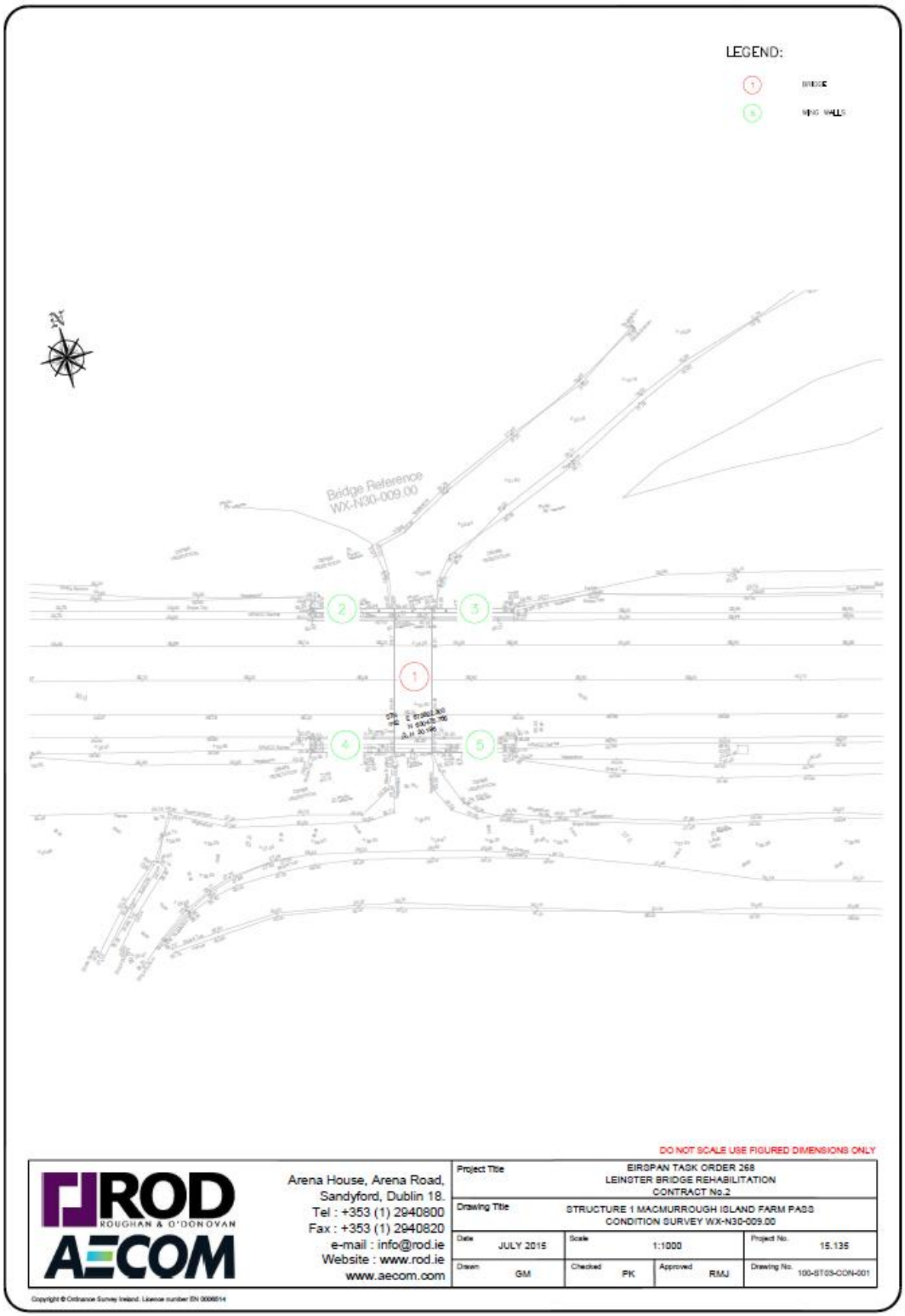

Fig 1/73/3 Str03 MacMurrough Island Farm Pass WX-N30-009.00

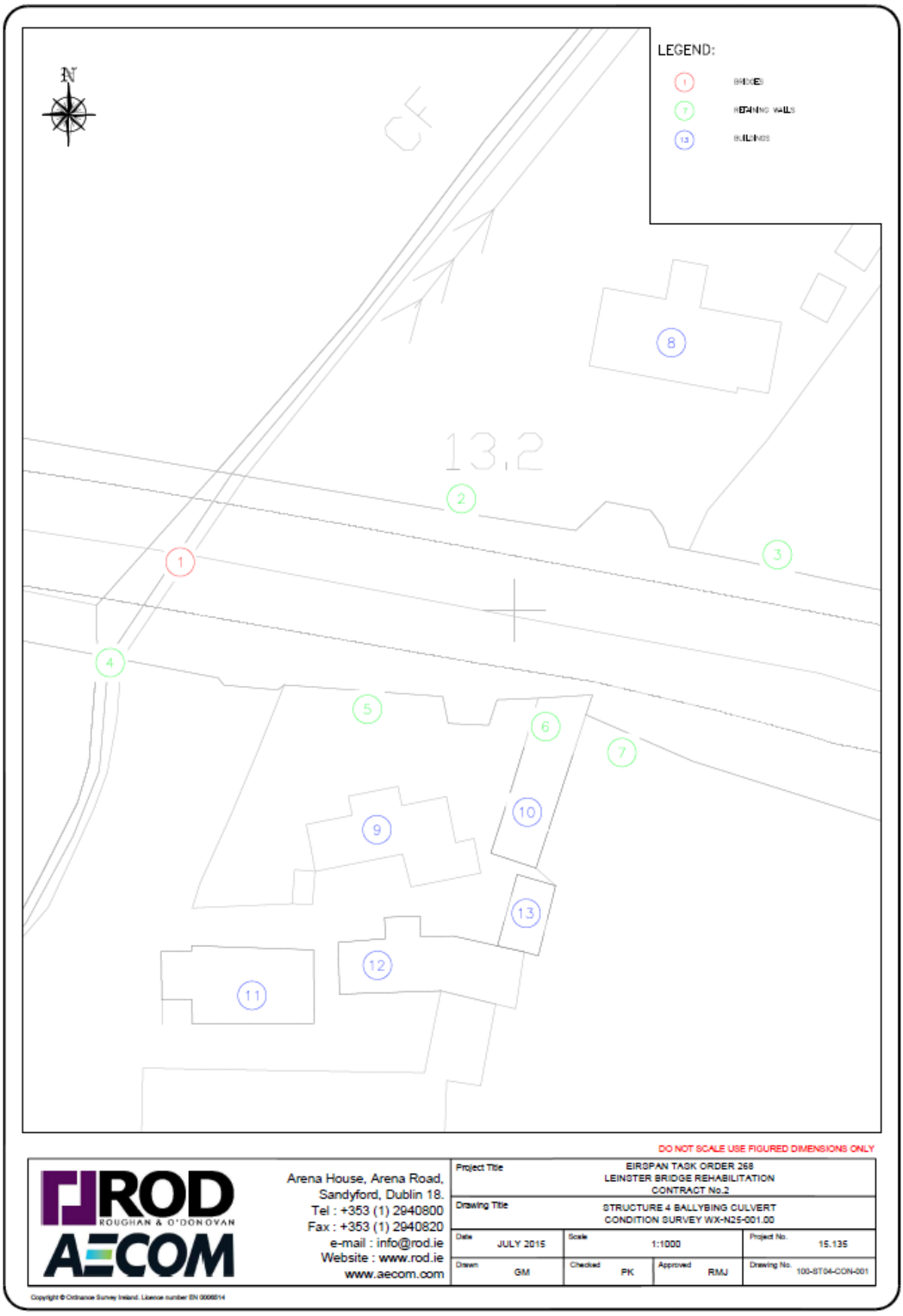

Fig 1/73/4 Str04 Ballybing Culvert WX-N25-001.00

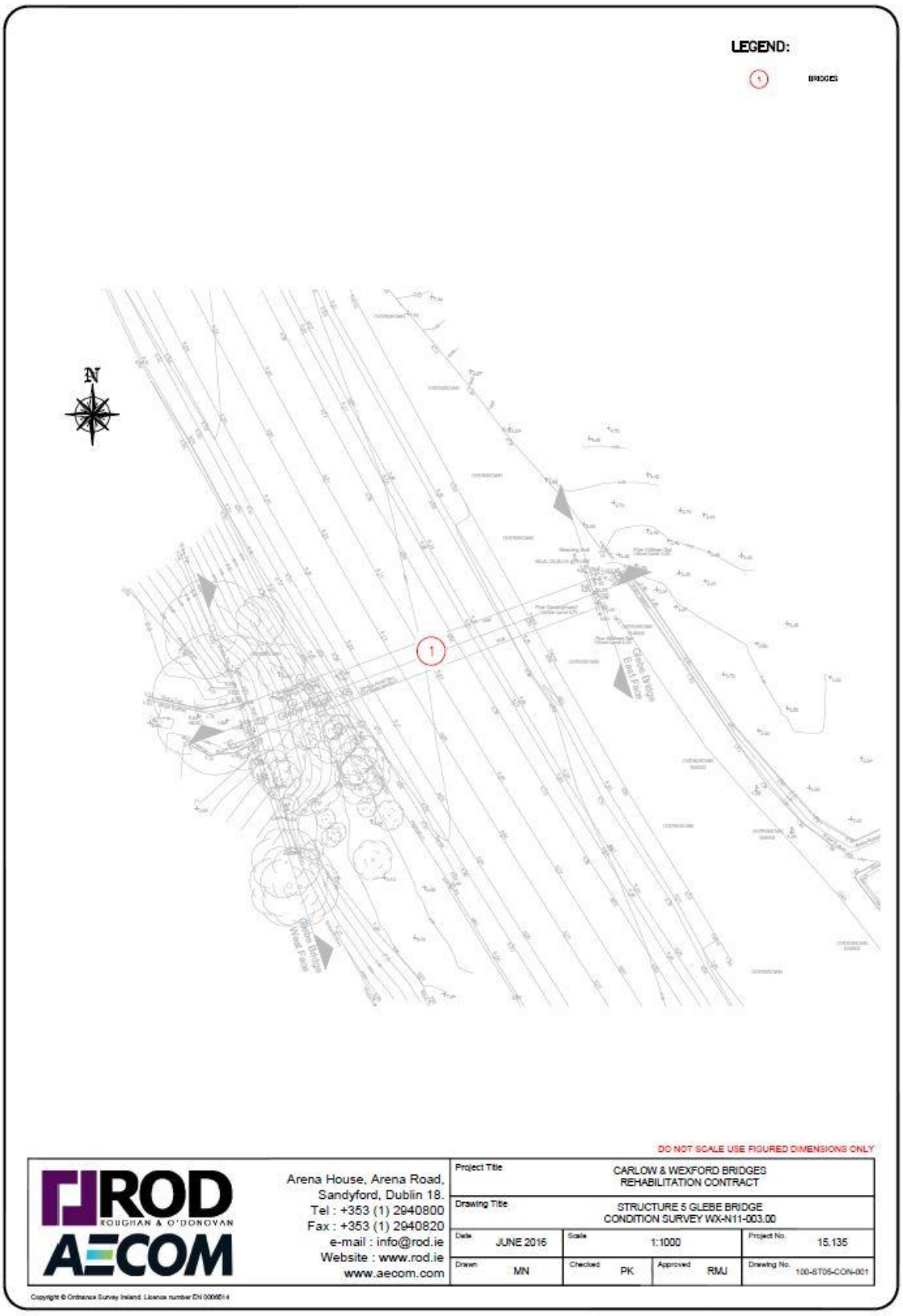

Fig 1/73/5 Str05 Glebe Bridge WX-N11-003.00

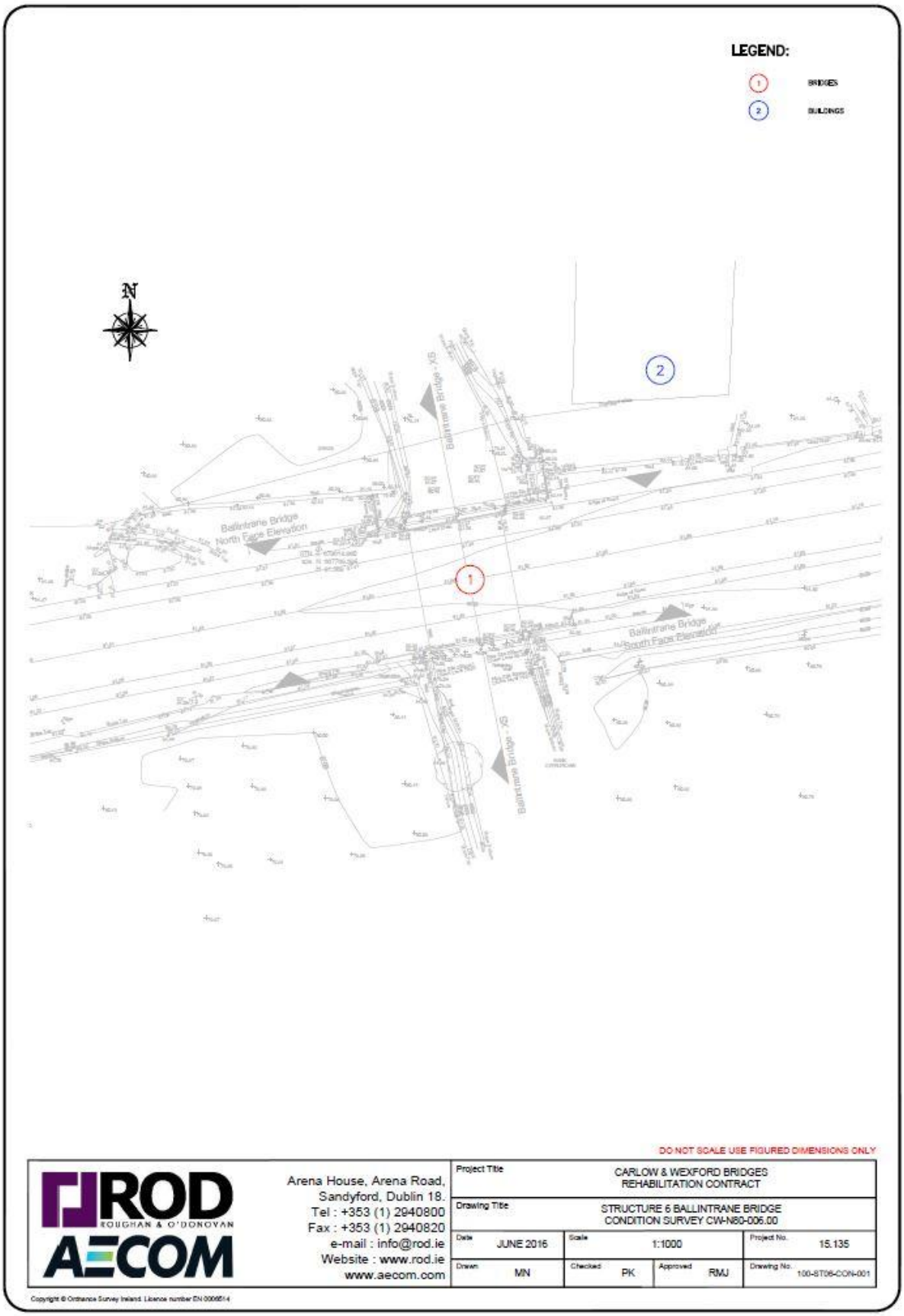

Fig 1/73/6 Str06 Ballintrane Bridge CW-N80-006.00

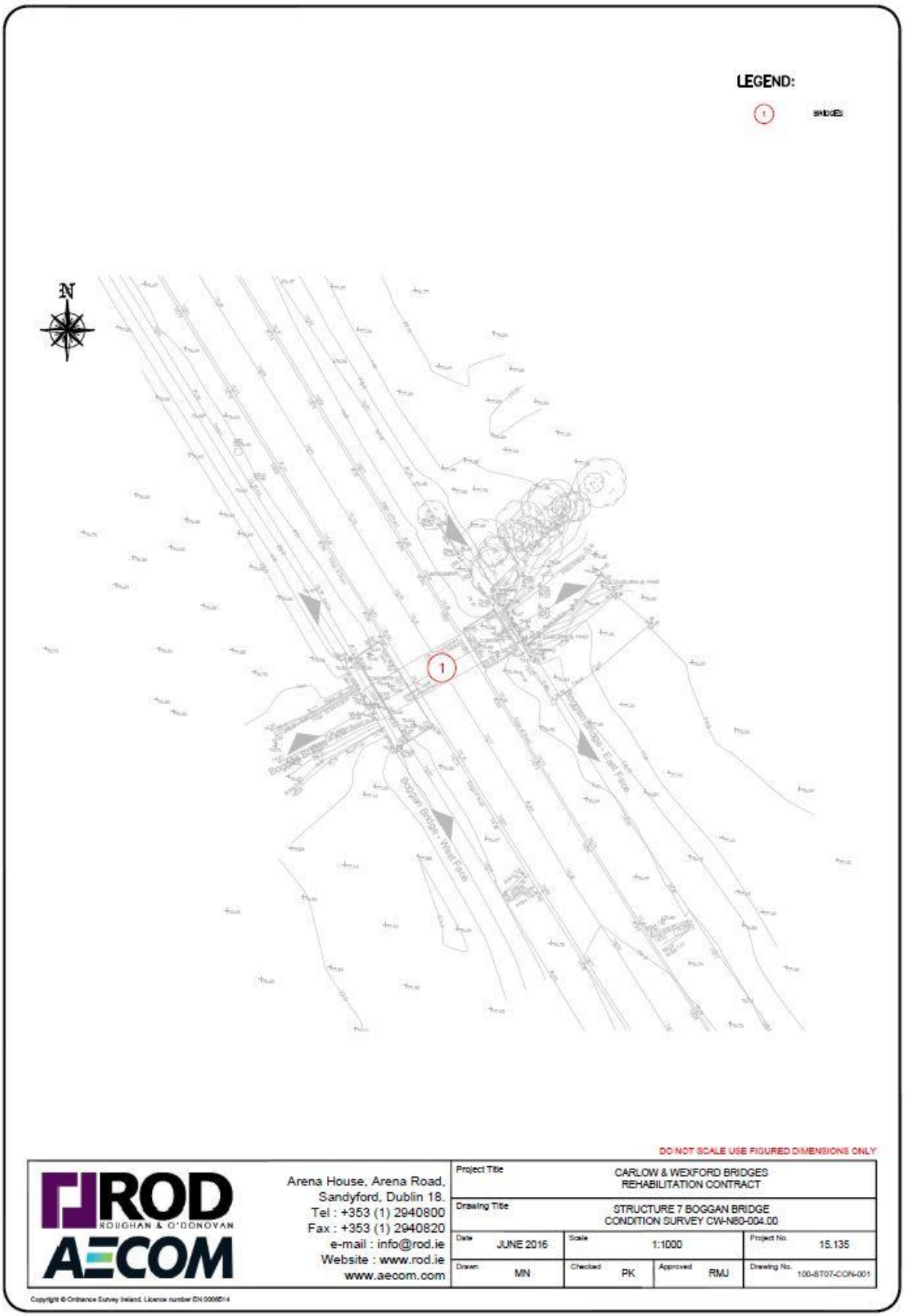

Fig 1/73/7 Str07 Boggan Bridge CW-N80-004.00

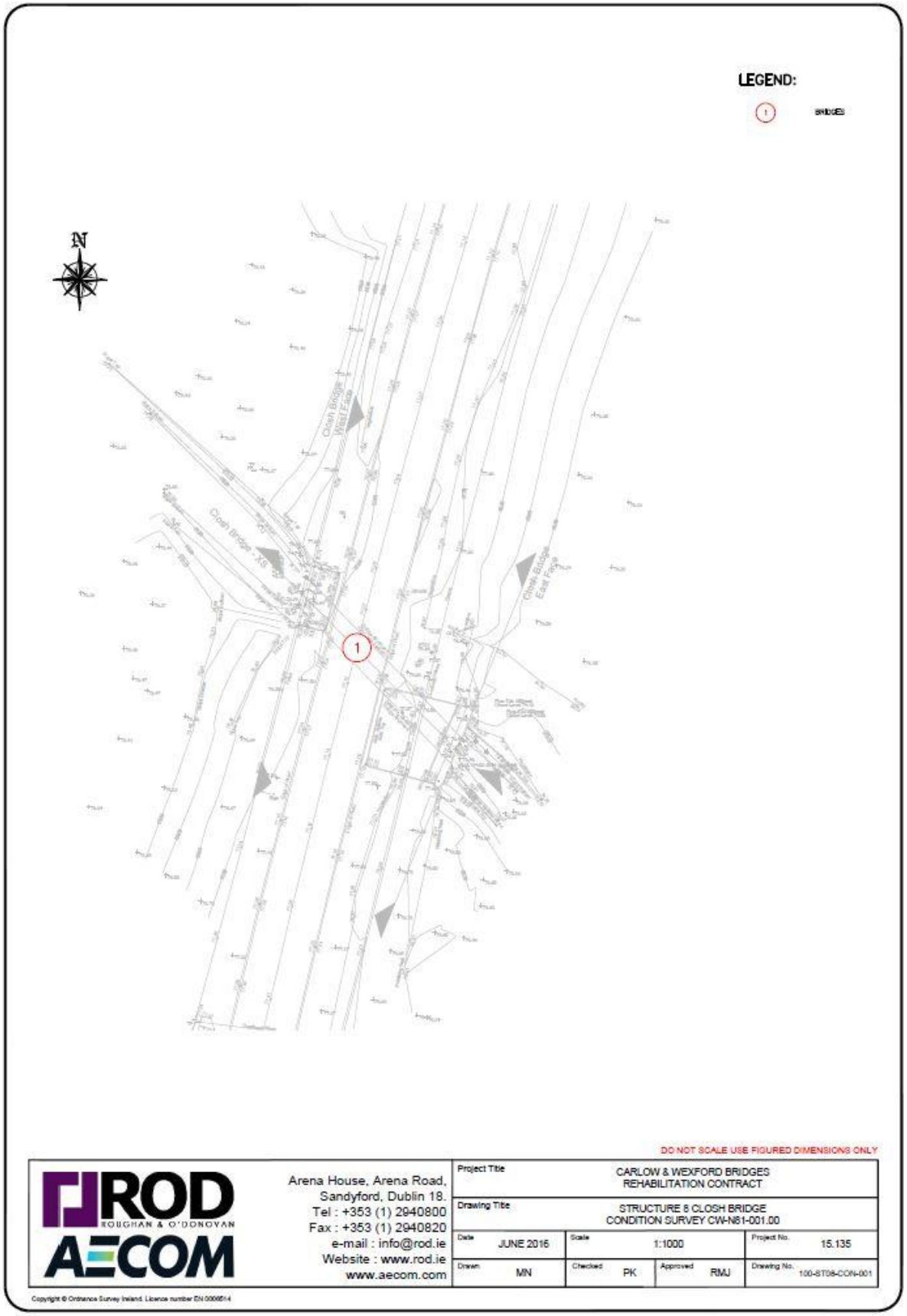

Fig 1/73/8 Str08 Closh Bridge CW-N81-001.00

APPENDIX 1/75
As Built Records Drawings

The contractor shall maintain and submit as built records and drawings of the works in accordance with the requirements of Clause 177AR and as described below:

1. Deliverables

The Contractor shall be responsible for supplying a detailed set of scalable as-built record drawings. All as-built drawings shall be submitted in A1 format.

Drawings shall include but not be limited to:

- All standard, typical and specific details pertaining to the design;
- All configuration plans and wiring diagrams;
- Component drawings;
- General arrangement details;
- Fully coordinated plan layouts for earthworks, foundations, earthing, structures, ducting, drainage, surfacing, watermains and building service layouts and details;
- Signs;
- Landscaping;
- Detailed sections and profile drawings.

Plan layouts, general arrangement and plan location drawings shall be drawn in context with the surrounding environment, to demonstrate how newly constructed elements tie in and link with the adjacent works.

The Contractor shall maintain and issue to the Employer's Representative interim as-built drawings of the works on request.

2. As-built drawing submissions

The following as-built information shall be issued by the Contractor to the Employer's Representative:

One electronic drawing file (including reference files and any drawings referred to within the main body of the as-built drawing) and one hard copy of interim as-constructed drawings shall be submitted to the Employer's Representative on request.

On completion of the works, one electronic drawing (including reference files and any drawings referred to within the main body of the as-built drawing) and two full size hard copies of the as-constructed record drawings shall be issued to the Employer's Representative.

On acceptance of this data a further signed full size hard copy shall be issued to the Employer's Representative.

3. Drawings

3.1 General

The Contractor shall create and maintain drawings within the specifications as laid out in this Appendix.

A brief description of the drawing requirements will include but not be exclusive to:

- All design criteria will be drawn to the Project grid;
- Global origin must be set to world coordinates;
- All design data to be drawn at a scale of 1:1;
- All master design files will be submitted at agreed intervals;
- All files must be named in accordance with the drawings in the Contract;
- All drawings numbers must be in accordance with the drawings in the Contract;

- Working units must be set to 1000mm per m and 1 pos unit per mm;
- Drawings shall not contain any additional contractor's address or telephone number other than that shown on the standard drawing sheet;
- Transmittals will accompany all submittals of drawing data, itemising each individual item, submitted CD's to be labelled and have cross reference of transmittal clearly on it;
- Where drawings are included within reports they are not deemed to have been officially submitted;
- All submittals will include hard copy, design files and drawing files;
- Email submittals must be accompanied by a formal transmittal.

4. Electronic Data

This section details the mechanism and modes for electronic data transfer of drawings between all parties. The following drawing submittal specifications shall be used unless directed otherwise by the Employer's Representative.

All drawings submitted for formal review shall be provided in the following formats, to be agreed with the Employer's Representative:

- Autocad DWG 2014 and Microstation V8i (Select) Series 2

The following standards shall also apply:

- Each transfer shall be fully documented to detail items such as layer use, cross-referenced files, necessary directory structure, etc.
- Data transfers shall be readable using equipment currently employed by the Employer's Representative.
- Generally the current version of all application software shall be deemed to be standard, as long as it is compliant with the operating characteristics of the Employer's Representative's computer systems.

APPENDIX 2/1
List of Buildings etc. to be Demolished

Address	Description	Drg Nos	Ref No	Requirements
Str01 MacMurrough Island Bridge No. 1 – N30 County Wexford	Partially demolish existing parapet upstands and support slabs to allow installation of new parapets and transition	200-ST01-001	WX-N30-007.00	The Contractor shall partially take down the existing parapet upstand and support slab and form a construction joint to the extents described on the drawings to allow strengthening of the parapet support members and installation of a new parapet
Str02 MacMurrough Island Bridge No. 2 – N30 County Wexford	Partially demolish existing parapet upstands and support slabs to allow installation of new parapets and transition	200-ST02-001	WX-N30-008.00	The Contractor shall partially take down the existing parapet upstand and support slab and form a construction joint to the extents described on the drawings to allow strengthening of the parapet support members and installation of a new parapet
Str03 MacMurrough Island Farm Pass – N30 County Wexford	Partially demolish existing parapet upstands to allow installation of new parapets and transition	200-ST03-001	WX-N30-009.00	The Contractor shall partially take down the existing parapet upstand and form a construction joint to the extents described on the drawings to allow strengthening of the parapet support members and installation of a new parapet
Str04 Ballybing Culvert – N25 County Wexford	Remove the existing twin 900mm dia pipe culverts and headwalls to the extents described on the drawings to allow installation of new box culvert with headwalls and wingwalls	200-ST04-001	WX-N25-001.00	The Contractor shall take down the existing southern headwall and wingwall to the extents described on the drawing and excavate and remove the existing twin 900mm dia pipe culvert under the N25 and take down the northern headwall to the extent described on the drawings to allow the installation of the new box culvert, headwalls and wingwalls. At the southern end a section of the existing blockwork wall shall be taken down and reinstated.
Str06 Ballintrane Bridge CW-N80-006.00 County Carlow	Partially demolish existing parapet upstands, northeast and northwest wingwalls and all four masonry clad blockwork parapet walls	200-ST06-001	CW-N80-006.00	The Contractor shall partially take down the existing parapet upstands, northeast and northwest wingwalls, and all four masonry clad blockwork parapet walls and form a construction joint to the extents described on the drawings to allow strengthening of the parapet support members and installation of a new parapet
Str08 Closh Bridge CW-N81-001.00 County Carlow	Partially demolish existing concrete upstand at west end of the structure to facilitate waterproofing works and the construction of a new stone masonry parapet	200-ST08-001	CW-N81-001.00	The Contractor shall partially take down the existing parapet upstand at the west side of the bridge to top of bridge deck level to facilitate waterproofing works and the construction of a new stone masonry parapet

APPENDIX 2/2
Filling of Trenches and Pipes

1. Existing surface water and sewers pipelines that are conflicting with the works shall be diverted and the existing removed, filled, grouted or sealed as detailed in the Specification and shown on the drawings.

2. Existing service ducts, watermains and other redundant manholes and chambers that conflict with the proposed works identified on the drawings are to be diverted and removed and backfilled by the Contractor with compacted 6N material.

3. Pipes to be grouted shall be filled with a 1:10, cement: PFA mix in accordance with Clause 506.3 (iii).

APPENDIX 2/3
Retention of Material Arising from Site Clearance

1. Retention of Material Arising from Site Clearance

Description	Location	Delivered to	Requirements
Kerbs, quadrants	Str04, Str07, Str08		Remove to tip off site
Paving	Str07, Str08		Remove to tip off site
Setts			
Chamber covers	Str01, Str04		Clean and set aside for reuse
Gully gratings and frames	Str04	Wexford County Council yard	Clean and remove to tip off site
Gates and fencing	Str02, Str04, Str07, Str08	Wexford/ Carlow County Council yard as appropriate	Clean and remove to store off site
Safety barrier components	Str01, Str02, Str03, Str06		Remove to tip off site
Parapets and transitions	Str01, Str02, Str03, Str06		Remove to tip off site
Traffic signs	Str04, Str06, Str08		Remove existing poles to tip off site. Retain existing sign faces and set aside for reuse.
Bollards			
Road studs	Str01, Str02, Str03, Str04, Str06, Str07, Str08		Remove, clean and remove to tip off site
Traffic signals			
Road lighting columns			
Lanterns			
Electrical equipment			
Communications equipment			
Cables			
Timber arising from trees	Str02, Str04, Str05		Remove to tip off site
Blockwork and Stonework	Str04, Str06, Str07, Str08		Take down and set aside for reuse where reinstatement is required otherwise remove to tip off site

APPENDIX 2/4
Explosives and Blasting

1. Explosives and blasting shall not be permitted.

APPENDIX 2/5
Hazardous Materials

1. The appropriate measures must be taken to safeguard the health of the Contractor's operatives and the general public.

2. Hazardous materials arising from site clearance and/or excavations shall be disposed of only at sites licensed by the County Council of the area for the arisings or other licensing authorities.

3. Japanese Knotweed has been identified in the vicinity of Str03 MacMurrough Island Farm Pass and Str05 Glebe Bridge. The Contractor shall develop an invasive species treatment and management plan. Refer also to Clause 180.6AR.

APPENDIX 3/1
Fencing, Gates and Stiles

1. Fencing, Gates and Stiles

(i) Fencing shall be Timber Post and Rail Fence to RCD/300/1 or Concrete post and Rail Fence to RCD/300/3 at locations described on the drawings. Concrete footings shall be provided.

(ii) Gates shall be Steel Single Field Gate to RCD/300/9.

2. Temporary Fencing

Temporary fencing shall generally be;

2.0m high block and mesh fencing or 2.0m high "M.A.S.S. guard" fencing as appropriate. The mesh panel frames shall consist of galvanised steel tubes, 40mm minimum diameter with in-fill mesh of 5mm minimum diameter. Where privacy requirements dictate, the Contractor shall provide solid infill panels from ground level to a minimum height of 2.0m above ground level. The Contractor shall provide design calculations and fabrication drawings for all temporary fencing and foundations. The design of temporary fencing shall be in accordance with Eurocodes and Irish National Annexes and provided by the Contractor at least 4 weeks before commencement of installation for the review and acceptance of the Employers Representative.

APPENDIX 3/2
Fencing: NRA Road Construction Details

Clause No.	Road Construction Detail Drawing No.
302.1 & 303.1	See Appendix 3/1
306.1	RCD/300/1, RCD/300/3, RCD/300/4, RCD/300/6
306.2	RCD/300/1
306.3	RCD/300/19
308.1	RCD/300/09, RCD/300/11, RCD/300/15, RCD/300/16
308.2	RCD/300/15, RCD/300/16
313.1	RCD/300/3

APPENDIX 4/1
Road Restraint System (Vehicle and Pedestrian)

1. The locations of safety fences and barriers are shown on the relevant Drawings. Table 4/1 contains a schedule of safety barriers and gives the performance criteria required.

2. The terminal lengths shall be appropriate to the type of barrier installed. The terminal lengths are not included in the safety barrier lengths specified on the drawings.

3. All safety barriers shall be installed complete with permanent reflectors at 4m centres along the rail throughout the scheme.

Transitions between the safety barrier and parapets shall be provided by the Contractor at Str01, Str02, Str03 and Str06.

4. Pedestrian Guardrails
Pedestrian guardrails to be provided as shown on the drawings.

Table 4/1

Bridge Name	Barrier Ref. No.	Start Approximate Coordinates of LoN	End Approximate Coordinates of LoN	Hazard Information				Barrier Type	Single / Double Sided	Safety Barrier Performance Criteria			
				Hazard Description	Hazard Approximate Coordinates	Location	Drg.			Containment Level	Impact Severity	Working Width	Set-back (m)
Str01 MacMurrough Island Bridge 1 WX-N30-007.00	MB1-1	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str01 MacMurrough Island Bridge 1 NW	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet	0.6 min
	MB1-2	See Contract Drawings	See Contract Drawings	Bridge Parapet and Verge Hazards	See Contract Drawings	Str01 MacMurrough Island Bridge 1 NE	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet	0.6 min
	MB1-3	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str01 MacMurrough Island Bridge 1 SW	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet and connection to existing N2/A/W4 safety barrier	0.6 min
	MB1-4	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str01 MacMurrough Island Bridge 1 SE	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet and connection to existing N2/A/W4 safety barrier	0.6 min
Str02 MacMurrough Island Bridge 2 WX-N30-008.00	MB2-1	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str02 MacMurrough Island Bridge 2 NW	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet and connection to existing N2/A/W4 safety barrier	0.6 min

Bridge Name	Barrier Ref. No.	Start Approximate Coordinates of LoN	End Approximate Coordinates of LoN	Hazard Information				Barrier Type	Single / Double Sided	Safety Barrier Performance Criteria			
				Hazard Description	Hazard Approximate Coordinates	Location	Drg.			Containment Level	Impact Severity	Working Width	Set-back (m)
Str02 MacMurrough Island Bridge 2 WX-N30-008.00	MB2-2	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str02 MacMurrough Island Bridge 2 NE	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet and connection to existing N2/A/W4 safety barrier	0.6 min
	MB2-3	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str02 MacMurrough Island Bridge 2 SW	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet	0.6 min varies
	MB2-4	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str02 MacMurrough Island Bridge 2 SE	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet and connection to existing N2/A/W4 safety barrier	0.6 min varies
Str03 MacMurrough Island Farm Pass WX-N30-009.00	MB3-1	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str03 MacMurrough Island Farm Pass NW	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet and connection to existing N2/A/W4 safety barrier	See Drawings
	MB3-2	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str03 MacMurrough Island Farm Pass NE	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet and connection to existing N2/A/W4 safety barrier	See Drawings

Bridge Name	Barrier Ref. No.	Start Approximate Coordinates of LoN	End Approximate Coordinates of LoN	Hazard Information				Barrier Type	Single / Double Sided	Safety Barrier Performance Criteria			
				Hazard Description	Hazard Approximate Coordinates	Location	Drg.			Containment Level	Impact Severity	Working Width	Set-back (m)
Str03 MacMurrough Island Farm Pass WX-N30-009.00	MB3-3	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str03 MacMurrough Island Farm Pass SW	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet and connection to existing N2/A/W4 safety barrier	See Drawings
	MB3-4	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str03 MacMurrough Island Farm Pass SE	1700-ST-100	Steel	Single	N2	A	W2 transition to be provided to N2/B/W2 parapet and connection to existing N2/A/W4 safety barrier	See Drawings
Str04 Ballybing Culvert WX-N25-001.00	BC1-1	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str04 Ballybing Culvert NW	1700-ST04-001	Steel	Single	N2	A	W2	See Drawings
Str06 Ballintrane Bridge CW-N80-006.00	BTB-1	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str06 Ballintrane Bridge CW-N80-006.00 NW	1700-ST06-004	Steel	Single	N2	A	W2	See Drawings
	BTB-2	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str06 Ballintrane Bridge CW-N80-006.00 SW	1700-ST06-004	Steel	Single	N2	A	W2	See Drawings
	BTB3	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str06 Ballintrane Bridge CW-N80-006.00 SE	1700-ST06-004	Steel	Single	N2	A	W2	See Drawings
Str07 Boggan Bridge CW-N80-004.00	BB-1	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str07 Boggan Bridge CW-N80-004.00 East	1700-ST07-003	Steel	Single	N2	A	W2	See Drawings
	BB-2	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str07 Boggan Bridge CW-N80-004.00 West	1700-ST07-003	Steel	Single	N2	A	W4	See Drawings

Bridge Name	Barrier Ref. No.	Start Approximate Coordinates of LoN	End Approximate Coordinates of LoN	Hazard Information				Barrier Type	Single / Double Sided	Safety Barrier Performance Criteria			
				Hazard Description	Hazard Approximate Coordinates	Location	Drg.			Containment Level	Impact Severity	Working Width	Set-back (m)
Str08 Closh Bridge CW-N81-001.00	CB-1	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str08 Closh Bridge CW-N81-001.00 East	1700-ST08-003	Steel	Single	N2	A	W4	See Drawings
	CB-2	See Contract Drawings	See Contract Drawings	Bridge Parapet	See Contract Drawings	Str08 Closh Bridge CW-N81-001.00 West	1700-ST08-003	Steel	Single	N2	A	W2	See Drawings

APPENDIX 4/2
Pedestrian Restraint System

1. Pedestrian restraint system shall be provided to the details and at the locations described on the drawings.

APPENDIX 4/3
Safety Barrier Terminals

1. Terminals shall be provided at the end of each safety barrier length.

2. All safety barriers shall be installed complete with permanent reflectors at 4m centres along the rail throughout the scheme.

Bridge	Barrier Ref No	Terminal					Ramp Down Y/N	Flared Y/N
		Performance Class P(1,4)	Impact Severity Level	Permanent Lateral Displacement Class		Exit Box Class $Z_{(1,2,3,4)}$		
				$X_{(1,2,3)}$	$Y_{(1,2,3,4)}$			
Str01 MacMurrough Island Bridge 1 WX-N30-007.00	MB1-1 EB (approach)	P4	A	X1	Y1	Z1	N	N
	MB1-2 EB (departure)	P1	A	X1	Y1	Z1	Y	Y
Str02 MacMurrough Island Bridge 2 WX-N30-008.00	MB2-3 WB (departure)	P4	A	X1	Y1	Z1	Y	Y
	EB (approach)	P4	A	X1	Y1	Z1	N	N
	MB2-5 (approach)	P4	A	X1	Y1	Z1	N	N
	MB2-5 (departure)	P1	A	X1	Y1	Z1	Y	Y
Str03 MacMurrough Island Farm Pass WX-N30-009.00	MB3-1	P4	A	X1	Y1	Z1	N	W
Str04 Ballybing Culvert WX-N25-001.00	BC1-1 EB (approach)	P4	A	X1	Y1	Z1	N	N
Str04 Ballybing Culvert WX-N25-001.00	BC1-1 EB (departure)	P4	A	X1	Y1	Z1	N	N
Str06 Ballintrane Bridge CW-N80-006.00	BTB-1	P4	A	X1	Y1	Z1	N	N
	BTB-2	P4	A	X1	Y1	Z1	N	N
	BTB3	P4	A	X1	Y1	Z1	N	N
	NA	P1	A	X1	Y1	Z1	N	N
Str07 Boggan Bridge CW-N80-004.00	BB-1	P4	A	X1	Y1	Z1	N	N
	BB-2	P4	A	X1	Y1	Z1	N	N
Str08 Closh Bridge CW-N81-001.00	CB-1	P4	A	X1	Y1	Z1	N	N
	CB-2	P4	A	X1	Y1	Z1	N	N

APPENDIX 4/7
Vehicle Parapet Systems

1. The location of Vehicle Parapet Systems are show on the drawings for ST01.

2. The performance criteria for the vehicle parapet system are shown in the following table:

Structure Ref No.	Approximate Length of Vehicle Parapet	Height of Vehicle Parapet	Vehicle Parapet Type	Vehicle Parapet Performance Criteria		
				Containment Level	Impact Severity Level*	Working Width
Str01 MacMurrough Island Bridge 1 WX-N30-007.00	16m north side	1.25m	Galvanised steel with mesh infill full height	N2	B	W2
	16m south side	1.25m	Galvanised steel with mesh infill full height	N2	B	W2
Str02 MacMurrough Island Bridge 2 WX-N30-008.00	18m north side	1.25m	Galvanised steel with mesh infill full height	N2	B	W2
	31m south side	1.25m	Galvanised steel with mesh infill full height	N2	B	W2
Str03 MacMurrough Island Farm Pass WX-N30-009.00	21.5m north side	1.25m	Galvanised steel with mesh infill full height	N2	B	W2
	21.5m south side	1.25m	Galvanised steel with mesh infill full height	N2	B	W2
Str04 Ballybing Culvert WX-N25-001.00	Bespoke reinforced concrete parapet both sides to the details described on the drawings					
Str06 Ballintrane Bridge CW-N80-006.00	22m north side	1.25m	Galvanised steel with mesh infill full height	N2	B	W2
	22m south side	1.25m	Galvanised steel with mesh infill full height	N2	B	W2

Note 1: Parapets shall incorporate anti-theft fixings (Anti-theft fixing for holding down bolts to be used on rear fixing). Anchorages shall be stainless steel with BBA or IAB Certificates.

2. Anchorage / Attachment System Requirements

Concrete surfaces of parapet upstands under parapet post baseplates for metal parapets shall be lightly scabbled with a needle gun prior to grouting.

Bedding mortar shall be cured for a minimum period equivalent to of 48hrs at 10^{o}C. Suitable weather protection shall be employed during the curing period.

Exposed surfaces of bedding mortar shall be formed using a suitable shutter to achieve Class F3 surface finish.

Parapet anchors are required to have a current BBA or IAB Certificates.

3. Aesthetic Approval

The parapet systems listed in Appendix G of BS 6779:Part 1 are deemed to have aesthetic approval.

4. Testing

Metal parapets shall be provided in accordance with BS 6779 Pt1 and NRA BD52 and from a supplier with an accredited quality management system.

Weld procedures, welder qualifications and production test certificates shall be provided. Welding procedures and welders qualifications must not exceed 7 years and production testing is to be carried out on 10% of all components.

Destructive testing at an ILAB accredited laboratory shall be carried out on welded joints for 1 complete post for each type, 1 shop splice for each type and one site splice for each type.

Parapet post shall be subject to production testing as specified in BS 6779 Pt 1(manufacturers tests) and certification provided.

Anchorage testing in drilled holes – 10% of anchorages shall be carried out on site to BS5080-1.

APPENDIX 5/1
Drainage Requirements

1.1 Requirements for box Culverts. Box culvert units shall be provided at Str04 Ballybing Culvert WX-N25-001.00 to the details described on the drawings.

1.2 Additional requirements for drains excluding those constructed using corrugated steel pipes – Not Used.

1.3 Locations where more than one pipe type is permitted within individual drain or service ducts between consecutive chambers – Not Used.

1.4 The hydraulic design of the surface water system is based on the "Modified Rational Method" using a pipe roughness of 1.5mm for Ogee pipes and a pipe roughness of 0.6mm for Spigot and Socket pipes. All pipes (including filter drain pipes) with a diameter of less than or equal to 375mm are to be spigot and socket pipes and have a Ks value less than or equal to 0.6mm.

1.5 Corrugated steel pipes – Not Used.

1.6 Corrugated steel pipes – Not Used.

1.7 Laying method for corrugated coilable perforated pipes – Not Used.

1.8 Where cover depth to the crown of a pipe is less than 1.2m under a carriageway a Type Z concrete bed and surround in accordance with RCD/500/21 is required, except pipes intended to drain the pavement foundation.

1.9 The minimum cement content within concrete pipes is to be 340kg/m^3. Where existing ground conditions contain high sulphate levels the minimum cement content is to be 400kg/m^3. The minimum free water : cement ratio within concrete pipe work is to be 0.5.

1.10 Bedding, haunching and surround to thermoplastic and structure walled filter drains shall be in accordance with Highways Construction Detail F2, Type I.

1.11 Joints in surface water drains shall be watertight to Clause 504.

1.12 Where rigid joints may be used – Not Used.

1.13 Trenches, other than filter drain trenches, in carriageways and other paved areas shall be backfilled above the pipe surround material described in Clause 503 with capping material to Clause 613.

1.14 Where filter drains in the road verge are designed to intercept surface run-off, the top surface of the filter material shall be between 25 millimetres and 50 millimetres below the adjacent finished verge or carriageway level. The exposed stone shall be Clause 505 Type B crushed rock (gravel shall not be permitted) for a depth of 300 millimetres. This filter material shall extend to the carriageway edge.

1.15 Existing land drains which are permanently severed by the Works shall be located and connected into a new drain, pipe or ditch as follows:

a) Where severed by an unlined interceptor drain to RCD/600/2, the land drain is to be trimmed in a manner to allow free drainage into the interceptor drain;

b) Where severed by a surface water drain, the land drain is to be connected to the surface water drain utilising a suitable sized 'Y' branch connection;

c) Where severed by a filter drain, the land drain is to be trimmed in a manner to allow free drainage into the filter material;

d) Where severed by roadworks construction in cut, the land drain is to be connected to the surface water drainage system utilising a herringbone filter drain to RCD/500/29.

The Contractor shall record the position of each land drain when intercepted and add this information to the As Constructed records.

1.16 Requirements for sealing, removal or grouting of existing drains - All existing chambers and gullies to be abandoned as part of the proposed works shall be treated in the same way as abandoned sewers in accordance with clause 506.3 of the Specification for Road Works. Where sewers or drains, chambers and gullies to be abandoned are within the limits of the proposed road, the Contractor shall break out and remove those parts that would be above 600mm below the underside of the road construction including the capping layer where one is provided. Foam concrete may be used in place of ST2 where specified in Clause 506.3.

1.17 Manholes shall be constructed in accordance with Series 500 of the NRA RCD's. Catchpits shall be constructed in accordance with NRA RCD/500/9, amended such that the chamber walls and cover slab are constructed in accordance with NRA RCD/500/4.

1.18 Concrete requirements for cast in situ chambers – Not Used.

1.19 Requirements for corrugated galvanised steel chambers – Not Used.

1.20 All Foul Sewer Manholes shall be watertight. On completion, the infiltration of ground water into the manhole shall not exceed 5 litres per hour.

1.21 Chamber covers, gratings and frames shall be manufactured from spheroidal graphite (ductile) cast iron and comply with I.S. EN 124:1994 with the following proviso:

a) Class A15 shall not be permitted within the new carriageway verges, slopes or areas adjacent to the new carriageway boundary fence;

b) Class C250 shall be used as a minimum standard of ironwork situated within any area of carriageway verges, slopes or areas adjacent to the new carriageway boundary fence.

c) Class D400 shall be used as a minimum standard for ironwork situated within any area of pavement.

The minimum chamber cover opening is 600mm diameter.

1.22 Gully gratings shall have a minimum clear waterway area of 90,000mm^2.

1.23 Requirements for setting existing covers and gratings to level if different from the requirements of sub-Clauses 507.19 and 508.8 – Not Used.

1.24 Gullies shall be un-trapped in accordance with NRA RCD 500/14.

1.25 In situ concrete gullies – Not Used.

1.26 Gully gratings and frames and fittings shall comply with I.S. EN 124 Class D400.

1.27 Gully gratings are to be flat.

1.28 Whether saddles are permitted – on agreement with the Employer's Representative.

1.29 Requirements for the cleaning of chambers, gullies and drains – in accordance with Clause 509.5.

1.30 Requirements for permeability testing of backfill material where required – Not Used.

1.31 Details of connecting existing land drains – Not Used.

1.32 Severed mole drains are to be intercepted by construction of a land drain.

1.33 The values of pipe stiffness and impact resistance for plastic pipes are as follows:

a) ultimate pipe stiffness (STES) in excess of 1400 N/m2 when tested in accordance with BS 4962; and

b) resistance to impact complying with BS 4962 except that the striker used in the test shall have a mass of 1kg and a 25mm hemispherical radius.

1.34 Structure drainage requirements are shown on the drawings and scheduled in Table 5/1/1 in this Appendix.

Note: The information listed in the drainage/ducting schedules shall be confirmed by reference to the drawings and the site conditions/measurement.

APPENDIX 5/1

Table 5/1/1
Substructure Drainage Schedule

Item	Unit	Quantity
Str02 MacMurrough Island Bridge 2 WX-N30-008.00 Retaining Wall		
Back of structure drainage hollow block drainage layer	m^2	103
Rodding eye	No	2
Filter drain in accordance with the details described on the drawings	m	20
Connection to 150mm dia carrier drain	No.	1
Drain 150mm dia OGGE pipe surrounded in no fines concrete	m	40
Outlet to swale in accordance with the details described on the drawings	No.	1

Measured as an item in "Drainage to Structure – Main Construction" in the Pricing Document.

Item	Unit	Quantity
Str04 Ballybing Culvert WX-N25-001.00		
Back of structure drainage hollow block drainage layer	m^2	58
Rodding eye	No	2
150mm dia carrier drain surrounded in Mix ST1 concrete	m	10
Connection to 150mm dia carrier drain	No.	2
Drain 150mm dia OGEE pipe surrounded in no fines concrete	m	60
Chamber to RCD/500/4	No.	3
Headwall outlets in accordance with the details described on the drawings.	No.	3
Non return double hung cast iron flap valve with corrosion resistant fitting for 150mm dia carrier drain	No.	3

Measured as an item in "Drainage to Structure – Substructure End Supports and Main Span" in the Pricing Document.

APPENDIX 5/1
Table 5/1/3
Manhole Schedule

Manhole Ref. No	Location	Eastings / Northings	Invert[3] Level (m)	Cover*[4] Level (m)	Depth to[1] Invert (m)	Outlet Pipe Dia. (mm)	M.H.Type	No. of Steps	No. of Connections	Cover Class
Str04 Ballybing Culvert WX-N25-001.00										
Refer to Table 5/1/1 for details or chambers and rodding eyes										
BC-C-01	Str04 Ballybing Culvert	See Drawing no 1700-ST04-001	10.850	12.220	1.37	150	NRA RCD 500/4 Type C	5	3	A 15
BC-C-02	Str04 Ballybing Culvert	See Drawing no 1700-ST04-001	10.850	11.720	0.87	150	NRA RCD 500/4 Type C	3	2	A 15
BC-C-03	Str04 Ballybing Culvert	See Drawing no 1700-ST04-001	10.850	12.000	1.15	150	NRA RCD 500/4 Type C	4	3	A 15

Notes:

1. Depth is from cover level.
2. Existing invert levels to be verified on site before commencing construction.
3. Cover level is for guidance only and must be verified on site.

APPENDIX 5/1
Table 5/1/5
Pipelines Schedule

From	Invert Level (mOD)	To	Invert Level (mOD)	Pipe Diameter (mm)	Length c/c (m)	Gradient (%)	Drain Type	Bed Type	Depth 0.0m to 2.0m		Depth 2.0m to 4.0m		Depth 4.0m to 6.0m		Comments
Manhole Ref		Manhole Ref							Length (m)	Average Depth to Invert (m)	Length (m)	Average Depth to Invert (m)	Length (m)	Average Depth to Invert (m)	
Str04 Ballybing Culvert WX-N25-001.00															
Gully BC-G-01	12.310	BC-C-03	10.85	150	7	1%	SS	Z	7	1.0	-	-	-	-	-
Gully BC-G-02	12.079	BC-C-01	10.85	150	15	1%	SS	Z	15	1.1	-	-	-	-	-
Connects drainage ditch to Manhole BC-C-01	10.94 (outlet)	BC-C-01	12.26 (inlet)	300	55	2.4%	SS	Z	55	1.1	-	-	-	-	-
Connects drainage ditch to Manhole BC-C-01	10.92 (outlet)	BC-C-01	12.28 (inlet)	300	55	2.5%	SS	Z	55	1.1	-	-	-	-	-

Notes

1. Drain Types: FD = French Drains, FS = Foul Sewer, SS = Surface Water Sewer
2. Average Depths are measured from the Earthworks Outline to invert of pipe

APPENDIX 5/1
Table 5/1/6
Gullies Schedule

Location	Eastings / Northings	Gully Grate Type	Pipe Length metres	Notes
Str04 Ballybing Culvert WX-N25-001.00	BC-G-1	R	7	-
Str04 Ballybing Culvert WX-N25-001.00	BC-G-2	R	15	-

APPENDIX 5/2
Service Duct Requirements

1. Ducts shall be located as shown on the drawings in the Contract and in the Schedule to this Appendix.

2. Schedules of service duct requirements are contained in Appendix 5/2 Table A. (Note: The information listed shall be confirmed by reference to the drawings and site conditions/measurement).

3. Ducts in verges, to be installed by the Contractor in connection with privately and publicly owned services, are detailed in the Schedules to this Appendix and shall be constructed in accordance with the drawings.

4. Ducts under carriageways, to be installed by the Contractor in connection with privately and publicly owned services, are detailed in the Schedules to this Appendix and shall be constructed in accordance with RCD/500/61.

5. Two-Way Ducts and more shall be constructed to the details shown on RCD/500/61 and as listed in the Ducting Schedules.

6. Marker Tape shall be provided to ducts as follows:

Public Lighting ducts:	As Specification Clause 1421.14 / 573
ESB ducts:	As Specification Clause 573

7. Colour coded ducting shall be used for the following companies:

ESB	Red
Eir	Black
Water Services	Blue
Telecommunication	Green
Spare Ducts	Orange

8. Permanent marker blocks and location posts for transverse ducts shall be installed as required in accordance with RCD/500/50 and the relevant schematic layouts detailed on RCD/500/53.

Where ducts traversing the road carriageway do not terminate in a cable chamber, their positions shall be dimensioned to an existing feature detail on neat plans supplied to the Employers Representative.

Permanent marker blocks and location posts shall be installed for longitudinal ducts that do not terminate at a chamber or pit.

9. All ducts shall be fitted with draw rope in accordance with Specification Clause 501.8.

10. Chambers for public lighting shall be constructed in accordance with RCD/500/64.

11. Chambers for Eir ducts shall be constructed in accordance with Eir requirements.

12. At tie-ins to existing ESB underground cable the cable shall be exposed and a jointing put forward by the Contractor to enable ESB to undertake required connection.

13. Ducts shall be watertight.

14. Marker blocks shall be provided at the ends of spare service ducts in accordance with RCD/500/60.

APPENDIX 5/2 – TABLE A
Schedule of Service Ducts

Spare Ducts

Pipe Type	Dia. and Number	Location	Drawing	Start Chainage	End Chainage	Length (m)	Bedding and Surround Material	Trench Backfill Material
*UPVC	150mm/2 No. spare ducts, blanked off at both ends	Str01 MacMurrough Island Bridge 1 WX-N30-007.00 – North Rubbing Strip	1700-ST01-001	As shown on drawing	As shown on drawing	23m	No fines verge concrete	No fines verge concrete
*UPVC	150mm/2 No. spare ducts, blanked off at both ends	Str01 MacMurrough Island Bridge 1 WX-N30-007.00 – South Rubbing Strip	1700-ST01-002	As shown on drawing	As shown on drawing	23m	No fines verge concrete	No fines verge concrete
*UPVC	150mm/2 No. spare ducts blanked off at both ends	Str02 MacMurrough Island Bridge 2 WX-N30-008.00 – North Rubbing Strip	1700-ST02-001	As shown on drawing	As shown on drawing	25m	No fines verge concrete	No fines verge concrete
*UPVC	110mm/2 No. spare ducts blanked off at both ends	Str02 MacMurrough Island Bridge 2 WX-N30-008.00 – South Rubbing Strip	1700-ST02-002	As shown on drawing	As shown on drawing	40m	No fines verge concrete	No fines verge concrete
*UPVC	150mm/2 No. spare ducts blanked off at both ends	Str04 Ballybing Culvert WX-N25-001.00 – North Verge	1700-ST04-001	As shown on drawing	As shown on drawing	15m	Sand complying with Table 5/4	Mix ST2 concrete
UPVC	180mm/1 No. spare duct blanked off at both ends	Str06 Ballintrane Bridge CW-N80-006.00 – North Verge	1700-ST04-001	As shown on drawing	As shown on drawing	23m	Sand complying with Table 5/4	Mix ST2 concrete
UPVC	150mm/1 No. spare duct blanked off at both ends	Str06 Ballintrane Bridge CW-N80-006.00 - North Verge	1700-ST04-001	As shown on drawing	As shown on drawing	23m	Sand complying with Table 5/4	Mix ST2 concrete
UPVC	150mm/2 No. spare ducts blanked off at both ends	Str06 Ballintrane Bridge CW-N80-006.00 – South Verge	1700-ST04-001	As shown on drawing	As shown on drawing	46m	Sand complying with Table 5/4	Mix ST2 concrete

* Measured under 'Item' in Service Ducts in Superstructure Bill

** Measured under Item in Service Ducts in Sub-structure End Supports and Main Span

Eir Ducts

Pipe Type	Dia. and Number	Location	Drawing	Start Chainage	End Chainage	Length (m)	Bedding and Surround Material	Trench Backfill Material
*UPVC	110mm/2 No. Eir ducts blanked off at both ends	Str04 Ballybing Culvert WX-N25-001.00	1700-ST04-001	As shown on drawing	As shown on drawing	20m	Sand complying with Table 5/4	Mix ST2 concrete
*UPVC	110mm/2 No. Eir ducts	Str03 MacMurrough Island Farm Pass WX-N30-009.00 – South Rubbing Strip	1700-ST03-002	As shown on drawing	As shown on drawing	29	No fines verge concrete	No fines verge concrete

* Measured under 'Item' in the Service Ducts in Superstructure Main Span Bill

Water Services

Pipe Type	Dia. and Number	Location	Drawing	Start Chainage	End Chainage	Length (m)	Bedding and Surround Material	Trench Backfill Material
PE	200mm dia galvanised steel duct for 100 uPVC Watermain	Str04 Ballybing Culvert WX-N25-001.00	500-ST04-002	As shown on drawing	As shown on drawing	6m	Mix ST2 concrete	Mix ST2 concrete
PE	350mm dia galvanised steel duct for 250 HPPE watermain	Str04 Ballybing Culvert WX-N25-001.00	500-ST04-002	As shown on drawing	As shown on drawing	6m	Mix ST2 concrete	Mix ST2 concrete

APPENDIX 5/2 – TABLE B

Schedule of Service Duct Chambers and Drawpits

Service	Chamber Type	Location	Number	Drawing No.
Eir	JB4	Str03 MacMurrough Island Farm Pass WX-N30-009.00 North Verge	2	1700-St03-002
Eir	JB4	Str04 Ballybing Culvert WX-N25-001.00 North Verge	1	500-ST04-002

APPENDIX 5/2 – TABLE C

Schedule of Air Valve Chambers

Service	Chamber Type	Location	Number	Drawing No.
300mm dia watermain	See RCD 2700/7&8 and drawings	Str04 Ballybing Culvert WX-N25-001.00	2	500-ST04-002 & 003
150mm dia watermain	See RCD 2700/7&8 and drawings	Str04 Ballybing Culvert WX-N25-001.00	2	500-ST04-002 & 003

APPENDIX 5/2 – TABLE D

Schedule of Hydrant Chambers

Service	Chamber Type	Location	Number	Drawing No.
300mm dia watermain	See RCD 2700/9&10 and drawings	Str04 Ballybing Culvert WX-N25-001.00	1	500-ST04-002 & 003

APPENDIX 5/2 – TABLE E

Schedule of Sluice Valve Chambers

Service	Chamber Type	Location	Number	Drawing No.
300mm dia watermain	See RCD 2700/4 Type A and drawings	Str04 Ballybing Culvert WX-N25-001.00	3	500-ST04-002 & 003
300mm dia watermain	See RCD 2700/4 Type A1 and drawings	Str04 Ballybing Culvert WX-N25-001.00	1	500-ST04-002 & 003
150mm dia watermain	See RCD 2700/4 Type A and drawings	Str04 Ballybing Culvert WX-N25-001.00	2	500-ST04-002 & 003
150mm dia watermain	See RCD 2700/4 Type A1 and drawings	Str04 Ballybing Culvert WX-N25-001.00	2	500-ST04-002 & 003

APPENDIX 5/3
Surface Water Channels, Swales and Drainage Channel Blocks

Surface water drainage chambers shall be provided at locations and to the details described on the drawings.

APPENDIX 5/7
Drainage and Service Ducts: NRA Road Construction Details

Clause No.	Road Construction Detail Drawing No.
503.3 (i)	RCD/500/20 & 21
503.3 (iii)	RCD/500/20 & 21
505.7	RCD/500/20
507.1	RCD/500/1 to RCD/500/6 and RCD/500/16
507.7	RCD/500/15
508.1	RCD/500/11 & 12
508.4	RCD/500/14
509.11	RCD/500/62
514.10	RCD/500/41
519.4	RCD/500/20

APPENDIX 6/1
Requirements for Acceptability & Testing etc. of Earthworks Materials

1. Acceptable Limits

The permitted classes, acceptable limits and material properties required for acceptability for the fill materials are given in Tables 6/1 and 6/2 of the specification.

The Acceptable Limits for the classification of materials in addition to those described in Table 6/1 of the specification are shown on Table 6/1 in this Appendix.

Drawings showing the locations of zoning of general and selected fills are as follows:

Element	Drawings
Str01 MacMurrough Island Bridge 1 WX-N30-007.00	Refer to Works Requirements Volume A Part 1
Str02 MacMurrough Island Bridge 2 WX-N30-008.00	Refer to Works Requirements Volume A Part 1
Str03 MacMurrough Island Farm Pass WX-N30-009.00	Refer to Works Requirements Volume A Part 1
Str04 Ballybing Culvert WX-N25-001.00	Refer to Works Requirements Volume A Part 1
Str05 Glebe Bridge WX-N11-003.00	Refer to Works Requirements Volume A Part 1
Str06 Ballintrane Bridge CW-N80-006.00	Refer to Works Requirements Volume A Part 1
Str07 Boggan Bridge CW-N80-004.00	Refer to Works Requirements Volume A Part 1
Str08 Closh Bridge CW-N81-001.00	Refer to Works Requirements Volume A Part 1

Table 6/1 - Acceptable Earthworks Limits

Class	Property	*Acceptable Limits*	
		Lower	***Upper***
1A	Grading	Table 6/2	Table 6/2
	Uniformity Coefficient	10	-
	mc	5	15
1B	Grading	Table 6/2	Table 6/2
	Uniformity Coefficient	-	10
	mc	5	15
1C	Grading	Table 6/2	Table 6/2
	Uniformity Coefficient	5	-
	Los Angeles Coefficient	-	50
2A	Grading	Table 6/2	Table 6/2
	MCV	8	13
	Undrained shear strength	50kPa	150kPa
2B	Grading	Table 6/2	Table 6/2
	MCV	8	13
	Undrained shear strength	50kPa	150kPa
2C	Grading	Table 6/2	Table 6/2
	MCV	8	-
	Undrained shear strength	50kPa	-
2D	Grading	Table 6/2	Table 6/2
	MCV	8	13
	Undrained shear strength	50kPa	150kPa
4	Grading	As for Class 2 Table 6/2	As for Class 2 Table 6/2
	MCV	5	15
	Undrained shear strength	40kPa	-
5A	Grading	-	Clause 618
5B	Comply with BS3882		
6C	mc	omc-1.5%	omc+0.5%
6H	mc	omc-1.5%	omc+0.5%
	MCV	8	13
6I	mc	omc-1.5%	omc+0.5%
	Ø'	36^{o}	-
	c'	0	-
	Coefficient of friction and adhesion	0.7	-
6J	mc	omc-1.5%	omc+0.5%
	Ø'	36^{o}	-
	c'	0	-
	Coefficient of friction and adhesion	0.7	-

Class	Property	*Acceptable Limits*	
6N1	As Class 6N with:		
	mc	omc-1.5%	omc+0.5%
	Ø'	35^{o}	45^{o}
	c'	0	-
6N2	mc	omc-1.5%	omc+0.5%
	Ø'	36^{o}	-
	c'	0	-
6P	mc	omc-1.5%	omc+0.5%
	Ø'	36^{o}	-
	c'	0	-
	Slope stability	1:1.5 h/v	
6P(i)	As Class 6P with:		
	mc	omc-1.5%	omc+0.5%
	Ø'	35^{o}	45^{o}
	c'	0	-
	Slope stability	1:1.5 h/v	
8	MCV	8	13

Note 1: Moisture content shall be determined on portion of material passing 20mm sieve.

Note 2: Optimum moisture content by vibrating hammer method and moisture content shall be determined on portion of material passing 20mm sieve.

Note 3: N/A indicates no value applied in this specification.

Note 4: Compaction Requirements are defined for additional material classes only; all other requirements are given in Table 6/1.

2. Requirements for Determining Acceptability

The Employer's Representative will be responsible for Classifying earthworks materials. The Contractor will be responsible for the testing of earthworks materials. The testing types and frequency for Earthworks Materials are given in Appendix1/5. Facilities shall be provided to allow the Employer's Representative to supervise any or all tests. The procedure for submission of test results shall be as follows.

At least one week prior to excavation of material from Cut or Borrow Area intended for use as Acceptable Material on site, the Contractor shall give 24 hours notice to the Employer's Representative of his intention to excavate Trial Pits for the purpose of sampling.

At least one week prior to excavation of imported materials intended for use as Acceptable Material on site, the Contractor shall give 48 hours notice to the Employers Representative of his intention to obtain samples of materials at the source location for the purpose of earthworks classification.

The location of the Trial Pits shall be agreed with the Employers Representative and shall be generally at a spacing to give one Trial Pit in the proposed Acceptable Material. Facilities shall be provided for the taking of duplicate samples by the Employers Representative.

Laboratory testing shall be carried out to show compliance of material with Tables 6/1, 6/2 and Appendix 6/1. Laboratory testing shall be carried out with regard to maximising the use of materials encountered on site.

Earthwork materials shall be tested and classified at the site of deposition and excavation as required by the testing schedule of Appendix 1/5.

Trial Pit sampling shall be in accordance with BS 5930:1981 Code of Practice for Site Investigations (British Standards Institution).

Acceptable Material Classifications Hierarchy (in order of decreasing importance):

- Topsoil (5A)
- Starter Layer Materials
- Selected Granular Fill Classes
- Class 1 Materials
- Class 2 Materials
- Class 4 Material
- Other classes not covered above

Materials won on site shall be separated according to this classification hierarchy and used for the specific purpose to which that class of material has been allocated in the specification and on the earthworks design drawings. The Contractor will be responsible for ensuring the maximum use of materials encountered on site.

3. Processing of Unacceptable Material Class U1

Where a particular class of material required in the earthworks construction is proven to the Employer's Representative not to be available from areas of cutting or where there is a proven shortfall in the quantity of a particular class of material required the Contractor may process Unacceptable Material Class U1 so that it complies with the permitted constituents and material properties of Table 6/1 for the required class of material. The use of other classes of Acceptable Material in the processing of unacceptable material (e.g. in mixing) shall only be allowed with the permission of the Employer's Representative.

4. Groundwater

Pumping or discharge of groundwater or surface water run-off into existing watercourses or sewers shall only be permitted upon provision of a detailed Method Statement which addresses the requirement of IFI, the Office of Public Works and all other relevant authorities to the Employer's Representative and its subsequent approval.

APPENDIX 6/2
Requirements for Dealing with Class U2 Unacceptable Material

1. General

For the purposes of this Contract, Unacceptable Material Class U2 shall be as defined in Clause 601.3 of the Specification, where hazardous chemical properties shall include in its definition material containing biodegradable (putrescible) material (i.e. capable of producing landfill gas) or containing leachate or capable of producing leachate or containing asbestos or containing petroleum products or contaminated with hydrocarbons or contaminated with invasive species.

2. Provisional Measures for Dealing with Unacceptable Material Class U2

The Contractor shall advise the Employer's Representative immediately and make arrangements to have an approved Sub-Contractor, specialising in the investigation of such material, to carry out sampling and testing of suspected hazardous material.

Where this material is identified as Class U2, the Contractor shall liaise with the Employer's Representative and make arrangements for this material to be excavated temporarily stockpiled on site and removed off site by a specialist waste-disposal sub-Contractor approved by the Employer's Representative and disposed of to a properly licensed landfill site subject to the approval of the Environmental Protection Agency. No material shall leave the site without the approval of the Employer's Representative. The Contractor shall keep records of the materials removed and shall obtain the Employer's Representative's authentication of the records.

Any material that is required to be temporarily stockpiled on the site will be stockpiled at a location agreed by the Employer's Representative. Protective measures shall include placing and covering the material with an impermeable polyethylene membrane minimum thickness 1.5mm. The stockpile will be made watertight to the satisfaction of the Employer's Representative.

Excavations into or adjacent to landfill wastes may encounter concentrations of landfill gas or other hazardous substances. The Contractor shall take all measures necessary to protect site staff, adjacent landowners and members of the public from any harmful effects arising from his operations.

Groundwater/Leachate from contaminated areas shall not be discharged to public or private surface water or foul sewers, nor to watercourses without prior approval from the appropriate authority. Should groundwater or leachate be found in contaminated areas, it shall be contained so as to prevent contamination of uncontaminated ground, prior to disposal off site.

The Contractor shall prepare appropriate Method Statements and safety plans to cover any such operations which will be subject to the approval of the Employer's Representative.

APPENDIX 6/3
Requirements for Excavation, Deposition, Compaction

1. The requirement for excavation, deposition and compaction are shown on the relevant drawings are included in the Works Requirement (Volume A Part 1).

2. Blasting for Excavation
Blasting for excavation is not permitted.

3. Cutting Faces
Undercutting Restrictions
Excavation of undercuttings shall comply with Clause 603 of this Specification. Undercuttings at the toe of slopes shall be adequately supported to prevent the failure of the slope. These cuttings shall be kept free of all standing water, with dewatering if required, to be in a controlled manner so as not to disturb the fines in adjacent soils.

In general the Contractor shall ensure that undercuttings at the toes of slopes are adequately supported to prevent slope failure.

Slope Angles
All cut off drains and ditches alongside cuttings shall be completed and outfalls provided prior to the commencement of any adjacent earthworks excavation or filling operations.

Excavation supports and struts shall be removed progressively as backfilling occurs, except where otherwise shown on drawings or directed by the Employer's Representative.

Temporary unsupported slopes in cutting for excavations other than trenches shall not be constructed steeper than 1 horizontal:1 vertical for excavations exceeding 1.5 metres deep but not exceeding 3 metres deep.
Temporary unsupported slopes in cutting for excavations greater than 3 metres deep shall not be constructed steeper than 1 horizontal:2 vertical.

When cutting is located in rock the slope angle of the cutting face may be altered in agreement with the Employer's Representative to suit the bedding and dip of the rock.

Clearing Loose Material
In areas of excavated rock, all loose material shall be cleared from the finished rock face by airline hose or water hose with a maximum pressure of 7.5bar.

Making Good Prior to Topsoiling
Isolated patches of soft/fragmented or insecure material shall be excavated and filled by well ramming in a class of fill with similar characteristics to the surrounding intact material.

4. Watercourses including Ditches
In general, the clearance of redundant watercourses shall involve excavation around the watercourse profile to a depth of 500mm below the bed and to 3m perpendicular to the watercourse channel measured from the top of the bank. Where soft and/or silty material is present beyond the limits of excavation, further excavation shall take place at the direction of the Employer's Representative.

Where the stream bed or banks are continuous naturally occurring rock, the excavation may be stopped in that location within the general limits at the direction of the Employer's Representative.

Redundant watercourses are to be back filled either with Class 1 material generally, capping layer material when in close proximity to the sub-formation (as indicated on the Earthworks Drawings) or when fill is to be placed below standing water Class 6A material shall be used.

5. Embankment Construction

Limits on Oversteepening or in Increase in Width

Side slopes of embankments and other areas of unsupported fills constructed with Class 1 material shall not be constructed with a side slope greater than 2 horizontal : 1 vertical.

Side slopes of embankments and other areas of unsupported fills constructed with Class 6 material shall not be constructed with a side slope greater than 1.5 horizontal : 1 vertical.

Side slopes of landscape fill areas, excluding landscape bunds, and other areas of unsupported fills constructed with Class 4 material shall not be constructed with a side slope greater than 2 horizontal : 1 vertical.

The width of embankment construction shall not exceed the limits of the earthworks outline indicated on the earthworks related drawings except where Clause 608.5 permits.

6. Starter Layers

Starter layers of Class 6B or 6C material shall be deposited as the first layer of fill above existing ground level following the removal of topsoil. The Starter Layer shall have a minimum thickness of 300mm as indicated on the drawings.

Starter Layer Material Class 6C shall be sourced by the Contractor prior to the commencement of Embankment construction.

Where processing of unacceptable material is required to obtain Class 6C material, this shall be undertaken in due time prior to the need to use such material in embankment construction.

7. Excavations that are Permitted to be Battered

Excavations for the construction of structure foundations may be battered.

Excavations for the clearance of watercourses and ditches are permitted to be battered. Excavations of soft spots and voids are permitted to be battered.

Benching prior to backfilling shall be to a method determined by the Contractor and subject to approval by the Employer's Representative.

8. Benching to Receive Fill

When fill is to be placed against natural slopes and earthworks sloping faces greater than 1 vertical:5 horizontal the slope receiving fill shall be benched. For benching the height of each step shall be at least 0.5 metres and the width of each berm should be approximately 1 metres.

9. Excavation Below Embankments & Below Formation Level in Cuttings

In areas of embankment construction where any material below the natural ground level (once topsoil has been removed) requires further excavation in the opinion of the Employer's Representative and in locations other than those identified as watercourses, ditches, solution infill features, swallow holes and other voids and treated accordingly, the material shall be excavated and backfilled with Class 6N material to the underside of any following Starter Layer or to the natural ground level that has been established following the removal of topsoil.

Plant and working method of isolated excavations shall be suited to the scale of each excavation and the materials to be handled and traversed.

All cuttings in areas which do not have rock present at formation level (where formation level is defined by a sub-base thickness of 150mm) will require further excavation to provide for a 600mm depth of Class 6F1 or 6F2 capping material under all locations of pavement construction.

Where rock is not encountered in cuttings during excavation of the capping layer, a 350mm depth of excavation will be required. Rock encountered during excavation of the capping layer shall be treated in accordance with Appendix 6/7.

APPENDIX 6/5
Geotextiles used to Separate Earthworks Materials

1. It is expected that the use of a geotextile to separate earthworks materials will be required in some of the following locations which will be confirmed by the Contractor with the Employers Representative following inspection:

- At the base and surrounds of excavations prior to backfilling with granular material

2. Geotextiles used for separating earthworks materials shall comply to BS8006 and EN965.

3. Geotextile maybe synthetic or other fibre that complies with the properties below.

4. The Contractor shall provide evidence to the Engineer before a geotextile is incorporated in the Permanent Works, that the geotextile will be sufficiently durable and maintain its integrity for in excess of 120 years, when installed in contact with the materials to be separated.

5. The manufacture will be required to provide samples, 3 metre square, for retention by the Engineer, for comparison with material supplied to site.

Physical Properties
(All geotextiles used shall have the following physical properties unless otherwise specified in the Specification).

6. The quality of the fibre polymer and structure of the filaments shall be such that heat fusion of the overlaps can be undertaken when the geotextile is to be installed as a subgrade separator. Alternatively, the overlap between adjoining layers of geotextile shall be not less than 0.5 metres.

7. The geotextile polymer shall be of sufficient quality to resist the effect of acid and alkali solutions in the Ph range 2-13.

8. The geotextile shall be especially resistant to the long term effects of contact with damp cementitious surfaces whenever installation against such components is required by the Engineer. Manufacturers will be required to substantiate performance in this respect if requested to do so by the Employers Representative.

9. Details of laying and lapping as described in Clause 609.5.

10. A minimum of five test specimens from each sample shall be taken to test the wide strip tensile strength of the geotextile in each of the two principal directions. A minimum of four specimens from each sample shall be taken to test the water flow rate and the number of flow runs per test piece shall be a minimum of four.

11. Five test pieces from each sample having dimensions exceeding the dimensions of the sieve shall be taken to provide a mean of 0.12mm for 090 pore size, as determined by BA6906: Part 2.

12. Geotextile meeting the criteria given in Clause 609.4 shall be defined as Grade 1 for the purpose of this Contract.

APPENDIX 6/6
Fill of Structures & Fill Above Structural Foundations

1. Class 6N material requires full scale trial to demonstrate that material is stable when it is trimmed to a slope of 1 vertical to 1.5 horizontal in accordance with CL 610.6.

2. If the Contractor, in placing and compacting structural fill, underfills the required profile, the Contractor shall NOT make good the undertill by placing and compacting on the slope. The Contractor shall cut back the area of underfill in such a manner so as to allow the placement and compaction of the underfilled area as specified in Clause 610. All additional works associated with cutting back, refilling and compacting shall be at the Contractor's expense.

3. In addition to the requirements of Clause 610, class 6N1 shall be used in locations as specified on the drawings. The material shall comply with the requirements of Table 6/1 as amended in Appendix 6/1. The upper bound value of ∅' peak for Class 6N1 shall be established by laboratory testing of the source material (not less than three shear box tests per 500m^3 of stock pile material) to demonstrate a ∅' peak not exceeding 45^0 and not less than 35^0. The drawings indicate the minimum lateral extents for backfill materials and the Contractor shall satisfy himself that his material is stable at the timed batters shown on the drawings as required in Clause 610.6.

4. Contract Drawings show the locations of zoning of general and selected fills.

APPENDIX 6/7
Sub-Formation, Capping, Preparation and Surface Treatment of Formation

1. Capping is to be provided as indicated on the Drawings

2. Capping shall be constructed with Class 6F1 or Class 6F2 material complying with Table 6/1. All capping shall be non-frost susceptible.

3. In cuttings where rock is present at formation level (based on a sub-base thickness of 150mm), the Employer's Representative shall inspect the formation and may direct further excavation and placement of regulatory course to take place to achieve the tolerances as described below or continue excavation to the full sub-base depth.

4. Where excavation has taken place to full sub-base depth on instruction of the Employer's Representative, the Employer's Representative shall again inspect the formation and direct further excavation to achieve the tolerances as described below or continue excavation to provide the required depth of capping layer.

5. Where rock is present at formation level and at the direction of the Employer's Representative, the material shall be excavated a minimum depth of 75mm below formation level such that the surface level of any part of the excavation is below +20mm of the proposed formation level. The exposed excavation shall then be regulated by depositing Clause 804 material so that the surface level tolerance of the completed formation is within +20mm and -30mm relative to its designed level.

6. Where rock is encountered during excavation of the capping layer, the Employer's Representative shall inspect the extents of the rock surface and direct excavation to continue to sub-formation level at either a depth determined by the Employer's Representative, or to the original proposed level of the sub-formation. Whereupon the surface of the sub-formation shall be excavated to a minimum depth of 75mm such that the surface level of any part of the excavation is below +20mm of the determined sub formation level design.

7. The exposed excavation shall then be regulated by depositing capping layer material so that the surface level tolerance of the completed formation is within +20mm and -30mm relative to the design level.

APPENDIX 6/8
Topsoiling, Grass Seeding and Turfing

1. All verges and side slopes are to be topsoiled, fertilised and seeded (Treatment I) as per Clause 618.4 (i) as shown on the drawings in the Contract.

2. The expected depth and extents of topsoil to be stripped in cuttings and under areas of embankments is shown on the Drawings.

3. All Class 5A topsoil arising from the site in excess of the requirements for topsoiling shall be disposed off site by the Contractor.

4. Topsoil is to be spread to a depth of no less than 150mm.

5. Where topsoiling on slopes greater than 1:8 is required to a thickness greater than 225mm, a soil retention/erosion geotextile system as described in Appendix 6/5 shall be fixed and filled.

APPENDIX 6/9
Earthworks Environmental Bunds, Landscape Areas, Screening Mounds, Strengthening Embankments

1. The locations of landscaping are shown on the drawings for this Contract. A row of semi-mature evergreen trees is to be provided along the top of the retaining wall at Str 02 McMurrough Bridge No. 2 at the location shown on the Contract drawings. The exact variety of the proposed trees is to be agreed with the Employer. Details of Accommodation Works are given in Schedule 1/15-1 of Appendix 1/15.

APPENDIX 6/10
Ground Anchorage, Crib Walling and Gabions

1. Ground Anchorages for Glebe Bridge Spandrel Wall

1.1 Ground anchorage in the form of:

i) permanent bar anchor system GEWI Threadbar by Dywidag System International Ltd. or approved equivalent provided in accordance with EN 1537 shall be provided at the locations and to the details described on the drawings with double corrosion protection.

2. Submissions to the Employer's Representative

2.1 The Contractor shall submit to the Employers Representative for acceptance a detailed Method Statement containing, but not limited to the following issues at least 7 days in advance of ordering material for installation:

i) Detailed information on the materials and equipment intended for use, including all Manufacturer's specification and test certification.

ii) Methods of installation.

iii) Details of temporary casing to prevent hole collapse and methods for withdrawal.

iv) Proposals on the time when the Contractor intends to carry out the load tests and how it co-ordinates with the construction programme.

v) Detailed description of equipment used for load testing (including calibration certificate for load cell or pressure gauges).

vi) Test programme and detailed description of the execution for the different load tests specified in this Appendix.

vii) Ground Anchor Grout cement mix design.

3. Materials

3.1. Ground Anchors

i) Ground anchor tendons shall be Grade 500 / 600 GEWI - Steel Threadbar as described on the drawing and shall only be supplied by Dywidag Systems International, except as agreed by the Employers Representative, constructed in accordance with EN 1537. Anchor components to be in accordance with ETA 05/0123 (bar post-tensioning system).

ii) Load transmitting parts such as thread, face plate, washer, nut or couplers shall have at least the same characteristic strength as the anchor itself and shall be compatible with the proposed anchor.

iii) Permanent anchors will require double corrosion protection. The presence of grout used to anchor the bolt in the ground is not considered as a corrosion barrier. A double protection corrosion system is required.

iv) Anchors shall be supplied in minimum total lengths and with the minimum bond lengths as detailed below and on the design drawings, or as approved by the Employers Representative.

v) All anchors shall be full-column grouted. Provision shall be made to permit the free length of the tendon to move without restriction after the hole has been grouted so that re-stressing can be carried out at any time during the life of the bolt.

vi) The dimensions of face plates shall be as described on the drawings. The shape of the face plate shall allow a uniform seat, even if the anchor is not installed exactly perpendicular to the surface below.

vii) Washers and nuts or specially shaped face plates shall allow the secure transfer of the bolt force to the face plate. After installation the anchors shall be equipped with plate, nut and other accessories as necessary or required by the Employers Representative. Face plates shall be bedded such that the bolt passes concentrically through the plate and the plate is loaded evenly during stressing. All bearing surfaces shall be clean prior to stressing. The nuts, washers and bolts shall be protected on all seating surfaces by a corrosion inhibiting grease or wax mastic which shall be applied during

assembly. Steel caps filled with corrosion inhibiting sealant shall be fitted over the exposed tendon and locknut.

viii) Couplers, centralisers, and type of grouting shall be used according to the recommendations of the Manufacturer and the results of site trials. The number of joints in the bar anchor shall be kept to a practical minimum and protection to the same standard as on the rest of the tendon shall be applied to the coupling. No joints shall be permitted within the bond length. The Contractor shall present to the Employers Representative for agreement, details of the bolt system including methods of corrosion protection he is intending to use in the Works. The Contractor shall prove that the bolt system is capable of fulfilling the design requirements in the long term.

All anchor components including end termination units shall have a 120 year design life. Minimum Drill hole diameter 150mm, at 30° declination or as detailed on drawings. Anchors shall have the following Characteristic loads and Characteristic yield strengths:

Anchor	Nominal Steel Diameter (mm)	Minimum Borehole Diameter (mm)	Characteristic Yield strength (kN)	Proof /Max. Test Load (kN)	Preload (kN)	Unfactored Characteristic Load (kN)	Factored Design Load EN1997 DA1 (kN)	Product name or Equivalent	Load Test Criteria
A1-5	25mm	150mm	245kN	23 kN	12 kN	21 kN	28 kN	Permanent bar anchor with double corrosion protection Free length = 2.5m Bond length = 5.5m	NA
T1 (Suitability Test)	25mm	150mm	245kN	31 kN	12 kN	21 kN	28 kN	Permanent bar anchor with double corrosion protection Free length = 2.5m Bond length = 5.5m	Load cycle 10kN, 15kN, 10kN, 31kN, 10kN

(Preload = 60% of Unfactored Working Load)

3.3. Grout

i) Cement grout shall conform to the requirements of EN 1537. The grout shall have a minimum cube strength of 40 N/mm^2 at 28 days.

ii) Resin grouts for anchor installation shall be used only if agreed by the Employers Representative.

4. Installation

4.1 General

i) Drilling of holes for anchor installation shall be in accordance with EN 1537 however, the radial tolerance described in Section 8.1.1 shall be reduced to 20mm and the maximum axial alignment deviation at set up should not exceed 1^0 degree and the deviation tolerance shall be limited to 1/60.

ii) The exact locations of ground anchors shall be as indicated on the design drawings. The detailed procedures to be adopted for the installation of the ground anchors shall be in accordance with the reviewed Method Statement.

iii) Holes shall be set out in the positions and drilled in directions shown on the drawings. The initial alignment of the hole shall be within vertical angular tolerance of +1° of the

specified alignment. The maximum permissible deviation from the designated line of a hole shall be 1 in 60, measured as the deviation of the centre line of the hole from that specified relative to the length of the hole.

iv) Holes shall be of such straightness and free of localised distortions that the anchor bars can be installed without undue force being applied. The lengths of holes shall be within 100mm of the specified lengths. The Contractor shall record for each drill hole the drill rate achieved per metre at 0.5m increments of length, loss of drilling fluid circulation and length. Records shall be provided to the Employers Representative within 24 hours of completion of drill holes for his review and approval.

v) All drilling plant shall be of modern rotary design capable of drilling holes of the specified diameter, length and inclination whilst complying with the maximum vibration and noise criteria specified in Appendix 1/9. DTH Percussion drilling methods will not be permitted under any circumstances. Prior to the installation of each anchor, drill holes shall be cleaned using water or compressed air to remove the debris. The Contractor shall not proceed to install ground anchors until the adjacent holes at each gridline have been drilled and approved by the Employers Representative or until at least 3 days after grouting of and adjacent hole at the same gridline.

vi) No welding of ground anchors shall be permitted and any extension shall be made using the proprietary coupler recommended by the Manufacturer of the anchor and accepted by the Employers Representative.

vii) The Contractor shall notify the Employers Representative of any ground anchors which couplers are proposed within the bond length in advance of ordering the materials. Unless accepted by the Employers Representative, couplers shall not be provided within the bond length of the anchors.

4.2. Anchors

i) Installation, storage and handling of anchors shall be carried out in accordance with the anchor manufacturer's recommendations and generally in accordance with the following Clauses.

ii) Installation of the anchor shall follow within 1 hour of the drilling and the preparation of the drillhole (cleaning of debris) unless otherwise agreed with the Employers Representative. Immediately prior to installation each anchor shall be carefully inspected for damage to the components. Anchors shall be lowered carefully into the holes at a controlled rate and measures, such as the fitting of funnels shall be taken to avoid damage to the protective layers at the entries to the holes. Anchors shall be provided with non corrodible centralisers (spacers) to Manufacturers recommendations to ensure correct location in the borehole.

iii) A smooth and regular surface shall be provided to seat the face plate by forming pads of quick-setting mortar. Where mortar pads are required they shall be a minimum of 10mm larger than the face plates and the edges shall be chamfered at 45 degrees. Care shall be taken to ensure the mortar does not interfere with the installed anchor.

iv) Two plastic hoses for grouting shall be attached to the anchor. One hose shall extend along the full hole length and a second one shall reach approximately 20 cm into the borehole.

v) Prior to tensioning, the anchor shall be secured by primary grouting along the tendon bond length to the surrounding ground to form the anchorage of the tendon bar. The bond length shall be grouted by use of an appropriate grouting system in accordance with EN 1537 and as agreed by the Employers Representative.

vi) After installation the anchor shall be equipped with plate, nut and other accessory as necessary or required by the Employers Representative.

4.4. Grouting

i) As soon as practicable the holes shall be filled with grout. Grouting shall be carried out in accordance with EN 1537 or EN 14490 as appropriate.

ii) No operation or movement of plant directly above the holes shall be allowed until such time that the compression strength of the grout has achieved 10 N/mm^2 and the Contractor shall provide temporary casing to the drill hole to prevent collapse until such

time as the grout is installed. Temporary casing shall be removed to ensure the grout soil interface provides the design resistance of the ground anchor/soil nail.

iii) Cement grout shall be mixed in a two compartment mechanically agitated colloidal grout mixer. The mixing time shall not be less than 3 minutes.

iv) The grouting shall be carried out by a return flow system to ensure the continuous circulation of grout to the hole and the return to the holding tank of surplus grout which is not accepted by the hole being injected. Depending on the inclination of the anchor, the longer plastic hose shall be used for grout injection (anchor inclined downwards) or for bleeding air (anchor inclined upwards). Any grout spilled on exposed parts or accessories of rock bolts including nut, washer, thread or plate shall be cleaned off thoroughly.

v) From the holding tank the grout shall pass through strainers into the suction of the grout pump. Provision shall be made for keeping the grout in the holding tank continuously agitated.

vi) The grout shall be pumped by a positive displacement type pump arranged with interconnecting pipes and valves. The return flow system shall operate such that grout takes can be measured from the holding tank and a constant grout pressure maintained to the hole throughout the grouting operations.

vii) Throughout the grouting operation pumping pressures must be limited so as not to cause any distress to the surrounding material, including existing masonry wall.

viii) Grouting shall be performed in a continuous operation and shall continue until the consistency of the grout return is the same as that of the injected grout. If, for any reason, grouting is interrupted or delayed beyond the setting period, the tendon shall be removed from the borehole. The grout shall then be removed by flushing or redrilling and the tendon installation and grouting procedures repeated.

ix) Initial grouting and secondary grouting shall permit re-stressing in accordance with this Appendix. The hole between the top of the grout already placed and the underside of the cover plate shall be filled with anti corrosion compound.

x) Unless otherwise approved by the Employers Representative, boreholes shall not be grouted when air temperature in the shade is lower than 3°C. Grouting shall not commence without the permission of the Employers Representative.

xi) Primary grouting shall be carried out over the bond length. Secondary grouting of the free length shall be carried out following tensioning.

4.5. Stressing

i) All stressing equipment used for tensioning the bolts shall be of a type compatible with the anchor system adopted.

ii) Stressing equipment shall be capable of tensioning the anchor to not less than the preload specified and up to 150% of the unfactored characteristic permanent and variable load.

iii) Where a torque stressing system is adopted it may be necessary to check the load in a representative number of bolts using a hydraulic jack.

iv) The stressing equipment shall allow the anchor to be initially tensioned and anchored in the specified increments and finally to allow the bolt to be check lifted to ascertain the load in the tendon if required.

v) The stressing equipment shall allow the elongation of the anchor to be measured to an accuracy of + 0.5mm.

vi) Hydraulic stressing equipment shall include 2 No. pressure gauges at least equal to BS EN 837-1 Class 2. Pressure gauges shall be supplied with a calibration certificate. Pressure gauges shall be mounted not more than 5m from the jack. Gauges shall be recalibrated after not more than 50 stressing activities or after 30 days whichever is the more frequent.

vii) The stressing equipment shall have a repeatability within the range of + 2 per cent of any given load over the range of operations.

viii) Tensioning shall be carried out only in the presence of the Employers Representative unless written permission has been obtained to the contrary.

ix) Stressing shall not commence until both the grout forming the fixed anchor and the bedding immediately below the anchor head have reached the specified strength for stressing. Daily, whilst grouting is in progress, samples of the grout shall be taken immediately prior to injection and test cubes shall be made, cured and tested in accordance with EN 196-1. The Contractor shall cast sufficient cubes to demonstrate that the grout has attained a compressive strength of at least 40 N/mm^2 before stressing. Samples of the mortar immediately below the bolt head shall be taken during concreting and test cubes shall be made and tested in accordance with EN 196-1. They shall be cured in similar conditions to the mortar to which they relate. The Contractor shall cast sufficient cubes to demonstrate that the mortar has reached a compressive strength of 40 N/mm^2 before stressing.

x) The Contractor shall establish the datum point for measuring extension and jack pressure to the satisfaction of the Employers Representative.

xi) The Contractor shall add to the forces described in the Contract an allowance for friction in the bolt head and jack losses. The total forces and calculated extensions shall be agreed with the Employers Representative before stressing is commenced.

xii) In working anchors scheduled for load testing, the stress in the anchor shall not exceed 50 per cent of their characteristic breaking strength immediately after anchoring. During load testing the value shall not exceed 80 per cent. All remaining working anchors shall be stressed and anchored at the lock off Preload.

xiii) The anchor shall be stressed at a gradual and steady rate. When stressing with hydraulic jack, the forces in the anchor shall be obtained from readings on two pressure gauges incorporated in the equipment.

xiv) When the stressing has been applied to the satisfaction of the Employers Representative, the anchor shall be anchored at the lock off Preload.

xv) Defective anchorages or anchors which are damaged or overstressed shall be replaced by the contractor at his own cost.

xvi) All necessary preparation of an anchor for grouting including attachment of tubes, shall be made before installation. After the anchor has been tensioned, the tension shall not be relaxed for grouting or any other purpose, unless required by the Employers Representative.

xvii) If any anchor does not pass the test criteria for on site acceptance or suitability tests the anchorages shall be deemed defective and another anchor shall be installed in a new hole(s) drilled at a location(s) agreed by the Employers Representative.

5. Trials and Testing

5.1 Testing of Materials

i) Sets of 4 cubes of cement grout shall be taken for each grout batch when installation of cement-grouted anchors is in progress. Samples shall be manufactured, cured and tested in accordance with EN 196-1 and EN 206-1.

ii) Test certificates shall be provided for tensile tests carried out at the Manufacturers Works in accordance with BS 4447, on portions of the anchor bars containing the threaded length.

5.3. Testing of Ground Anchors

i) Testing of ground anchors shall comply with the requirements of EN 1997 and EN 1537. Suitability tests shall be carried out on one sacrificial ground anchor under identical or comparable conditions to working anchors in accordance with EN 1537 in advance of installation of working anchors in general accordance with EN 1537 Test Method 1. Suitability maximum test load shall be 31 kN. The location of the suitability test shall be at location T1 or other suitable location as agreed with Employers Representative. The anchor subject to suitability test shall be cut back by 200mm from the face of the existing masonry and the existing masonry reinstated to the original profile and layout to the satisfaction of the Employers Representative.

ii) Acceptance tests shall only be carried out on scheduled working ground anchors in accordance with EN 1537, Test Method 1. Test load = proof load 110% characteristic permanent and variable load.

iii) Testing shall be carried out in accordance with EN 1537 and held for a minimum of 60 minutes. The suitability test anchor need not be excavated on completion of the tests. Detailed test procedures shall be agreed with the Employers Representative prior to commencement of the tests. The results of all suitability tests shall be reported to the Employers Representative a minimum of 2 days prior to the commencement of working anchor installation in the main works.

iv) All anchors shall be subject to on-site acceptance tests in accordance with the methods and products described in EN 1537.

5.4. Installation / Trial / Testing Records

i) Records of ground anchor installation, stressing and testing shall comply with the requirements of EN 1537 and shall be agreed with the Employers Representative.

ii) During drilling operations, the Contractor shall record all changes in ground conditions together with notes on water encountered, drilling rates and similar information and as required by the Employers Representative.

iii) During grout operations related to the installation of ground anchors/soil nails, the Contractor shall record data such as grouting location, age of constituents, air temperature, grouting pressure, quantity of grout injected, details of samples and tests as appropriate and similar information as requested by the Employers Representative.

iv) Details of the stressing procedure shall be recorded. The Contractor shall record information such as date of installation, forces, displacement, seating and other loss observed during all stressing operations and similar information as requested by the Employers Representative.

v) Testing shall be recorded in a similar manner as for the stressing procedure.

vi) The Contractor shall agree the format of all record sheets with the Employers Representative and shall maintain copies of all records on site and make them available to the Employers Representative at all times. Copies of all records shall be submitted to the Employers Representative within 24 hours of completion of each operation.

6. Gabions and Reno Mattresses

6.1 The locations and sizes gabions and Reno mattresses are shown on the Contract Drawings.

6.2 Unless otherwise indicated on the Drawings, mattress units shall be formed from plastic coated woven steel wire mesh, divided by partition panels (diaphragms) at 1m centres. Unless otherwise indicated on the Drawings, the mesh wire core shall be 2.0mm for mattress units. Mesh joints shall be flexible and shall consist of one and a half turns of wire. (This mesh is often called double or triple twist). All edges of the mesh shall be reinforced with a „selvage" wire, heavier than the mesh wire and not less than 3.40mm diameter for mesh type 8/2.7 and 2.40mm diameter for mesh type 6/2.0.

6.3 Unless otherwise indicated on the Drawings, mesh openings shall be hexagonal in shape, nominally 60 x 80mm (type 6) for mattresses.

6.4 The assembly and erection of the units shall be generally in accordance with the manufacturer's instructions, using lacing wire 2.2mm in diameter, of the same specification as the mesh wire. Particular care shall be taken throughout the construction to ensure tightness of mesh, well packed filing with minimum voids, and secure lacing. The exposed faces of completed work shall present a neat face and line, free from excessive bulges or depressions. Bulges or depressions greater than 50mm per m^2 of face is not permitted. Tolerance of +75mm both horizontally and vertically from setting out line is required under this contract.

6.5 For mattresses the Class 6G Stone size shall be 75 to 150mm but never more than two-thirds the thickness of the mattress. A tolerance of 5% of smaller material is acceptable.

APPENDIX 6/11
Swallow Holes and Other Naturally Occurring Cavities and Disused Mine Workings

1. Any natural cavities, voids or swallow holes encountered within the formation, where excavating in rock, shall be excavated to depth 200mm below the base of the weathered rock and backfilled with a lean wet-mix (C15) concrete to formation level. The Employers Representative shall determine the extent of weathered rock and whether further site investigation by probing is required.

2. Where directed by the Employers Representative probing shall extend 3.0 metres beneath formation level to a depth specified by the Employers Representative in areas of existing structural foundations. Probing shall be undertaken such that a 10m x 10m grid of investigation is used to define the extents of the scour holes, cavities and/or swallow holes in plan.

3. Following results of the probing, the areas of any weak material and/or voids should be evident, and if deemed necessary by the Employers Representative the following remedial measures shall be employed:

3.1 In areas of solution infill the weak material shall be excavated to a minimum depth of 200mm and to a maximum depth as directed by the Employers Representative below proposed formation or foundation level and backfilled with Class 1A or 1B material. The top 200mm of backfilling shall be with a lean wet-mix (C15) concrete to formation level.

3.2 In swallow holes or cavities the material surrounding the void shall be excavated to extents determined by the Employers Representative. The resulting void beneath formation or foundation level shall be backfilled to formation or foundation level with Class 1A or 1B material.

3.3 At existing scour holes the material surrounding the void shall be excavated to extents determined by the Employers Representative. The resulting void shall be backfilled with bedding layer and protected by armourstone and bedding.

3.4 In areas where solution infill, swallow holes or cavities have been identified or treated, a geotextile grade 2 shall be laid at sub-formation level. A geotextile as per EN 12956, EN 12958, EN 1897, EN 13738, EN 10319, EN 12236, EN 918 and EN 9864 consisting of a synthetic material shall be used having the following properties:

- Textile strength > 30 kN/m^2 (warp and weft)
- Static Puncture Resistance > 3000 N
- Permeability > 30 l/m²/s
- Apparent pore size O90 < 0.10 mm

Geosynthetic materials meeting these requirements shall be defined as Grade 3 for the purpose of this Contract.

The geosynthetic shall be laid at sub-formation level and overlaid with capping as per Specification. Overlaps of the geotextile shall be greater than 1.0m and bonded or heat fused as per manufacturer specification. The geotextile shall extend a minimum of 3.0 m beyond the extent of probing or trial pits in direction parallel and perpendicular to the direction of excavation.

APPENDIX 6/12
Instrumentation and Monitoring

1. Instruments

1.1 Instrumentation shall be installed as required:

- Vibration monitoring
- Noise monitoring
- Precision levelling

2. Schedule of Instruments

2.1 The extents of instrumentation required is shown in the following Schedule. The Contractor is to agree the positions on site with the Employers Representative and review the positions with the Employers Representative prior to any installation of equipment.

Table 6/1E Instrumentation Schedule

	Instrument Type	No. or Estimated Length (m)	Reading Frequency *
Str01 MacMurrough Island Bridge 1 WX-N30-007.00	Vibration Monitoring	2 No.	Daily
	Noise Monitoring	2 No.	Daily
Str02 MacMurrough Island Bridge 2 WX-N30-008.00	Vibration Monitoring	2 No.	Daily
	Noise Monitoring	2 No.	Daily
Str03 MacMurrough Island Farm Pass WX-N30-009.00	Vibration Monitoring	2 No.	Daily
	Noise Monitoring	2 No.	Daily
Str04 Ballybing Culvert WX-N25-001.00	Vibration Monitoring	2 No.	Daily
	Noise Monitoring	2 No.	Daily
Str05 Glebe Bridge WX-N11-003.00	Vibration Monitoring	2 No.	Daily
	Noise Monitoring	2 No.	Daily
Str06 Ballintrane Bridge CW-N80-006.00	Vibration Monitoring	2 No.	Daily
	Noise Monitoring	2 No.	Daily
Str07 Boggan Bridge CW-N80-004.00	Vibration Monitoring	2 No.	Daily
	Noise Monitoring	2 No.	Daily
Str08 Closh Bridge CW-N81-001.00	Vibration Monitoring	2 No.	Daily
	Noise Monitoring	2 No.	Daily

* Note:

(i) Reading frequency is indicative only and may be less or more frequent as determined by the Employers Representative.

(ii) See Section 7 of this Appendix for precision levelling.

3. Equipment, Installation and Reporting

3.1 Equipment shall consist of all necessary readout and ancillary equipment to maintain their operation during and after construction. The instruments shall be demonstrated to be in working order to the satisfaction of the Employers Representative, over the ranges specified both before and after installation.

3.2 All equipment installations and tasks involved in their operation including readings shall be carried out by suitably qualified and experienced personnel using the techniques described in this Clause. Prior to the installation of the first Instrument Type the Contractor shall provide the Employers Representative with a method statement outlining the names and relevant qualifications/experience of the operatives undertaking installation and operation of each Instrument Type. The Employers Representative shall approve the Contractors method statement prior to the commencement of installation.

3.3 All records of instrumentation, including installation, readings or monthly summaries shall contain the following information:

- Project name
- Instrument name, location and number
- Dates of installation or reading
- Co-ordinate location
- Personnel
- Relevant comments or remarks

3.4 The Contractor shall prepare an installation sheet for each instrument installed. The installation sheet for each instrument type shall be to a format agreed with the Employers Representative.

3.5 The Contractor shall submit to the Employers Representative three copies of each installation report sheet within one working day of the completion of the installation, including the taking of base readings.

3.6 The Contractor shall demonstrate to the Employers Representative that all instruments are operating satisfactorily.

4. Survey Equipment

4.1 All surveying equipment used in conjunction with the monitoring of instrumentation shall be maintained and calibrated as required by the manufacturers and cognisant with professional surveying practice.

4.2 The datum points used for levelling shall be sufficiently remote from the proposed works such that they are not affected by movements caused by embankment construction, ground settlement, piling or other construction activities. Datum points shall be regularly checked against local bench marks.

5. Commission of Instruments

5.1 Following demonstration of the satisfactory operation of all instruments there shall be commissioning period of one week during which time the Contractor will take daily readings of all instruments. These readings shall be available to the Employers Representative.

5.2 The Contractor shall, as required by the Employers Representative, instruct a member of the Employers Representative's staff, or that of the Local Authorities, on the use of the equipment and on the interpretation of readings.

5.3 All instruments shall be proven to be vandal proof to the satisfaction of the Employers Representative.

6. Vibration Monitoring

6.1 The Contractor shall comply with the requirements of Appendix 1/9.

7. Precision Levelling

7.1 The Contractor shall carry out Precision levelling at 4 locations on each of the following structures as directed by the Employers Representative:

- Str01 MacMurrough Island Bridge 1 WX-N30-007.00
- Str02 MacMurrough Island Bridge 2 WX-N30-008.00
- Str03 MacMurrough Island Farm Pass WX-N30-009.00
- Str04 Ballybing Culvert WX-N25-001.00
- Str05 Glebe Bridge WX-N11-003.00
- Str06 Ballintrane Bridge CW-N80-006.00
- Str07 Boggan Bridge CW-N80-004.00
- Str08 Closh Bridge CW-N81-001.00

X, Y and Z co-ordinates shall be established to within +/- 0.1mm prior to commencing works.

Precision levelling shall be carried out daily during the works and weekly thereafter for 1 month. The contractor shall compile and submit reports to the Employers Representative on the establishment if survey and control points and each time levelling is carried out thereafter. The format of the report shall be approved by the Employers Representative and once approved shall not be changed without the Employers Representative consent. The minimum content of each report shall be as follows:

- Project and structure;
- Instrument name, location and number;
- Dates of installation
- Co-ordinate and level information at date of installation
- Co-ordinate and level information at each reading
- Difference in X, Y and Z co-ordinates and levels at each reading
- Personnel
- Relevant comments or remarks.

APPENDIX 7/1
Permitted Pavement Options

Sheet 1 -: Flexible or Flexible Composite Pavement Type A

1	***Location: Main Carriageway*** Str01 MacMurrough Island Bridge 1 WX-N30-007.00 Str02 MacMurrough Island Bridge 2 WX-N30-008.00 Str03 MacMurrough Island Farm Pass WX-N30-009.00		**General Requirement**
2	Grid for checking surface levels of pavement courses, if different from the requirements of Cl 702.4:	Long dim: Trans dim:	N/A N/A
3	Surface regularity (Cl 702.7 and Cl 702.8):	Category of Road Long Reg: Trans Reg:	A Each wheel track of each lane Every 10m per lane
4	Additional Requirements for coarse aggregates – Polished Stone Value (PSV), Aggregate Abrasion Value (AAV) (Series 900 Cl 3.2.2, 5.2.2, 6.2.2, 8.4.1.1, 8.6.1.1):		PSV 60 AAV 16
5	Requirements for pre-coated chippings – Polished Stone Value (PSV) for general use mixtures, PSC for mixtures for roundabouts, Aggregate Abrasion Value (AAV) (Series 900 Cl 4.2.4):		N/A
6	Requirements for testing for Polished Stone Value using the friction after polishing test (NRA HD 300 Clause 2.25)		Yes
7	Freezing and thawing (soundness) category if different from the requirements of Cl 901.6:		N/A
8	Compaction control and extraction of cores if different from the requirements of Series 900 Cls 10.1.9, 10.1.9.1, 10.1.9.2, 10.1.9.3, 10.1.9.4		N/A
9	Requirements for monitoring resistance to permanent deformation of HRA (Series 900 Cl. 10.1.10.1)		Yes
10	Sealant to be applied to the whole of any freestanding edge on the outside of the finished pavement on the low side of the camber (Series 900 Cl 10.1.8):		Yes
11	Any tests additional to those required by IS EN 13108–20, IS EN 13108–21 or the relevant SRW (Series 900 Cl 1.2 and 1.3):		N/A
12	Whether subbase material may be spread in more than one layer (Cl 802.4)].		No

Pavement Course	**Clause**	**Mixture Designation / Material**	**Thickness (mm)**	**Other Requirements**
Surface Course	5.1.3	SMA 14 Surf PMB 65/105-60	40	
Binder Course	3.1.2	AC20 dense bin 70/100	60	
Base	3.1.2	AC20 dense bin 70/100	200	
Sub-base	804	Granular material Type B	300	Shall not be frost susceptible
Total Pavement Thickness (excluding sub-base)			300 min.	

Notes

1. Capping is required as described in Appendix 6/7
2. Bond coat to be applied to all surfaces including HBM layers

Sheet 2 -: Flexible or Flexible Composite Pavement Type B

1	***Location: Main Carriageway Over Structural Concrete Elements*** Str01 MacMurrough Island Bridge 1 WX-N30-007.00 Str02 MacMurrough Island Bridge 2 WX-N30-008.00 Str03 MacMurrough Island Farm Pass WX-N30-009.00		**General Requirement**
2	Grid for checking surface levels of pavement courses, if different from the requirements of Cl 702.4:	Long dim: Trans dim:	N/A N/A
3	Surface regularity (Cl 702.7 and Cl 702.8):	Category of Road Long Reg: Trans Reg:	A Each wheel track of each lane Every 10m per lane
4	Additional Requirements for coarse aggregates – Polished Stone Value (PSV), Aggregate Abrasion Value (AAV) (Series 900 Cl 3.2.2, 5.2.2, 6.2.2, 8.4.1.1, 8.6.1.1):		PSV 60 AAV 14
5	Requirements for pre-coated chippings – Polished Stone Value (PSV) for general use mixtures, PSC for mixtures for roundabouts, Aggregate Abrasion Value (AAV) (Series 900 Cl 4.2.4):		N/A
6	Requirements for testing for Polished Stone Value using the friction after polishing test (NRA HD 300 Clause 2.25)		Yes
7	Freezing and thawing (soundness) category if different from the requirements of Cl 901.6:		N/A
8	Compaction control and extraction of cores if different from the requirements of Series 900 Cls 10.1.9, 10.1.9.1, 10.1.9.2, 10.1.9.3, 10.1.9.4		N/A
9	Requirements for monitoring resistance to permanent deformation of HRA (Series 900 Cl. 10.1.10.1)		Yes
10	Sealant to be applied to the whole of any freestanding edge on the outside of the finished pavement on the low side of the camber (Series 900 Cl 10.1.8):		Yes
11	Any tests additional to those required by IS EN 13108–20, IS EN 13108–21 or the relevant SRW (Series 900 Cl 1.2 and 1.3):		N/A
12	Whether subbase material may be spread in more than one layer (Cl 802.4)].		No

Pavement Course	**Clause**	**Mixture Designation / Material**	**Thickness (mm)**	**Other Requirements**
Surface Course	5.1.3	SMA 14 Surf PMB 65/105-60	40	
Binder Course	3.1.2	AC20 dense bin 70/100	60	
Base	3.1.2	AC20 dense bin 70/100	Varies to top of concrete surface	
Sub-base				
Total Pavement Thickness (excluding sub-base)			Varies	

Notes

1. Capping is required as described in Appendix 6/7
2. Bond coat to be applied to all surfaces including HBM layers

Sheet 3 -: Flexible or Flexible Composite Pavement Type C

1	***Location: Main Carriageway*** Str04 Ballybing Culvert WX-N25-001.00 Str06 Ballintrane Bridge CW-N80-006.00 Str07 Boggan Bridge CW-N80-004.00 Str08 Closh Bridge CW-N81-001.00		**General Requirement**
2	Grid for checking surface levels of pavement courses, if different from the requirements of Cl 702.4:	Long dim: Trans dim:	N/A N/A
3	Surface regularity (Cl 702.7 and Cl 702.8):	Category of Road Long Reg: Trans Reg:	A Each wheel track of each lane Every 10m per lane
4	Additional Requirements for coarse aggregates – Polished Stone Value (PSV), Aggregate Abrasion Value (AAV) (Series 900 Cl 3.2.2, 5.2.2, 6.2.2, 8.4.1.1, 8.6.1.1):		N/A
5	Requirements for pre-coated chippings – Polished Stone Value (PSV) for general use mixtures, PSC for mixtures for roundabouts, Aggregate Abrasion Value (AAV) (Series 900 Cl 4.2.4):		PSV 60 AAV 12
6	Requirements for testing for Polished Stone Value using the friction after polishing test (NRA HD 300 Clause 2.25)		Yes
7	Freezing and thawing (soundness) category if different from the requirements of Cl 901.6:		N/A
8	Compaction control and extraction of cores if different from the requirements of Series 900 Cls 10.1.9, 10.1.9.1, 10.1.9.2, 10.1.9.3, 10.1.9.4		N/A
9	Requirements for monitoring resistance to permanent deformation of HRA (Series 900 Cl. 10.1.10.1)		Yes
10	Sealant to be applied to the whole of any freestanding edge on the outside of the finished pavement on the low side of the camber (Series 900 Cl 10.1.8):		Yes
11	Any tests additional to those required by IS EN 13108–20, IS EN 13108–21 or the relevant SRW (Series 900 Cl 1.2 and 1.3):		N/A
12	Whether subbase material may be spread in more than one layer (Cl 802.4)].		No

Pavement Course	**Clause**	**Mixture Designation / Material**	**Thickness (mm)**	**Other Requirements**
Surface Course	4.1.2	HRA 35/14 F Surf des	45	
Binder Course	3.1.5	AC20 dense bin 70/100	55	
Base	3.1.2	AC20 dense bin 70/100	200	
Sub-base	804	Granular material Type B	300	Shall not be frost susceptible
Total Pavement Thickness (excluding sub-base)			300	

Notes

1. Capping is required as described in Appendix 6/7
2. Bond coat to be applied to all surfaces including HBM layers

Sheet 4 -: Flexible or Flexible Composite Pavement Type D

1	***Location: Access Tracks*** Str02 MacMurrough Island Bridge 2 WX-N30-008.00 Str04 Ballybing Culvert WX-N25-001.00		**General Requirement**
2	Grid for checking surface levels of pavement courses, if different from the requirements of Cl 702.4:	Long dim: Trans dim:	N/A N/A
3	Surface regularity (Cl 702.7 and Cl 702.8):	Category of Road Long Reg: Trans Reg:	B Each wheel track of each lane Every 10m per lane
4	Additional Requirements for coarse aggregates – Polished Stone Value (PSV), Aggregate Abrasion Value (AAV) (Series 900 Cl 3.2.2, 5.2.2, 6.2.2, 8.4.1.1, 8.6.1.1):		PSV 60 AAV14
5	Requirements for pre-coated chippings – Polished Stone Value (PSV) for general use mixtures, PSC for mixtures for roundabouts, Aggregate Abrasion Value (AAV) (Series 900 Cl 4.2.4):		N/A
6	Requirements for testing for Polished Stone Value using the friction after polishing test (NRA HD 300 Clause 2.25)		No
7	Freezing and thawing (soundness) category if different from the requirements of Cl 901.6:		N/A
8	Compaction control and extraction of cores if different from the requirements of Series 900 Cls 10.1.9, 10.1.9.1, 10.1.9.2, 10.1.9.3, 10.1.9.4		N/A
9	Requirements for monitoring resistance to permanent deformation of HRA (Series 900 Cl. 10.1.10.1)		No
10	Sealant to be applied to the whole of any freestanding edge on the outside of the finished pavement on the low side of the camber (Series 900 Cl 10.1.8):		No
11	Any tests additional to those required by IS EN 13108–20, IS EN 13108–21 or the relevant SRW (Series 900 Cl 1.2 and 1.3):		N/A
12	Whether subbase material may be spread in more than one layer (Cl 802.4)].		No

Pavement Course	**Clause**	**Mixture Designation / Material**	**Thickness (mm)**	**Other Requirements**
Surface Course	7.2.3	Double Surface Dressing	-	
Binder Course	3.1.5	AC20 dense bin 70/100	60	
Base	3.1.5	AC20 dense bin 70/100	200	
Sub-base	804	Granular material Type B	200	Shall not be frost susceptible
Total Pavement Thickness (excluding sub-base)				

Notes

1. Capping is required as described in Appendix 6/7
2. Bond coat to be applied to all surfaces including HBM layers

Sheet 5 -: Flexible or Flexible Composite Pavement Type E

1	***Location: Main Carriageway Over Structural Concrete Elements*** Str06 Ballintrane Bridge CW-N80-006.00 Str08 Closh Bridge CW-N81-001.00		**General Requirement**
2	Grid for checking surface levels of pavement courses, if different from the requirements of Cl 702.4:	Long dim: Trans dim:	N/A N/A
3	Surface regularity (Cl 702.7 and Cl 702.8):	Category of Road Long Reg: Trans Reg:	A Each wheel track of each lane Every 10m per lane
4	Additional Requirements for coarse aggregates – Polished Stone Value (PSV), Aggregate Abrasion Value (AAV) (Series 900 Cl 3.2.2, 5.2.2, 6.2.2, 8.4.1.1, 8.6.1.1):		N/A
5	Requirements for pre-coated chippings – Polished Stone Value (PSV) for general use mixtures, PSC for mixtures for roundabouts, Aggregate Abrasion Value (AAV) (Series 900 Cl 4.2.4):		PSV 60 AAV 12
6	Requirements for testing for Polished Stone Value using the friction after polishing test (NRA HD 300 Clause 2.25)		Yes
7	Freezing and thawing (soundness) category if different from the requirements of Cl 901.6:		N/A
8	Compaction control and extraction of cores if different from the requirements of Series 900 Cls 10.1.9, 10.1.9.1, 10.1.9.2, 10.1.9.3, 10.1.9.4		N/A
9	Requirements for monitoring resistance to permanent deformation of HRA (Series 900 Cl. 10.1.10.1)		Yes
10	Sealant to be applied to the whole of any freestanding edge on the outside of the finished pavement on the low side of the camber (Series 900 Cl 10.1.8):		Yes
11	Any tests additional to those required by IS EN 13108–20, IS EN 13108–21 or the relevant SRW (Series 900 Cl 1.2 and 1.3):		N/A
12	Whether subbase material may be spread in more than one layer (Cl 802.4)].		No

Pavement Course	**Clause**	**Mixture Designation / Material**	**Thickness (mm)**	**Other Requirements**
Surface Course	4.1.2	HRA 35/14 F Surf des	45	
Binder Course	3.1.5	AC20 dense bin 70/100	55	
Base	3.1.2	AC20 dense bin 70/100	Varies to top of concrete surface	
Sub-base	804	Granular material Type B		Shall not be frost susceptible
Total Pavement Thickness (excluding sub-base)			Varies	

Notes

3. Capping is required as described in Appendix 6/7
4. Bond coat to be applied to all surfaces including HBM layers

APPENDIX 7/2
Excavation & Reinstatement of Existing Surfaces

1. Where the new road surface is to be laid above the existing road pavement, the pavement construction will comprise:

a) The existing road pavement is retained: Plane off wearing course, regulate and construct new wearing course.

2. The required treatment of the various sections of existing pavement that fall within the proposed carriageway are shown on the drawings.

3. At the tie-in of the new roadworks with the existing roadway, reference should be made to the schematic sections shown on RCD/700/03 and RCD/700/04 for the detail of where the existing road pavement is retained.

4. Where cold-milling is required over an existing bridge deck or culvert, the final 10-20mm of road surfacing shall be carefully removed by hand to ensure that no damage occurs to the concrete/ masonry arch bridge deck.

5. Trenches are to be cut through the retained road pavement and footpath construction for the following:

a) Eir, watermain, ESB and other Duct runs

Prior to excavation, the sides of the trenches are to be marked out and the bounded pavement cut using a saw.

Where these trenches are through the retained existing road pavement once the service has been laid, the trench is to be backfilled with concrete (ST2 mix) to within 100mm of the existing surface unless otherwise described in Appendix 5/2. The final 100mm is to be finished in accordance with Appendix 7/1. The cross section of the trench is that required as for Series 500.

APPENDIX 7/3
Surface Dressing Product (End Performance)

1. Location and Site Category: MacMurrough Island Bridge 2 (WX-N30-008.00) ; Site Category C - Single Carriageway.

2. Minimum binder peak cohesion required. [Series 900 Clause 7.2.3.1.1]

3. Minimum declared PSV of chippings: 60 PSV.

4. Maximum AAV of chippings: 14 AAV.

5. Category for accuracy of spread of binder required: Category 1 (≤15%).

6. Category for accuracy of spread of chippings required: Category 1 (≤15%).

7. Category for tolerance on rate of spread of binder required: Category 1 (± 15).

8. Category for tolerance on rate of spread of chippings required: Category 1 (± 15).

9. Frequency of testing required for binder and chipping application:

Test	Category	Frequency
Rate of spread of binder - tolerance	Category F_1	Reconciliation of binder used to area of surface dressing for each job site
Accuracy of spread of binder	Category F_0	As set out in the quality plan
Rate of spread of chippings - tolerance	Category F_1	Reconciliation of chippings used to area of surface dressing for each job site
Accuracy of spread of chippings	Category F_0	As set out in the quality plan

10. Design Working Life: 5 Years.

11. Traffic Volume. [cv/lane/day]

12. Description of existing surface: Surface dressing in poor condition

13. Pre-treatment [type, design, process]

14. Type of surface dressing permitted. Double sided surface dressing

15. Macrotexture: Category Performance 0 (No Performance Determined).

16. Category of fatting up, tracking and bleeding. (% Area - P1) acceptable: Category Performance 0 (No Performance Determined).

17. Category of scabbing and tearing (% area affected - P2) acceptable: Category Performance 0 (No Performance Determined).

18. Category of fretting (% chipping loss - P3) acceptable: Category Performance 0 (No Performance Determined).

19. Category of streaking. (Length of streaking - P4) acceptable: Category Performance 0 (No Performance Determined).

20. Specific weather requirements: N/A

APPENDIX 7/4
Bituminous Sprays

1. Location

Bituminous spray tack coats are to be applied on binder course and/or base surfaces where:

a) The surfaces are left exposed for more than 4 weeks before the covering layer is applied in the case of base and 1 week in the case of the binder course and/or

b) Where the surface has been soiled by construction activity and/or other vehicular traffic.

The binder shall be spraying grade cationic bitumen emulsion to Clause 10.1.4 for which the rate of application shall be 1.1 to 1.5kg per m^2 or at an alternative rate of spray determined from bitumen spraying trials.

The binder in tack coat shall be spraying grate cationic bitumen emulsion to Clause 10.1.4 and the rate of application shall be 5.5 to 7.0kg per $10m^2$.

APPENDIX 7/5
Road Pavement: NRA Road Construction Details

Clause No.	Road Construction Detailed Drawing No.
701	RCD/700/1, 2, 3, 4, 5, 6

APPENDIX 7/6
Breaking Up or Perforation of Existing Pavement

1. Breaking-up of Existing Pavement:

Where the existing pavement is between 150mm and 250mm of the proposed finished surface (other than in areas of roadways) the pavement is to be broken-up to allow drainage unless otherwise stated. The broken pavement shall be reduced to pieces no larger than 100mm in size. The operation is to be carried out in such a manner as not to damage the adjacent pavement where it is to be retained is to be cut using saws for the depth of the bonded material.

The surface shall be regulated with Class 4 Fill, prior to undertaking the instructed restitution of the ground.

2. Perforation of existing Pavement:

Where the existing pavement is between 250mm and 450mm of the proposed finished surface (other than in areas of roadways), the pavement is to be perforated with holes to allow drainage unless otherwise stated. The holes are to be 300mm centres in all directions and are to be 25mm minimum diameter and 300mm depth. Due care shall be taken to ensure that any pavement to be retained adjacent to the area of perforation is not damaged during the operation.

APPENDIX 7/9
Cold Milling (Planing) of Bituminous Bound Flexible Pavement

1. Areas of Cold Milling are indicated on drawings:

- 1700-ST01-001.& 002
- 1700-ST02-001 & 002
- 1700-ST03-001 & 002
- 1700-ST04-001
- 200-ST06-001
- 200-ST07-001
- 200-ST08-001

2. Cold Milling to be carried out to depths indicated in the table below:

Location	Drawing	Cold Milling Depth
Str01 MacMurrough Island Bridge 1 WX-N30-007.00	1700-ST01-001.& 002	300mm*
Str02 MacMurrough Island Bridge 2 WX-N30-008.00	1700-ST02-001 & 002	300mm*
Str03 MacMurrough Island Farm Pass WX-N30-009.00	1700-ST03-001 & 002	300mm*
Str04 Ballybing Culvert WX-N25-001.00	1700-ST04-001	300mm*
Str06 Ballintrane CW-N80-006.00	1700-ST06-001	300mm*
Str07 Boggan Bridge CW-N80-004.00	1700-ST07-001	300mm*
Str08 Closh Bridge CW-N81-001.00	1700-ST08-001	300mm*

* Maximum cold milling depth located outside footprint of structure. A reduced cold milling depth is required over existing structure.

3. Refer to RCD/700/3 and RCD/700/4.

4. Sweeping of areas prior to cold-milling to be carried out to locate any buried metalwork.

Schedule: Sweeping Areas Prior to Cold Milling	
Drawing No.	**Location**
1700-ST01-001.& 002	Str01 MacMurrough Island Bridge 1 WX-N30-007.00
1700-ST02-001 & 002	Str02 MacMurrough Island Bridge 2 WX-N30-008.00
1700-ST03-001 & 002	Str03 MacMurrough Island Farm Pass WX-N30-009.00
1700-ST04-001	Str04 Ballybing Culvert WX-N25-001.00
1700-ST06-001	Str06 Ballintrane CW-N80-006.00
1700-ST07-001	Str07 Boggan Bridge CW-N80-004.00
1700-ST08-001	Str08 Closh Bridge CW-N81-001.00

APPENDIX 11/1
Kerbs Footways & Paved Areas

1. Roadside Concrete Kerbs

1.1 Concrete kerbs shall be insitu, and shall be constructed to the dimensions shown on the drawings.

1.2 Trapezoidal extruded type kerbs may be used where kerb alignments suit that form of construction. In other areas, alternative in situ casting methods may be used subject to the Employer's Representative's approval.

1.3 Where concrete kerb edging is required, it is to be constructed to the detail shown on the drawings.

1.4 The height of kerbs adjacent to the footways and above the carriageway shall be 75mm or as described on the drawings. Transition between the different heights kerb shall be provided over 5m. At the end of kerb runs the kerb shall taper down to 20mm over 3m.

2. Flexible Footway Construction

2.1 Pavement Construction

Flexible footway construction at locations described on the drawings and as below.

a) Wearing Course — 50mm Flexible Surfacing to Clause 1105 as described on the drawings. Colour to be agreed by the Contractor with the Employers Representative.

b) Granular Sub-Base — 150mm Granular Sub-base Material to Clause 804

2.2 Properties of Coarse Aggregate for Dense Wearing Course Macadam — Minimum PSV: **45**; Maximum AAV: **16**

3. Concrete Footway

3.1 Pavement Construction

In situ reinforced concrete pavement construction to shall be provided at locations described on the drawings and shall be as follows:

(a) Wearing Course — 100mm min concrete to Clause 1106 as described on the drawings.

(b) Granular Sub-Base — 150mm Granular Sub-base Material to Clause 804 for areas not overlaid onto existing concrete footpath.

(c) No fines concrete to details described on the drawings for verges over structures and parapet restraining slabs.

APPENDIX 11/3
Kerbs, Footways and Paved Areas: NRA Construction Details

Road Construction Details Drg No.	Title
Cl 1101.1 + 1101.2 RCD/1100/1	Precast Kerbs
Cl 1103.1 RCD/1100/2	In-situ Concrete Kerb
Cl. 1103.1 RCD/1100/3	Dropped Kerb Ramp
Cl 1105 RCD/1100/4	Bituminous Footway
Cl 1106 RCD/1100/5	Concrete Footway
Cl 1101.1 + 1101.2 RCD/1100/9	Precast Kerb Units

APPENDIX 12/1
Traffic Signs: General

Schedules of signing requirements follows:

Note

1. Schedules of signs to be read in conjunction with the Department of Transport Traffic Signs Manual.

2. All signs are to be manufactured in accordance with TS4 'Guidelines, Certification Schemes and Specification for the Construction of Traffic Signs' Department of the Environment and Local Government January 2001.

3. Where existing signs are to be taken down to allow construction of the permanent works, temporary signs shall be erected until the sign is re-erected into its permanent position. The location of temporary signs shall be agreed by the Contractor with the Employer's Representative.

4. Where existing signs are to be removed and re erected on completion of the works the sign faces shall to be cleaned to the satisfaction of the Employer's Representative.

APPENDIX 12/1
Schedule of Traffic Signs

Location	Sign Type	Quantity	Size (m) (w x h)	Sign Area (m^2)	Mounting Height (2)	Foundation (m) (L x W x D) (3)	Pole Length (4)	No. of Poles	Pole Diameter
Str02 McMurrough Island Bridge 2 WX-N30-008.00	Stop Sign RUS 027	1	0. 75 x 0. 75	0.56	1.5	0.6 x 0.6 x 0.6	2.85	1	Passively safe pole required
Str04 Ballybing Culvert WX-N25-001.00 SW of existing parapet	Do Not Pass	1	Contractor designed element	2.98	2.1	1.380 x 1.800 x 0.700	5.24	2	Passively safe poles required
Str04 Ballybing Culvert WX-N25-001.00 NW of existing parapet	Do Not Pass	1	Contractor designed element	2.98	2.1	1.380 x 1.800 x 0.700	5.24	2	Passively safe poles required
Str04 Ballybing Culvert WX-N25-001.00 NW of existing parapet	Town or Village Sign	1	1.335 x 0.780	1.04	1.2	1.380 x 0.900 x 0.500	2.48	2	76.1 x 3.2
Str06 Ballintrane Bridge CW-N80-006.00	River Name Sign with Symbol F01 "An Bhoirinn R. Burren"	2	1.335 x 0.780	1.04	1.2	1.380 x 0.900 x 0.500	2.48	2	Passively safe poles required
Str06 Ballintrane Bridge CW-N80-006.00	Junction Ahead W 002L: Side Road	1	0. 75 x 0. 75	0.56	1.5	1.380 x 1.800 x 0.700	2.85	2	Passively safe poles required
Str08 Closh Bridge CW-N81-001.00	W 061R Single Chevron – Right: Existing Sign Face to be Reused	1	Existing Sign Face to be Reused		1.2	0.6 x 0.6 x 0.6	5.24	1	Passively safe poles required
Str08 Closh Bridge CW-N81-001.00	Directional Information Sign - Route Confirmatory sign: Existing Sign Faces to be Reused	1	Existing Sign Faces to be Reused		2.1	1.380 x 1.800 x 0.700	5.24	2	Passively safe poles required

Notes

1. Sign types refer to DoT Traffic Signs Manual (2010) and SI 187 (1997).
2. Height above ground to lower edge of sign.
3. L x W x D where Length = distance parallel to sign face, Width = distance perpendicular to sign face and Depth = depth below ground
4. Pole length = sign height + mounting height + (buried length – 100mm).
5. Existing signs to be taken down and cleaned and reinstated on new foundations at locations shown on the drawings.

APPENDIX 12/3
Traffic Signs, Road Markings and Studs

General

1. Permanent road markings shall consist of reflectorised thermoplastic road marking material in accordance with IS EN 1871. All white markings shall be reflectorised with glass beads in accordance with IS EN 1423 and IS EN 1424 by incorporation (apart from preformed markings) into the road marking mixture and to the wet surface of the marking.

2. 50mm drainage gaps are required in continuous lines to prevent ponding.

3. Permanent road markings shall comply with the following performance requirements of IS EN 1436:

Property	IS EN 1436 Reference	Requirement	Value
Colour	Table 6	1. White	x, y co-ordinates to match existing
		2. Yellow Class Y1, *Y2*	x, y co-ordinates to match existing
Luminance Factor	Table 2	1. Class B3	Texture Depth > 2mm B ≥ 0.4
		1. Class B4	Texture Depth < 2mm B ≥ 0.5
		2. Class B2	B ≥ 0.3
Skid Resistance	Table 7	1. Class S2	SRT ≥ ≥50
		2. Class S2	SRT ≥ 50
		3. Class S3	SRT ≥ 55
Retro reflectivity	Table 3 Class of R_L for dry markings	1. Class R2	$R_L \geq 100$
		2. Class R1	$R_L \geq 80$

1. = White lines

2. = Yellow lines

3. = arrows, lettering, chevron markings and yield symbols, etc

The classes Y1 and Y2 for yellow road markings are intended for permanent and temporary road markings respectively.

4. Permanent road markings shall have a minimum functional life as defined in IS EN 1436 of two years.

5. Permanent road studs shall comply with the following particular requirements of IS EN 1463:

Property	IS EN 1463 Reference	Type	Requirement
Reflector	IS EN 1463-1 Table 2	Type 1	Glass
Design	IS EN 1463-1 Table 3	Type B	Depressible road stud
Anchor Method	IS EN 1463-1 Clause 3	Embedded	Embedded
Durability in use	IS EN 1463-2 Clause 6	Primary Assessment	S1
		Night-time visibility	R1

6. Road Markings and Studs are to be provided as per the drawings. All road markings to match the existing.

APPENDIX 12/3
Table 12/3/1
Schedule of Road Markings

Marking Type	Colour	Width or Size (mm)	Mark (m)	Gap (m)	Centres (m)	Locations	Start Chainage	End Chainage	Painted Line Length (m)	Drawing No.
Str01 MacMurrough Island Bridge 1 WX-N30-007.00										
Edge of Carriageway Markings	Yellow	150	2	2	4	Each carriageway	To match existing	To match existing	24 each side	1700-ST01-001 – 002
Str02 MacMurrough Island Bridge 2 WX-N30-008.00										
Edge of Carriageway Markings	Yellow	150	2	2	4	Each carriageway	To match existing	To match existing	13 North 13 South	1700-ST02-001 – 002
Centre of Carriageway Lines	White	100	3	9	12	Centreline	To match existing	To match existing	7m	1700-ST02-001 – 002
Stop line	White	200	-	-	-	Access track	Refer to drawing	Refer to drawing	8	1700-ST02-004
Continuous single centre line	White	100	-	-	-	Access track	Refer to drawing	Refer to drawing	3	1700-ST02-004
Str03 MacMurrough Island Farm Pass WX-N30-009.00										
Edge of Carriageway Markings	Yellow	150	2	2	4	Each carriageway	To match existing	To match existing	28m each side	1700-ST03-001 – 002
Centre of Carriageway Lines	White	100	3	9	12	Centreline	To match existing	To match existing	13m	1700-ST03-001 – 002
Str04 Ballybing Culvert WX-N25-001.00										
Edge of Carriageway Markings	Yellow	150	2	2	4	Each carriageway	To match existing	To match existing	12m each side	1700-ST04-001
Centre of Carriageway Lines	White	100	3	9	12	Centreline	To match existing	To match existing	14	1700-ST04-001

Marking Type	Colour	Width or Size (mm)	Mark (m)	Gap (m)	Centres (m)	Locations	Start Chainage	End Chainage	Painted Line Length (m)	Drawing No.
Centre of Carriageway Lines	White	100	Continuous	-	-	Centreline	To match existing	To match existing	28	1700-ST04-001
Str06 Ballintrane Bridge CW-N80-006.00										
Edge of Carriageway Markings	Yellow	150	2	2	4	Each carriageway	To match existing	To match existing	12m each side	1700-ST06-001
Centre of Carriageway Lines	White	100	3	9	12	Centreline	To match existing	To match existing	9m	1700-ST06-001
Str07 Boggan Bridge CW-N80-004.00										
Edge of Carriageway Markings	Yellow	150	2	2	4	Each carriageway	To match existing	To match existing	8m each side	1700-ST07-001
Centre of Carriageway Lines	White	100	3	9	12	Centreline	To match existing	To match existing	6m	1700-ST07-001
Str08 Closh Bridge CW-N81-001.00										
Edge of Carriageway Markings	Yellow	150	2	2	4	Each carriageway	To match existing	To match existing	10m each side	1700-ST08-001
Centre of Carriageway Lines	White	100	Continuous	-	-	Centreline	To match existing	To match existing	20m	1700-ST08-001

APPENDIX 12/3
Table 12/3/2
Schedule of Road Studs

Colour	Location	Start Chainage	End Chainage	Type	Spacing	No.
Yellow	Str01 MacMurrough Island Bridge 1 WX-N30-007.00	To match existing	To match existing	Bi-Directional	12	3
Yellow	Str01 MacMurrough Island Bridge 1 WX-N30-007.00	To match existing	To match existing	Bi-Directional	12	3
Yellow	Str02 MacMurrough Island Bridge 2 WX-N30-008.00	To match existing	To match existing	Bi-Directional	12	3
Yellow	Str02 MacMurrough Island Bridge 2 WX-N30-008.00	To match existing	To match existing	Bi-Directional	12	3
White	Str02 MacMurrough Island Bridge 2 WX-N30-008.00	To match existing	To match existing	Bi-Directional	12	3
Yellow	Str03 MacMurrough Island Farm Pass WX-N30-009.00	To match existing	To match existing	Bi-Directional	12	3
Yellow	Str03 MacMurrough Island Farm Pass WX-N30-009.00	To match existing	To match existing	Bi-Directional	12	3
White	Str03 MacMurrough Island Farm Pass WX-N30-009.00	To match existing	To match existing	Bi-Directional	12	3
Yellow	Str04 Ballybing Culvert WX-N25-001.00	To match existing	To match existing	Bi-Directional	12	3
Yellow	Str04 Ballybing Culvert WX-N25-001.00	To match existing	To match existing	Bi-Directional	12	3
White	Str04 Ballybing Culvert WX-N25-001.00	To match existing	To match existing	Bi-Directional	12	3
Yellow	Str06 Ballintrane Bridge CW-N80-006.00	To match existing	To match existing	Bi-Directional	12	4
White	Str06 Ballintrane Bridge CW-N80-006.00	To match existing	To match existing	Bi-Directional	12	2
Yellow	Str07 Boggan Bridge CW-N80-004.00	To match existing	To match existing	Bi-Directional	12	2
White	Str07 Boggan Bridge CW-N80-004.00	To match existing	To match existing	Bi-Directional	12	1
Yellow	Str08 Closh Bridge CW-N81-001.00	To match existing	To match existing	Bi-Directional	12	4
White	Str08 Closh Bridge CW-N81-001.00	To match existing	To match existing	Bi-Directional	6	3

APPENDIX 17/1
Concrete – Classification of Mixes

These mixes shall be supplied designed mixes in accordance with the clauses of IS EN 206-1			
1. Mix reference	Mix I Verge Concrete	MIX II Foundations, Retaining Walls, Wing walls, Parapets, Headwalls	Mix III Culvert Units
2. Compressive Strength class	C25/30	C40/50	C50/60
3. Nominal max size of aggregate, mm(D)	20	20	20
4. Type of aggregate			
Coarse	IS EN 12620	IS EN 12620	IS EN 12620
Other	N/A	N/A	N/A
Fine	IS EN 12620	IS EN 12620	IS EN 12620
Other	N/A	N/A	
5. Sulphate class	XA1	XA1	XA1
6. Cement type(s) or combination types complying with:			
CEM I N – (Ordinary early Strength) IS EN 197-1	[CEM I N]	CEM I N	CEM I N
CEM I R – (High Early Strength) IS EN 197-1	CEM I R	CEM I R	CEM I R
CEM I SR – (Sulphate Resisting Portland Cement) BS 4027	CEM III A Combination of 50% CEM I with 50% GGBS to BS 6699		
Combination of Portland Cement to IS EN 197-1 with GGBS to BS 6699	CEM III A 50% GGBS	[CEM III A] 50% GGBS	[CEM III A] 50% GGBS
7. Exposure Class (As in IS EN 206-1 or combinations)	[XC4] [XF4]	[XC4] [XD3] [XS1] [XF4]	[XC4] [XD3] External [XS1] [XF3]
8. Chloride Class EN 206-1 2000 – Table 10, adjusted to NA.2.8 referring to table NA.4	Cl 0.40 or 0.4% as appropriate	0.2% max.	0.2% max.
9. Minimum cement content (kg/m^3)	340	400	440
10. Maximum free water/ cement ration	0.45	0.45	0.4
11. Quality assurance requirements	Third Party Certification	Third Party Certification	Third Party Certification
12. Rate of sampling intended by the purchaser for strength testing	-	See Specification	See Specification
13. Other requirements			
(a) Air Content %	---	---	---
(b) Minimum % ggbs by weight of total cement	-	50%	50%
(c) Minimum % pfa by weight of total cement	---	---	---
(d) Other	Coarse and fine aggregates, and cement type to be from similar sources for all concrete mixes	Coarse and fine aggregates, and cement type to be from similar sources for all concrete mixes	Coarse and fine aggregates, and cement type to be from similar sources for all concrete mixes

Table 17/1.2: Classification of Mixes

Notes:

1) [ ] identifies cement type or applicable exposure clause. 2) for blinding concrete mix STI to be adopted.

3) refer also to Appendix 1/24, 1/25 and 1/5.

APPENDIX 17/2
Concrete – Impregnation and Coating Schedule

1. At all locations exposed concrete shall be impregnated with a hydrophobic pore liner in accordance with the Specification except internal faces of culverts carrying watercourses and drainage.

APPENDIX 17/3
Concrete - Surface Finishes

1. General

Permanently exposed concrete surfaces to Classes F2 finish, (or better), shall be protected from rust marks and stains of all kinds.

Unless otherwise described in the Contract, all formwork joints for exposed surfaces of concrete to Class F2 or better finish shall form a regular pattern agreed by the Employers Representative with horizontal and vertical lines continuous throughout each structure and all construction joints shall coincide with these horizontal or vertical lines.

2. A regular formwork joining pattern is required at all exposed surfaces**.**

3. All exposed concrete surfaces shall be of a uniform colour, match the existing concrete colour and are subject to approval by the Employers Representative.

4. Formwork for curved concrete surfaces shall be achieved by smooth unbroken curved surfaces.

5. A trial panel of reinforced concrete retaining wall 2m long x 1.5m high shall be provided by the Contractor and used to provide a masonry cladding trial panel as required by Appendix 24/1.

APPENDIX 17/4
Concrete – General

1. Sampling and Testing

Sampling and testing of fresh and hardened concrete shall comply with Clause 1707.1. Identity testing is not required.

2. Construction Joints

The positions of construction joints are shown on the Contract Drawings. Additional positions may be proposed by the Contractor subject to submission of details to the Employer's Representative and subject to the additional positions not compromising the integrity, durability or aesthetics of the structure.

3. Lifting Scheme and Support Points for Precast Concrete Members

The Contractor shall design the number, type and location of any embedded lifting devices required for the handling, transport and temporary support of precast concrete members. Precast members shall not be supported on concrete sections of nominal thickness 150mm or less. Embedded lifting devices shall not be located within concrete sections of nominal thickness 150mm or less. Full details and supporting calculations for embedded lifting devices shall be submitted to the Employer's Representative not less than 10 days prior to commencement of casting.

Following installation of precast members, any lifting devices shall be covered over with concrete replacement grout of the same colour as the member concrete and the grout finished flush with the concrete face. Where the depth of grout cover to a lifting device does not exceed the nominal cover to reinforcement for the member, the lifting device shall be corrosion resistant.

4. Assembly and Erection of Precast Concrete Members

Precast units shall be lifted only from locations shown on the manufacturer's drawings.

5. Welding of Reinforcement Joints within Prefabricated Cages

Welding of reinforcement joints within prefabricated reinforcement cages is permitted subject to compliance with the requirements of Clause 1717.

6. Inspection and Testing

The Contractor shall submit a Structural Concrete Works Quality Plan to the Employer's Representative within 21 days of the Contract Date or a minimum of 20 working days in advance of the any preparatory works for structural concrete construction, whichever date occurs earlier. The Structural Concrete Works Quality Plan may be separate from or part of the Quality Plan described in Appendix 1/24, but shall, in either case, be consistent with the Quality Plan described in Appendix 1/24.

The Structural Concrete Works Quality Plan shall include:

(a) An inspection plan for all structural concrete as detailed in I.S. EN 13670 Clause B.4.3.2 and B3.3.3.

(b) A pro forma for a Pre-Pour Inspection Report which makes provision for recording inspection as per the requirements of I.S. EN 13670 Clause 4.3.2 and Clause 4.3.3.

(c) A pro forma for a Post-Pour Inspection Report which makes provision for recording inspection as per the requirements of I.S. EN 13670 Clause 4.3.2 and Clause 4.3.3.

(d) Details of the items to be included in the execution record documentation for each structural component, including those listed in I.S. EN 13670 Clause A.4.2.3.

For the purpose of these requirements, all structural concrete shall be considered significant for the load-bearing capacity and durability of a structure.

7. High Yield Reinforcement

All high yield reinforcement shall be Grade B500B.

8. Stainless Steel Reinforcement

Stainless steel reinforcement shall be Grade 500 designation number 1.4301 ribbed bars to IS EN 10088 for bars fully encased in concrete otherwise designate number 1.4436 shall be used.

9. Post-installed Rebar for Parapet Edge Beam (chemically anchored bars)

Post installed rebar to be chemically anchored with HIT-HY 200 injection mortar (or equivalent) to embedment depths shown on the drawings. Hammer drilled installation to ETA 11/0493. Following the installation of all post-installed rebar, the Contractor shall submit a completed and signed form FM 03 as set out in the HSA *Code of Practice for the Design and Installation of Anchors*.

Where an equivalent post-installed rebar system is proposed by the Contractor, the proposed system must have a valid European Technical Approval and the Contractor shall submit a completed and signed form FM 02 as set out in the HSA *Code of Practice for the Design and Installation of Anchors* with his submission.

APPENDIX 17/7
Precast Concrete Products

1. The relevant European Product Standard for various precast concrete products is as follows:

- Box culverts and underpasses I.S. EN 14844
- Retaining wall elements I.S. EN 15258

2. Where there is no relevant European Product Standard, manufacture of precast elements shall be in accordance with I.S. EN 13369.

3. CE Marking shall be provided in accordance with Annex ZA of the products standard, as follows:

- Box culverts and underpasses I.S. EN 14844 Annex ZA.3.4
- Retaining wall elements I.S. EN 15258 Annex ZA.3.4

4. Refer to Appendix 0/4 for a list of drawings containing technical data.

APPENDIX 19/1
(Specification for Road Works) Sheet No. Form BE/P1 (New Works) Paint System Sheet

The following shall be applied for steel parapets:

1. CONTRACT TITLE: **Carlow and Wexford Bridges Rehabilitation Contract** STRUCTURE. NO.: **Str01 MacMurrough Island Bridge 1 WX-N30-007.00** **Str02 MacMurrough Island Bridge 2 WX-N30-008.00** **Str03 MacMurrough Island Farm Pass WX-N30-009.00** **Str06 Ballintrane Bridge CW-N80-006.00** GRID REF: **Refer to Drawings**					
2. DATE OF ISSUE OF DOCUMENTS TO TENDERERS: **2016**					
3. ENVIRONMENT AND ACCESSIBILITY: **Difficult Access**					
4. REQUIRED DURABILITY OF SYSTEM: NO MAINTENANCE: **up to 12** YEARS MINOR MAINTENANCE: **from 12** YEARS MAJOR MAINTENANCE: **after 20** YEARS	5. COLOUR OF FINISH: **N/A**				
6. PAINT SYSTEM TO BE APPLIED OVER: AREA REF: **G** AREA DESCRIPTION: **Road Restraint Systems – Parapets, Barriers** PROTECTIVE SYSTEM TYPE: (i.e. I, II etc): **IV**					
7. DETAILS	1st Coat	2nd Coat	3rd Coat	4th Coat	5th Coat
Registered Description Item No. and Colour NSAI Agrément Certificate Reference Brand Name and Manufacturer's Ref. No. Manufacturer's Data Sheet No. Where applied How applied Min dry film thickness (mdft) Max local dft (See Cl. 1914.7) Estimated total volume of paint likely to be used. (litres) 'A' type testing required? (YES/NO) (See Cl 1912.4) 'B' type testing required? (YES/NO) (See Cl 1912.11)	Hot Dip Galvanised				
8. STRIPE COAT DESCRIPTION (Including Item No. and colour) Workshop:			9. PAINT MANUFACTURER'S OFFICIAL STAMP:		
10. Mdft (µm) **175 min** NOTE. The minimum total dry film thickness of the paint system, neglecting primers and sealers under 30 microns, shall be 15% greater (to the nearest 25 microns) than the sum of the mdfts of the individual paint coats.			11. APPROVED BY: DATE		

APPENDIX 19/3
(Specification for Road Works) Form BE/P2 Paint Data Sheet

NSAI Agrément, BBA HAPAS Road and Bridges or equivalent Certificate Reference and Date		:	
Manufacturer		:	
Item No.		:	
Registered Description		:	
Brand Name and Reference No.		:	
Consistency and Method of Application		:	
Weight per 5 Litres (kg)		:	
Specific gravity		:	Colour:
For two-pack paints		:	
Base:	Activator	:	Mixed components:
Volume Solids %		:	

For two pack paints volume solids % for mixed paint :

VOC content g/l (mixed) :

Manufacturer's Minimum Dry Film

Thickness Range

Recommended lower mdft :

Recommended upper mdft :

Full Application Instructions :

Mix ratio :

Flash Point :

		5°C	10°C	20°C	30°C
Drying Times (hours)	Surface Dry				
	Hard Dry				
Overcoating Times (hours)	Minimum				
	Maximum				
Pot Life (hours)					

Cleaning Solvent State effects on Drying Times of Temperatures below 20°C	:
Manufacturer's Application Restrictions, e.g. for Temperatures or Humidity	:
Manufacturer's General Recommendations	:

APPENDIX 19/4
(Specification for Road Works) Form BE/P3 Paint Sample Despatch List: Sheet 1

Contract Title .....

Structure Name ..... Structure No. .....

Client Name .....*(Transport Infrastructure Ireland, Local Authority or other company*)

Supervising
Firm (Employer's Representative) .....

Supervising Firm's Representative (Employer's Representative) Name: .....Tel No. .....

Address: ..... Fax No. .....

Independent Painting Inspection Firm: .....

Samples Despatched From:..... (Note 1) Date Despatched.....

Inspector's Name: ..... Tel No .....

Inspector's Signature .....

SAMPLES: (Numbered A1, A2 etc. or B1, B2 etc.) (Note 2)					
Sample No.	**Item No.**	**Manufacturer's Reference No.**	**Batch No.**	**Colour BS 4800 reference (Note 3)**	**Sp.G. (Notes 4 & 5)**

Paint Manufacturer.....

APPENDIX 19/4
(Specification for Road Works) Form BE/P3 Paint Sample Despatch List: Sheet 2

INSPECTOR to complete Form BE/P3 and to forward single copies to each of the following within 24 hours of despatch of samples by the Contractor to CREST:

1	Transport Infrastructure Ireland Parkgate Business Centre Parkgate Street Dublin 8	2	CREST FOCAS Institute DIT – Kevin St Dublin 8	3	Employer's Representative

INSPECTOR to forward Form(s) BE/P1 Paint System Sheet(s) with the first Form BE/P3 to all addresses unless otherwise agreed with the Client.

INSPECTOR to select 'A' samples and to ensure that manufacturer's labels on tins comply with the Specification.

INSPECTOR to take and mark each 'B' sample tin with Item No., manufacturer's name and brand reference No., batch No. sample No. and colour (NOTE 2).

CONTRACTOR to CLIP DOWN LIDS of all tins and to pack, address and despatch samples. In addition to address, CONTRACTOR to label each case (or tin sent loose): 'TII (State structure name) and DATE (date of despatch as noted above)'.

Notes

1. State whether from workshop or site (give name and address).

2. Batch samples comprising unopened tins to be marked A1, A2, etc. Control samples in 0.5 litre tins to be marked B1, B2, etc. Samples No. to run consecutively, i.e. A1 and B1 onwards.

3. Colour reference to BS 4800 or BS 381C (or RAL) to be given, as stated on Form BE/P1 (New Works) Paint System Sheet, e.g. 18 B 25.

4. For 'A' samples specific gravity (Sp.G.) to be measured by Inspector from separate tins of the same batch. For 'B' samples Sp.G. to be measured by Inspector when taking samples. Samples will be rejected unless Sp.G. is filled in above by Inspector.

5. If Sp.G. differs appreciably from data sheet do not despatch 'A' or 'B' samples.

6. Use of this Form, issue of samples to be agreed with the Employer, if the Employer is not Transport Infrastructure Ireland.

APPENDIX 19/5
Workmanship Standards for the Surface Preparation of Coated Steelwork by Blast Cleaning, Abrading, Grinding and Cleaning

1. Refer to Appendix 1/23 for requirements regarding substances hazardous to health.

2. Solvents may only be used for the removal of traces of oil or grease provided that the paint manufacturer confirms that any residual from the solvent will not be harmful to the paint system and provided that a cleaning agent followed by rinsing has first been tried.

3. Measures shall be taken to prevent excessive release of dust and debris on site.

APPENDIX 20/1
Waterproofing for Concrete Structures

The Contractor shall complete this Appendix for the bridge deck waterproofing applied to Str03 MacMurrough Island Farm Pass WX-N30-009.00, Str06 Ballintrane Bridge CW-N80-006.00, Str07 Boggan Bridge CW-N80-004.00 and Str08 Closh Bridge CW-N81-001.00 to the extent described on the drawings.

1.	Manufacture or Marketing Group				
2.	Product				
3.	Irish or British Agrément Board Roads and Bridges Certificate	No. Date			
4.	Concrete Deck Surface Finish	Class U4			
5.	Manufacturer's maximum and minimum application temperatures at respective relative humidities				
6.	Application Temp. of Bonding Agent	To comply with Clause 2005			
7.	Life of Mixed Liquid Materials				
8.	Recommended Minimum Depth of Flexible Surfacing and Waterproofing	125mm			
9.	Manufacturer's Recommended Minimum Depth of Flexible Surfacing and Waterproofing	See Annex A			
10.	Preparation and Installation	Date			
11.	Form PWS with Annex A cleared through IAB				
12.	Description of Materials	Thickness Mm	Weight kg/m^2	Nominal width	Nominal length

ANNEX 'A'

Manufacturer or Marketing Group:

Product:

IAB or BBA Certificate No.

Preamble
The waterproofing system is to be installed in accordance with this Annex and the Specification.

Should there be any contradiction between the requirements of this Annex and the Specification, the Specification requirement shall take precedence unless otherwise agreed by the Employers Representative.

All materials of the waterproofing system are to be as stated on the PWS (Proprietary Waterproofing System) Data Sheet.

No substitution of any of the stated materials is permitted.

General Requirements
Immediately before the application of the primer or laying of the waterproofing system or protective layer, the concrete surface or primed surface shall be clean, dry and free from ice, frost, laitance, loose aggregate, dust and other debris and also where the adhesion of the concrete would not be impaired, free from curing liquids, compounds and membranes.

On any structure, providing no damage results, plant and equipment all fitted only with rubber tyres may stand or travel on the waterproofing system solely for the purposes of laying an additional protective layer or surfacing material on the surface. All such plant and equipment shall have its tyre threads regularly inspected and any embedded stones removed.

The permission of the Employers Representative shall be obtained before the plant, equipment and traffic is permitted onto the waterproofing system.

Rollers shall not be permitted to stand or travel directly on the waterproofing system.

Where it is necessary for plant, equipment or traffic to stand or travel on the waterproofing system, suitable temporary protection is to be provided to the satisfaction of the Employers Representative.

2. Particular Requirements
Non-destructive tests shall be carried out in accordance with the Specification.

The existing waterproofing shall be removed over the plan area of the structure and to 200mm below the level of the deck soffit on the vertical faces. The top surface and vertical faces of the deck and end supports shall be waterproofed with a proprietary sprayed bridge deck waterproofing with system BBA Certificate or equivalent certificate. An approved system is:

- The Eliminator system supplied by Stirling Lloyd Polychem Limited

At all joints, edges and laps in the waterproofing system due to either the phasing of the works or to features encountered on site, the Contractor shall provide an additional stripe coat, which shall be a minimum of 300mm wide.

The Contractor shall liaise with all relevant service and utility providers to agree suitable methods for the temporarily raising/moving existing services to facilitate waterproofing of the bridge deck beneath them.

3. Below Ground Concrete Surfaces

All structural concrete surfaces in contact with the ground shall be waterproofed with a proprietary below ground waterproofing system. Waterproofing of below ground surfaces shall be with MC-DUR 1680 epoxy resin such surfaces shall be treated (by brushing or airless spray) with two coats of MC-DUR 1680 as manufactured by MC Building Chemicals Castleblayney, Co. Monaghan or approved equivalent. First coat shall be thinned with 7% to 10% maximum MC Thinner EP and shall be red brown in colour. Second coat shall be similarly thinned but shall be black in colour. Each coat shall be applied at a rate of 300 grams/m^2. All areas to be painted shall be clean, dry and free from all loose particles, dust, oil and other contaminants. A minimum concrete compressive strength of 25N/mm^2 and a minimum sub-strata pull-off strength of 1.5N/mm^2 is required before application of coatings. In addition, all blowholes in concrete surfaces shall be cleared out, filled with approved non-shrink cementitious filler such as "Fastpatch" or "Fastplug" and the repair work properly cured before application of paint.

APPENDIX 23/1
Bridge Deck Expansion Joints Schedule

1. General Requirements

All bridge deck expansion joints shall satisfy the requirements of UK Departmental standard BD 33/94 'Expansion Joints for Use in Highway Bridge Decks, except where otherwise noted.

Expansion joint locations, types and movement requirements are shown below.

Where proprietary joint systems are detailed on the drawings, a specialist contractor approved by the Employers Representative and by the joint manufacturer shall install these. Any alternative expansion joint system proposed by the main Contractor shall only be used with the written approval of the Employers Representative. The Employers Representative's approval will only be given provided that he is satisfied that the proposed system is the equal in all respects to the system shown on the drawings.

Table 23/1/1 Bridge Deck Expansion Joints

Location	Joint Type	Structure Ref.	Movement Range (SLS)		
			Expansion (mm)	Contraction (mm)	Vertical (mm)
Ends of Deck	Double 20mm x 25mm saw cuts in surfacing as shown on the drawing	Str03 MacMurrough Island Farm Pass WX-N30-009.00	5	5	+1.5
Ends of Deck (Expansion gap between bridge deck and ballast wall)	Type 1 Buried Joint to details shown on the drawing	Str06 Ballintrane Bridge CW-N80-006.00	5	5	+1.5

APPENDIX 23/2
Sealing of Gaps Schedule (Other Than in Bridge Deck Expansion Joints)

General Requirements

1. Where cold poured sealants are indicated on the Drawings for sealing of gaps or joints, they shall consist of gun applied two part polysulphide complying with BS 4254 (1983).

2. Unless otherwise indicated on the Drawings, all gap joints sealers shall be backed with a suitable sized circular cross section rod of closed cell expanded polyethylene. Such rods shall be compressed and pushed into the joint prior to sealing.

3. Unless otherwise indicate on the Drawings, all joint fillers in gap joints shall consist of closed cell expanded polyethylene board of appropriate width.

4. Joint faces shall be prepared and joints installed in accordance with the manufacturer's instructions.

5. Unless otherwise indicated on the drawings, compression seals shall be FB Series supplied by Compriband or equivalent approved. The compression sealer shall be compressed and pushed, into the joint gap prior to sealing. Joint faces shall be prepared and joints installed in accordance with the manufacturer's instructions.

6. Compression seals shall be as described on the drawing. The compression sealer shall be compressed and pushed, into the joint gap prior to sealing.

APPENDIX 24/1
Brickwork, Blockwork and Stonework

1. Not Used.

2. Mortar for masonry cladding to retaining walls shall be compressive strength class M6, mortar designation (ii) prescribed mortar to BS EN 1996-1-1 and shall comprise 1:4 cement:sand proportioned by volume. Bed joints and perpend joints in blockwork masonry shall have a nominal thickness of 10mm, and shall have a thickness of not less than 6mm nor greater than 15mm.

Factory made mortar shall conform to BS EN 998-2. Site mixed mortar shall be subject to preliminary strength tests carried out in accordance with BS EN 1015-2 and BS EN 1015-11 indicating conformity with the requirements given in BS EN 1996-1-1. Regular testing on site, in accordance with BS EN 1015-2 and BS EN 1015-11, shall show that the strength requirements of BS EN 1996-1-1 are being maintained.

3. Admixtures, where proposed by the Contractor, shall be subject to the agreement of the Designer and comply with the requirements of BS EN 954.

4. Not Used.

5. Concrete blocks shall be Category I or II, Group 1 units with a minimum normalised mean compressive strength of 10.5 N/mm^2 and shall comply with the requirements of BS EN 771-3. The supplier shall confirm the conversion from mean compressive strength to normalised mean compressive strength for the block side proposed, in accordance with BS EN 771-3. Dimension of blocks shall be 440mm x 215mm x 100mm with a gross dry density of 1990 kg/m^3 to BS EN 771-3.

6. Stone for coping and masonry cladding to reinforced concrete shall be locally sourced natural limestone. Stone masonry shall be random rubble uncoursed in accordance with the requirements of Clause 2413 of the Specification for Roadworks. The appearance of masonry throughout the scheme shall be consistent and shall comply with the requirements of BS EN 1996.

7. Stones shall be trimmed so as to provide a natural finished edge and to provide stones complying the with following:

- The length of any stone shall not exceed three times its height.
- For masonry walls, the breadth on the bed shall be not less than 150mm nor greater than three-quarters the thickness of the wall.

Stones are to be laid damp.

Coping stones shall be subject to the dimensional control of the main body of masonry and shall be laid flat across the wall.

The exposed width of the mortar joints in random rubble shall not exceed 24mm (recessed), or be less than 12mm. All joints shall be sufficiently thick to prevent stone to stone contact and shall be completely filled with mortar. Internal cavities are not permitted.

Before the general delivery of stone to site, a sample panel of masonry cladding to a reinforced concrete panel is to be constructed on site. The panel is to be altered if required until it satisfies the requirements of the specification. The purpose of the sample is to ascertain whether the stonework complies with the specification and to have an approval sample for comparison. The panel is to be 2 metres long and 1.5 metres high.

Where natural stone cladding is to be installed on a reinforced concrete stems on a retaining wall, the wall shall be backfilled to within 100mm of the top of the stem prior to installation of the cladding.

The characteristic flexural strength of natural stone masonry shall be determined in accordance with Appendix 1/5.

8. Concrete blockwork units and brickwork units shall be laid with a stretcher bond.

Where required, blockwork walls shall be rendered in accordance with BS EN 13914-1:2005. The render shall be mortar render with a plain white finish as detailed in Table 7 of BS EN 13914-1:2005.

9. Not Used.

10. Pointing is required, mortar shall be recessed 20mm.

11. Jointing is to be provided at the locations and to the details described on the drawings.

12. The requirements of Clause 2413.1 of the Specification for Roadworks are applicable.

13. Not Used.

14. The requirements of Clause 2413.9 of the Specification for Highway Works are applicable.

15. Not Used.

16. All traffic facing walls shall have a surface finish with the steps and undulations in the surface not exceeding 30mm when measured with respect to a plane through the peaks, the plane shall be broadly parallel to the road alignment.

The variation in depth front to back of masonry facework shall be 200 $\pm$ 20mm, however, facework shall be placed to satisfy the requirements of paragraph 1 of this sub-clause.

17. Refer to 6 above.

18. Coping to be provided in accordance with the details shown on the drawings and as described above.

19. Refer to 8 above.

20. Back of wall drainage system is described on the drawings and shall be provided in accordance with Series 500 of the Specification for Roadworks.

21. Execution Control Class 1 in accordance with BS EN 1996-1-1 shall be used for all masonry construction except cladding to reinforced concrete stems of retaining walls.

22. Unless otherwise agreed with the Designer, wall ties shall generally be installed at a maximum spacing of 450mm vertically and 450mm horizontally. At movement joints and at the ends of walls, wall ties shall be installed at a maximum spacing of 300mm vertically and not more than 225mm from the edge.

The embedment of wall ties in each leaf shall not be less than 50mm or the minimum distance required by the wall tie manufacturer.

Wall ties shall comply with the requirements of Clause 2411 - stainless steel grade 1.4436.

For natural stone cladding to reinforced concrete, wall ties shall be Ancon SD21 to suit 21/18 Ancon Omega channel or similar approved, and shall comply with the requirements of BS EN 845-1.

APPENDIX 24/2
Brickwork, Blockwork and Stonework "NRA Road Construction Details"

Clause No.	RCD
2412.1	RCD/2400/1, 2, 3, 4, 5, 6
2413.1	RCD/2400/3, 4, 5, 7

APPENDIX 24/3
Requirements for Masonry Repoining and Reconstruction of Historic Structures

1. Structures of special or historical or architectural interest include:

- Str01 MacMurrough Island Bridge 1 WX-N30-007.00
- Str02 MacMurrough Island Bridge 2 WX-N30-008.00
- Str05 Glebe Bridge WX-N11-003.00
- Str07 Boggan Bridge CW-N80-004.00
- Str08 Closh Bridge CW-N81-001.00

Only stone masons shall be used that are experienced in the repair and rehabilitation of historic masonry with lime mortar and are members of the National Guild of Master Craftsmen – Stone Masonry Restoration.

1.1 **Repointing** – shall be carried out in accordance with the Clauses 2450-2465.

1.2 **Mortar** – stone masonry at the structures listed in 1 above shall be repaired and repointed over the extents shown on the drawings using lime mortar to Clause 2405 NHL5 mix reference (a).

1.3 Masonry Cleaning

1.3.1 Extent of Cleaning

All surfaces of the stonework to be de-vegetated, repointed, repaired and have graffiti removed will be cleaned in accordance with the appropriate standards and with this Specification. This shall entail the use of a mild abrasive blast to all the stone surfaces, using chemicals and other mechanical methods where the mild abrasives are unsuccessful as specified below. The Contractor shall note that there may be a variety of different stone types used at each structure and shall propose a suitable method of cleaning for each of the material types for the approval of the Employers Representative.

1.3.2 Removal of Vegetation, Growths etc.

The Contractor will be required to cut back and remove all plants and other vegetation within the extent of the works and shall submit his proposals for so doing for the approval of the Employers Representative.

The Contractor shall allow for all necessary cutting, spraying etc. to kill existing vegetation. The removal of all vegetation shall be undertaken with great care and on no account should any such plant with invasive roots be removed with force, which would dislodge or otherwise damage the stone. In all cases, any plants that are still alive and growing shall be treated by cutting and spraying to stop the growth and sufficient time allowed elapse for the woody stalks, roots, tendrils etc. to dry and contract before any attempt is made to remove them unless otherwise agreed with the Employers Representative. No debris shall be allowed to fall onto the carriageway.

1.3.3 Cleaning Stonework

A specialist shall undertake the entire works associated with cleaning of the stonework. Only fully experienced and trained operatives shall be permitted to carry out cleaning works, and full protection for the general public, operatives, access/scaffold, different adjoining masonry material types etc. shall be provided. In addition, full protection for persons and property in the vicinity of cleaning operations shall be provided.

The Contractor shall note the nature and extent of the various carbon, calcite and other deposits on the surface of the stone and on the underside of arch bridges. These deposits can be hard and firmly bonded to the surface of the stone. The cleaning specified below will

be required to remove all these deposits and the Contractor will be expected to make all necessary allowances for this work.

1.3.4 Standards

All works associated with the cleaning of stonework shall comply with this Specification and the requirements of BS8221 and BS5628.

1.3.5 Cleaning Chemicals

Chemicals for cleaning stone shall be approved by the Employers Representative. Trials must be completed in advance of the cleaning programme to determine the appropriate times for application of chemicals. As chemical cleaners differ slightly in their effectiveness on differing substrates, the Contractor shall allow for the Employers Representative to select whichever chemical he deems most effective to be used on the works. The Contractor should keep in mind that these materials contain injurious chemicals and the manufacturer's safety precautions must be prominently displayed, and adhered to at all times. The chemicals must be applied in accordance with the manufacturers recommendations. The recommended safety first aid kit should be maintained on site and readily available during operations.

1.3.6 Test Panels

The Contractor shall undertake a series of test cleanings of the methodology described below to confirm or otherwise its effectiveness. When the results of these tests are available, they shall be submitted to the Employers Representative for review.

1.3.7 Abrasives

The abrasive to be used shall be approved stone grit free of all siliceous particles, the actual grit to be determined by test. In addition, the Contractor shall include for the use of other abrasives such as copper slag or glass bead if tests indicate that such are appropriate and shall allow for the use of differing grits in differing locations as may be determined as the most appropriate for the removal of the dirt and encrustations without damage to the stone following testing of the proposed abrasives by the Contractor.

As far as practical, the finer grades of abrasive shall be used, but the Contractor's attention is drawn to the fact that heavy encrustations of dirt etc. may have to be removed using the coarser grades to reduce the necessary contact time and prevent damage to adjoining fragile stonework.

Before work commences, the Contractor shall undertake sample panels to determine the grade abrasive, the contact time and the optimum pressure for the operations and submit proposals to the Employers Representative for approval. Abrasives used for cleaning shall not be permitted to enter the watercourse and should be recirculated, collected and disposed off site.

1.3.8 Methodology

Use of Abrasives

The Contractor shall provide, adjust as necessary, maintain and remove upon completion all necessary protection for the area under repair, any adjoining buildings or structures, the workforce and the public including cars, pedestrians, cyclists and trains travelling adjacent to the works for the full course of the works. In all cases, the Contractor will be required to provide all necessary protection to contain the dust and debris from the cleaning works and to prevent it becoming a nuisance to the public or contaminating any watercourses. Parking areas shall be carefully noted and protected from all dust, chemical or other contamination by the works.

Initial cleaning shall comprise of the removal of all algaecidal, biocidal and fungicidal growths, particularly where these have built up on the surface of the stonework. The stonework shall then be treated with an approved sterilising fluid used strictly in accordance with the manufacturer's recommendations and safety requirements. Particular care must be taken to ensure that the chemical is well worked into the friable surfaces of the stone without damaging the stone. It shall be permitted to remain in contact with the stone for the length of

time recommended by the manufacturer or as determined by the on-site trials. Upon completion of this contact time, it shall be rinsed off as recommended by the manufacturer using warm water where appropriate, care shall be taken to ensure that none of the stone is saturated. If necessary, repeat applications shall be applied to ensure all spores, seeds, etc. are fully sterilised.

Following the application of the sterilising fluid, all stone shall be cleaned by mild abrasive blast as specified below. The masonry shall be cleaned using a controllable pressure blast system with water introduced at the nozzle to control dust or similar approved mild abrasive cleaning system in strict accordance with the manufacturers instructions and safety recommendations. Only the minimum of water to control dust shall be used and on no account shall the stoneworks be permitted to become saturated. Great care will be required to ensure that no salts within the stone are liberated by the cleaning which may result in staining due to the deposit of the salt on the surface of the stone. The tolerances for the range of pressures permitted at the nozzle shall be determined by trials for each type of grit and the nozzle pressure shall be capable of being reduced to a minimum pressure of 25 p.s.i. Wherever possible, the lowest possible nozzle pressures shall be used to obviate damage to the stone and to prevent the spreading of dust.

The cleaning operations shall be undertaken by holding the nozzle approximately 1 meter from the surface of the stone at an angle of 45 degrees to the plane of the surface of the stone. The nozzle shall be moved over the surface in gentle, even strokes both vertically and horizontally to achieve an even clean appearance to the stone without causing any damage to fragile areas, particularly fine, weathered arises. In areas where there is any doubt, cleaning operations shall be suspended before any damage occurs and the residual dirt allowed to remain until such time as the Employers Representative has inspected the work. On no account shall 'gun shading' be permitted to occur on the surface of any stone cleaned by these operations.

The Contractor shall complete the initial cleaning of each area in a single pass operation and subsequently return to clean isolated areas that have particularly heavy or stubborn accumulations until a clean even visual appearance is achieved.

The Contractor shall, before the work commences, agree the programme and limits of the areas to be cleaned with the Employers Representative. As far as possible, the boundaries shall occur at natural breaks in the façade, changes of plane, string courses, etc.

Spent abrasive shall be contained and never be allowed to accumulate on the access platform / scaffold or on the face of the stonework and must be bagged and removed at regular intervals during the day's work. Any slurry, dust etc. adhering to the surface of the stone must be cleaned away immediately as the effectiveness of the completed cleaning cannot be determined while such deposits contaminate the surface. At no time shall spent abrasive, chemicals, debris arising from the cleaning process or any other material arising from the works be allowed to enter into existing watercourses or drainage systems.

Use of Chemical Cleaning Agents

In situations where the mild abrasive blast is unable to achieve a satisfactory clean appearance or where a 'shadow' remains visible from contaminants within the pore structure of the stone, chemicals or mechanical tools as specified below shall clean all defected areas.

Stonework shall be cleaned with suitable chemicals, as previously specified, and shall always be used in strict accordance with the manufacturer's instructions and safety recommendations. In all cases, the cleaning shall be undertaken in panels coinciding with a natural break in the stonework.

All adjoining masonry surfaces shall be carefully protected before commencement. On no account should any chemical, or rinse water from areas cleaned with chemical, be permitted to come in contact with dry masonry. Areas at particular risk are those underneath the current site operations. It is imperative that all such areas are fully protected before operations commence and fully rinsed down upon completion.

Sample panels are to be completed before the cleaning commences in areas selected by the Employers Representative, to enable contact times to be established. In all cases, tests to ensure the surface is chemically neutral shall be undertaken 3 days after completion of the cleaning using litmus or another approved method.

Removal of Calcareous Deposits
Areas that have particularly heavy or stubborn accumulations, such as calcareous deposits, shall be cleaned in accordance with the provisions of the following paragraphs. Where mild abrasives failed to remove the contamination to necessary standard the Contractor shall:

(i) Pre-wet the masonry with water

(ii) Apply chemical by brush, contact time to be determined by prior test, but not exceeding 1 hour. When 50% of the contact time has elapsed, the chemical shall be agitated and additional material added as necessary.

(iii) Rinse off with water, using warm water if available, at 1,500 p.s.i. in quantities recommended by the manufacturer.

(iv) Repeat steps ii and iii as necessary to achieve a clean visual appearance – in all instances the chemical must never come in contact with dry masonry.

(v) Apply the litmus test after 3 days as specified.

The Contractor shall note that, if the results of the test cleaning so indicates, the methodology shall be reversed to undertake the cleaning by chemicals initially and to subsequently use mild abrasives in situations where the chemical is unable to remove the soiling without damage to the stone surface.

As an alternative, or in addition to the liquid chemical cleaning, AB57 Poultice may be used on Calcareous materials. Of particular significance is the precise type, strength, chemical composition and use of the constituents of the poultice shall be strictly followed and no deviations will be permitted. Only laboratory quality constituents shall be used. The poultice shall be prepared as recommended and allowed to cure for 24 hours. The material shall be applied by brush, wooden trowel or spatula etc. to all surfaces of the stone, care being taken to ensure that all surfaces are fully coated and shall be a minimum thickness of 12mm. The poultice shall be covered to exclude air and left for 24 hours. After the 24 hours has elapsed, the cover shall be removed and the residue of the poultice carefully removed without damage to the stone.

It shall be rinsed as specified for the chemical cleaning operations, particular care being taken to control the run-off as previously specified. Repeat applications shall be made until a clean, even appearance is achieved. The litmus test as previously specified shall be undertaken in these areas.

Use of Mechanical Cleaning Equipment
Where so approved by the Employers Representative, the Contractor may utilise mechanical tools such as Jason guns, needle punches, scribers etc. to remove stubborn accumulations and deposits, particularly where formed of carbon, calcite or a compound of both. The Contractor will be required to undertake demonstrations of the type of tools he proposes to use and the skill of his operatives in operating such tools for the Employers Representative.

Graffiti Removal
When removing graffiti, where possible the use of proprietary graffiti removing products shall be favoured over abrasive cleaning techniques to avoid unnecessary damage to the fabric of the structure. Therefore, graffiti shall be removed by a combination of proprietary materials such as water-soluble sprays and aerosols, gels and poultices, and high pressure hosing, stiff brush and abrasives when so approved by the Employers Representative.

Regardless of the method of removal of graffiti it will always be necessary to carry out insitu trials on a small unobtrusive section to determine the effectiveness of the chosen method and to confirm that no undue damage is caused to the substrate during the process. Proprietary materials shall be applied strictly in accordance with the manufacturers recommendations and shall be appropriate both for the substrate material and the marking agent (paint, ink, wax

based materials, etc.). Acid based cleaners should never be used on acid sensitive materials that might be etched or abraded by acid. These include stonework such as limestone, marble or calcareous siltstone. The thicker consistency of gels and poultices, which are expressly designed to draw out pigment from permeable materials, make them more suitable for brickwork and other porous substrates. However, aluminium and anodised metals can be attacked by bleach, ammonia and other alkalis.

Mechanical abrasive graffiti removal shall be carried out as a last resort by specialist firms and should only be carried out on uncoated substrates. Typical methods include low and high-pressure water cleaning with or without detergents as well as sand or grit blasting.

Due care shall be taken to protect the general public from the affects of all mechanical abrasive graffiti removal techniques, to the satisfaction of the Employers Representative. The Contractor shall provide method statements and risk assessments associated with graffiti removal to demonstrate compliance with the Specification at least 2 weeks prior to undertaking any trials.

Ink and felt tip marker stains should be removed using a glycol ether solvent, such as methoxypropanol, applied with a clean white cloth over the area affected. The minimum amount of solvent necessary to remove the stain shall be used as excess solvents on porous substrates can potentially carry the dyes further into the parent material. Materials such as brick and stone are generally not be adversely affected by glycol ether. However, if a reaction is noted, the area should be immediately dosed in water. All personnel using glycol ethers shall be trained in their use and application and alerted to the dangers of using these chemicals in accordance with the requirements of the Health Safety and Welfare at Work (Construction) Regulations 2013.

Graffiti caused by spray-applied paints shall be removed using a water based cleaning gel. The gel shall be applied to the affected area with a brush in a circular motion. After a short waiting time the mixture of paint and gel shall be washed off with water, collected and disposed of off site in a suitable waste disposal facility. In the case of persistent graffiti stains the cleaning action should be repeated.

1.4 Masonry Repair

1.4.1 Stone for Repair

Where possible existing stonework taken down from adjacent structures shall be used for repairs. The repair of stones shall match the existing as regards type, colour, texture, porosity, crushing strength etc. It shall be free of all vents, cracks, fissures, soft beds, etc. or other defects that may affect durability. The Contractor shall note that stone can exhibit many variations of colour, texture, wining, particle size and distribution, type, void, cherts, stylolites, fossils, calcite veins etc. The Contractor shall provide a series of samples of each type of stone for the approval of the Employers Representative. The Employers Representative will indicate the extent of the variation he will permit for use in the works and these approved stone samples are to be retained on site until the conclusion of the works. These approved samples will be used to judge the permissible level of variation in the stone to be used in the works, and any stone that exceeds the permitted level of variation shall be rejected. Any stone rejected will be removed from the site by the Contractor and replaced with new stone to comply with the approved samples. If the rejected stone has been worked, carved, moulded, decorated or built into the works, the Contractor will be required to remove and replace it with stone complying with the approved samples. In addition, the Contractor should note that he will be required to match the surface finish, tool markings, rock facing, mouldings, carvings and decorations etc. as required. He shall replicate the surface texture of the adjoining stones and shall make allowances for all necessary needle punching, acid etching, blasting, sparrow pecking, bush hammering, flame texturing etc. to obtain the required texture. Full sized drawings and templates shall be prepared by the Contractor for the Employers Representative's approval before any work is put in land.

1.4.2 Mortar

Mortar for stone repairs shall be lime mortar to Clause 2405 NHL5 mix reference (a).

1.4.3 Removal of Damaged / Weathered Stone

All damaged stone, substandard repairs etc. shall be carefully removed, either in part or in total as directed by the Employers Representative. Temporary support shall be provided, as required and care shall be taken to ensure that no damage occurs to any adjoining stone etc. Where large amounts of any course are to be removed, great care shall be taken to ensure that the support for the structure above is maintained, this may demand the work to be undertaken in a series of short lengths or other methods approved by the Employers Representative. As far as possible and wherever relevant the removals shall comply with the requirements of BS 6187, Code of Practice, for Demolitions. Full and detailed method statements including calculations, drawings and Design and Check Certificates shall be submitted by the Contractor for approval in advance of commencement of the works.

The Contractor shall note that the areas of the damaged / weathered stonework to be removed shall be marked for review before any work of removal is initiated. When cutting out is being undertaken, all cuts shall be carefully made, being square and at right angles to the surface of the stone being repaired. No damage shall occur to the original stone being repaired or to adjoining stone. The Contractor shall note that in this respect, the use of mechanical cutting tools will have to be carefully controlled by the operative. In circumstances where damage occurs, the Contractor will be required to make good the damage at his own expense as directed by and to the satisfaction of the Employers Representative. The Contractor should note that this may involve either enlarging the repair or the complete replacement of the stone.

For piecing, incidents or mortar repairs, all damaged stone shall be cut back until strong, stable strata is achieved and in such a manner to ensure that the minimum thickness for any repair shall not be less than 30mm unless otherwise permitted by the Employers Representative.

1.4.4 Inserting New Stone

Where a complete new stone is to be inserted the area shall be carefully cleaned and all loose or deleterious material removed. The stone shall be laid on a full bed of mortar, using lead or slate "skids" or timber wedges as required, and all joints fully filled, including the back and sides of the stone. It is imperative that the top bed is filled with mortar, well rammed home, so that the loadings within the wall are correctly transferred to the masonry below. If deemed necessary by the Employers Representative, the work shall be carefully grouted by hand to ensure all cavities around the repair are fully filled using a method and material approved by the Employers Representative. Mortar, grout or other substances shall not come into contact with adjoining masonry. All mortar or grout splashes shall be immediately washed off and not allowed to dry or stain the masonry. All faces of joints shall be raked out for pointing. The surface finish of the new stone shall precisely replicate the original before damaged or weathered and all necessary tool markings, mouldings, carvings and decorations shall be provided. It is imperative that the stone is inserted on the line of the original, and that the correct spacing, geometry etc. of the original design is maintained by the new stone. The Contractor shall note that he will be required to undertake necessary works to the surface texture to ensure that the new stone visually blends with the extant original.

Where repairs are to be executed by 'piecing' or 'indenting' stone to repair a section of a single stone, the 'piece' or 'indent' shall be carefully cut out from stone to match the existing stone and approved by the Employers Representative. The Contractor shall note that the characteristics and visual appearance of the original stone being repaired and the stone selected for the repair shall match as closely as possible. If he is in any doubt, he should consult with the Employers Representative. As far as possible, the joint between the parent stone and the repair shall be kept as small as possible and shall never exceed 2mm. The repair shall be inserted into the prepared recess and fixed in place with an approved epoxy or polyester resin stone glue by 'dotting' 50% of the surface area of the stone. Once the resin has cured, the completed repair shall be tooled to match the original if necessary and the joint pointed. The Contractor shall note that he will be required to match the surface finish, tool markings, mouldings, etc. of the parent stone. It is essential that these repairs do not distribute the lines and geometry of the original design.

The Contractor shall provide for all necessary non-ferrous metal fixings, cramps, dowels, armatures etc. that may be required by these repairs.

1.4.5 General Workmanship

All natural stone for incorporation into the works shall match the existing and be of proven durability and weather resistance and shall be selected with regard to its suitability to local atmospheric conditions and the nature of the work to be carried out.

Stone shall be free from vents, cracks, fissures, objectionable irregularities of colour or particle size and any other defects that would adversely affect its strength or appearance, and shall be of the best quality in relation to it use.

All stone shall be set with its natural bed at right angles to the direction of the load and supports, except cornices where deeply undercut and where otherwise directed in writing. The natural bed of the voussoir stones in the underside of arches shall be cut to shape and inserted in such a manner so that the natural bed is at right angles to the curve of the angle of compression within the arch. The direction of the natural bed shall be clearly marked at the quarry.

Hoisting shall be by approved means and care shall be taken not to damage the stone. All stonework shall be protected as it is unloaded and stored on site with sacks, straw, or other approved material. No damaged stone shall be fixed. All stonework shall be carefully protected from staining and shall be left clean from stains and all other defects to the approval of the Employers Representative.

All necessary labours such as surface texture and tooling to match the original, throatings and weatherings, mortises for dowels, cramps and chases for fixing stonework shall be performed. A mason shall execute all holes and chases formed on site. Dowels, cramps and lugs shall be provided as required. The stones shall be level, plumb, square and true, and free from hollow or rough surfaces. Stones shall be of the full dimensions required with back joints square and regular.

The stones shall be wetted (except if frosty weather) to control suction, set in full bed of mortar and all vertical joints filled. No hollow beds will be allowed. The bed and joints shall be square with the face, arranged to bond with the masonry of the backing or hearting. Joints shall be raked out as the work proceeds and pointed on completion.

The Contractor shall submit in duplicate all working drawings and sketches for review, showing his proposals for the cramping and supporting of stones.

All works shall be thoroughly cleaned or rubbed down at the completion of the works to the satisfaction of the Employers Representative.

2. Mortar shall be NHL5 Mix reference (a). All mortar beds shall be of a thickness to match adjacent stonework as closely as possible. The colour of the mortar shall match the existing.

3. Trial mixes shall be undertaken by the Contractor. In addition, as soon as practicably possible after award of the Contract, the Contractor shall prepare a minimum of 3 No. test moulds (9 No. prisms) for testing at 28 days to determine compressive and flexural strength thereof of his proposed lime mortar. The Employer's Representative shall be invited to attend the preparation of the mortar and test samples and shall be given a minimum of 7 days advance notice of the proposed date.

APPENDIX 26/2
Bedding Mortar

Bedding Mortar – General

1. Proprietary bedding mortars shall be mixed, placed and cured in accordance with the manufacturer's detailed instructions.

Early Loading Requirements

2. The maximum stress in bedding mortar should not exceeding 12N/mm^2 at the time of loading.

APPENDIX 27/1
Requirements for Watermains

1. Watermains

The Contractor shall temporarily divert the existing watermains to allow removal of the existing culverts and installation of the new Str04 Ballybing Culvert in accordance with the requirements of Appendix 1/16, and as shown on the Drawings. A schedule of watermains is included below.

Table 27/1 Schedule of Watermains

Existing Pipe Type	Dia. and Number	Location	Description	Drawing Numbers	Length (m)	Average Depth to Invert (m)	Bed Type
Asbestos Cement with hydrant	300mm x 1	Str04 Ballybing Culvert WX-N25-001.00 Southern Verge	Diversion of existing supply and reinstatement with new section of watermain	500-ST04-002	24	Refer to drawings	RCD/2700/1 & RCD/2700/2
uPVC with scour valve	150mm x 1	Str04 Ballybing Culvert WX-N25-001.00 Southern Verge	Diversion of existing supply and reinstatement with new section of watermain	500-ST04-002	24	Refer to drawings	RCD/2700/1 & RCD/2700/2

2. The relevant Water Service Authorities are:

- Irish Water
- Wexford County Council
- Carlow County Council

3. The Contractor shall apply for permission to the Water Services Authority three weeks in advance of making connections.

4. All connections to existing watermains shall be undertaken by the Contractor in the presence of the Water Services Authority personnel.

5. Not used.

6. The pipes for the watermain diversions are to be HDPE 300 Rated SDR11 pipes.

7. Testing of butt fusion and electrofusion joints shall be carried out in accordance with Cl 2703.9 (vi). One test is to be carried out per day.

8. The direction of the sluice valves is to be advised by the relevant Water Services Authority. Sluice valves shall be in accordance with EN1074 flange to PN116 flanged tee on mainline to scour 375 x 450 chamber with 100mm min C25 base (A393 base), D400 centres.

9. Hydrants to be provided with a new chamber and to have Type 2 round head outlet to BS 750, 1984 with ductile iron tail pieces and shall comply with Clause 2704.5 and 2704.6 and have 80mm inlets and 63mm screw type made thread outlets or as required by the relevant Water Service Authority.

10. Air Valves shall be provided in accordance with Clause 2704.7 and in accordance with the requirements of the relevant Water Service Authority.

11. C32/40 concrete and B500B reinforcement.

12. The test pressure for each watermain to be advised by the relevant Water Services Authority.

13. The maximum test pressure for each watermain to be advised by the relevant Water Services Authority.

14. The requirements for disinfection / sterilisation testing for each watermain to be advised by the relevant Water Services Authority.

15. Chlorine residual testing shall be in accordance with the guidance given in the EPA Water Treatment Manual.

16. The disinfection process shall be repeated if the chlorine residual is less then 10mg/l.

17. Bacteriological sampling and testing shall be carried out in accordance with the specification and one test will be carried out on each watermain diversion on completion.

18. Chlorine residual is to be less than 0.2mg/l before discharge to the local watercourse.

APPENDIX 27/2
Watermains: NRA Road Construction Details

Clause No.	Road Construction Details
2704.2	RCD/2700/4 & RCD/2700/5
2704.4	RCD/2700/6
2704.6	RCD/2700/7, RCD/2700/8, RCD/2700/9, RCD/2700/10
2704.7	RCD/2700/7 and RCD/2700/8
2707	RCD/2700/1 to RCD/2700/3
2710.2	RCD/12700/13

APPENDIX 55/1
Structural Concrete Repairs

Construction Activity	Component	Repair Method
Remedial Works to Structure no. 05 Glebe Bridge WX-N11-003.00	Soffit of reinforced concrete bridge deck	Crack injection