



MERLIN PARK CNU ADDITIONAL CAR PARK WORKS

CIVIL & STRUCTURAL SPECIFICATION



T01 | July 2026



Merlin Park CNU Additional Car Park Works

Civil & Structural Specification

Document No: MERC-ROD-00-XX-SP-C-0001

Author:..... Úna Cotter (ÚC)

Checker: Nicholas McCann (NMCC)

Approver:..... Andrew Thomson (AWT)

Status	Revision	Description	Author	Checked	Approved	Date
S2	T01	For Tender	ÚC	NMcC	AWT	14/07/2026

Roughan and O'Donovan Consulting Engineers

HSE

Merlin Park CNU - Car Park Works

Civil & Structural Specification

14-07-2026

Contents

A1 General conditions	1
C20 Demolition	14
D20 Excavating and filling	18
E05 In situ concrete construction generally	31
E10 Mixing/casting/curing in situ concrete	33
E20 Formwork for in situ concrete	39
E30 Reinforcement for in situ concrete	42
E40 Designed joints in in situ concrete	45
E41 Worked finishes to in situ concrete	47
E42 Accessories cast into in situ concrete	49
Q10 Kerbs/ edgings/ channels/ paving accessories	51
Q20 Granular sub-bases to roads/ pavings	54
Q21 In situ concrete roads/ pavings/ bases	56
Q22 Asphalt roads/ pavings	63
Q25 Slab/ brick/ sett/ cobble pavings	66

A1

General conditions

Clauses

100 Extent of contract and description of work

1. This Contract includes for the provision of all such plant, equipment, transport, materials, labour, supervision and workmanship as may be required to carry out the construction of the proposed: Merlin Park CNU Car Park Works in accordance with the Drawings, Risk Assessments & Specification prepared by Roughan & O'Donovan and other consultants .
2. The proposed works consists of:
3. (1) Site set-up
4. (2) Site Clearance
5. (3) Excavation of existing road and footpaths adjacent to live traffic
6. (4) Provision of new utility ducts
7. (5) Resurfacing of road pavement
8. (6) Construction of proposed kerb lines, footpaths and traffic islands
9. (7) Provision of traffic management system for construction/ reconstruction of road
10. (8) Taking up existing road markings and provision of new road markings
11. (9) Taking up existing road signs and provision of new road signs
12. (10) Landscaping
13. (11) Site clearance and demobilisation
14. All references to "The Client" or "The Employer" refers to HSE
15. All references to The National Roads Authority (NRA) shall also be deemed to refer to Transport Infrastructure Ireland (TII)

101 Notices and notifications

1. Before the commencement of any work in connection with this Contract the Contractor shall notify all Public Authorities and the owners and tenants of all properties likely to be affected by the carrying out of the works.
2. He shall notify the Client, the Architect and the Engineer when he is ready to proceed with the works. He shall satisfy the Engineer that all necessary precautions have been taken to protect all underground or overground works, such as drains, sewers, watermains, cables, walls, fences, buildings etc. during the carrying out of the Contract. If necessary, he shall support or divert these works. If any damage or injury is caused he shall notify the Engineer and the Authority concerned immediately. All statutory fees shall be paid and any notices required shall be served on any persons or local authority. The Contractor shall fully satisfy himself as to the exact location of all existing services. The Contractor should contact all utility providers in relation to power cables, gas pipes, telephone cables, cable T.V. routes, drains and watermains in advance of any excavation or opening up work and formulate a contingency plan to ensure an immediate emergency response by the relevant bodies in the event that such services are damaged. The contingency plan must be approved in advance by the Engineer and will include the names and contact numbers to effect an immediate response to restore and maintain services. The Contractor will advise the relevant bodies in advance of commencing excavation or opening up work of the dates on which such services may be risk. Where deemed necessary the Services Engineer or relevant authority a representative or emergency crew as appropriate will be in attendance where any particular service is at risk.
3. For Public Works Contracts, all references in this Specification to the Architect or Engineer shall be read as referring to the Employer's Representative or Client's Representative. All references in this Specification to the Client shall be read as referring to the Employer.

115 The site

1. The site which the Contractor may use for carrying out the works included in the Contract is outlined in the Works Requirements.
2. The Contractor shall confine his operations to the Site and shall insist on his workmen using the public roads, footpaths and other rights of way when entering or leaving the Site.
3. The Contractor shall provide washdown facilities for all vehicles leaving the site.
4. The Contractor shall be liable for and shall make good at his own expense any damage caused to the Site or other lands by his operations or by trespass of himself or his workers.
5. All damage to existing roads, footpaths, drains, watermains, fences, buildings and other property caused by the Contractor's operations shall be made good by the Contractor at his own expense.
6. Before tendering the Contractor shall visit the site and satisfy himself as to the existing conditions, e.g. nature of ground, positions and levels of existing works on site. He must accept the site as he finds it and shall include in his tender for any work to complete the Contract.

120 Health and safety

1. The Contractor shall in respect of all persons and site activities provide for and ensure compliance with all current Health, Welfare and Safety Standards and Regulations whatsoever arising in connection with the works and as between the Employer and the Contractor. The Contractor shall be responsible for the health and safety of all persons employed on the site, whether under his direct control or not. The Contractor shall ensure that safe practices and methods of work are adopted at all times. The Contractor, when developing the Construction Safety and Health Plan should identify any problem areas, i.e. with the time period, aspects of the design which might cause particular safety problems, hazardous materials specified in the Bill of Quantities etc. shall notify the Engineer in writing of said problems. The Contractor shall bear all costs arising out of his failure to give notice of foreseeable matters in this regard.
2. The Contractor shall include as a minimum for the following non-exhaustive list of activities:
 - 2.1. provision of Safety Officers and all safety supervisors, first aiders, inspectors and certifiers required;
 - 2.2. provision of tests and certificates on plant and equipment;
 - 2.3. provision of safety signs and signals;
 - 2.4. provision of Personal Protective Clothing and Personal Protective Equipment;
 - 2.5. provision and maintenance of Emergency routes and exits and designated personnel responsible for emergency procedures. provision of energy distribution installations in compliance with the fourth schedule of the Safety, Health and Welfare at Work (Construction) Regulations;
 - 2.6. provision of temporary fire detection and fire fighting systems;
 - 2.7. provision and maintenance of appropriate working conditions and work stations;
 - 2.8. provision and maintenance of onsite routes;
 - 2.9. provision of first aid equipment and first aid room as appropriate for the duration of the construction works and assurance that they are fully fitted out at all times;
 - 2.10. provision of on-site training, induction courses and tool box talks;
 - 2.11. compliance with Safe Pass Regulations;
 - 2.12. establish and maintain appropriate welfare facilities;
 - 2.13. establish and maintain a permit system for all hazardous activities.
3. The Contractor shall include for the provision of all necessary information as requested by the Project Supervisor for the Design Process to enable the preparation and completion of the Safety File, including but not limited to As-built drawings as set out in Clause A1/121 of this Specification.

121 As-built records

1. 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 (A1 extended where necessary) format.
2. The Contractor shall maintain throughout the duration of the contract record drawings to show details of the works.
3. Drawings shall include but not be limited to:
4. All standard, typical and specific details pertaining to the design.
5. All configuration plans and wiring diagrams
6. Component drawings
7. General Arrangement details
8. Fully coordinated plan layouts for earthworks, foundations, earthing, structures, ducting, drainage, surfacing and building service layouts and details.
9. Signs
10. Hard and soft landscaping
11. Detailed sections and profile drawings.
12. 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.
13. The Contractor shall maintain and issue to the Engineer interim as-built drawings of the works on request.
14. **As-Built Deliverables**
15. The following as-built information shall be issued by the Contractor to the Engineer:
16. One electronic drawing file (including reference files and any drawings referred to within the main body of the as-built drawings), one plot file and one hard copy of interim as-constructed drawings shall be submitted to the Engineer on request.
17. 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), one plot file and two full size hard copies of the as-constructed record drawings shall be issued to the Engineer;
18. On acceptance of this data, a further signed full hard copy size shall be issued to the Engineer and the PSDP
19. A finished as-built survey plotted to a scale of 1: 200. A plan showing sheet size, layout and orientation shall be submitted to the Engineer prior to plotting
20. A brief description of the drawing requirements will include but not be exclusive to:
21. All design criteria will be drawn to the Project grid;
22. Global origin must be set to world coordinates
23. All design data to be drawn at a scale of 1: 1
24. All master design file files will be submitted at agreed intervals (3 monthly default in the event of no agreement)
25. All files must be named in accordance with the drawings in the Contract
26. Working units must be set to 1000mm per m for the building
27. Drawings shall not contain any additional contractor's address or telephone number other than that shown on the standard drawing sheet
28. No changes are to be made to the submitted alignment chainage
29. Transmittal's will accompany all submittal of drawing data, itemising each individual item, submitted CD's to be labelled and have cross reference of transmittal clearly on it
30. Where there is a series of drawings to be produced along the entire length of the line the Project 'snake' should be used as a guide, sets will be itemised individually and include Sheet_of_ in the title and clearly show continuation markers

31. Where drawings are included within reports they are not deemed to have been officially submitted
32. All submittal will include hard copy, design files, drawing files and plot files
33. Email submittal must be accompanied by a formal transmittal.
34. **Electronic Data**
35. 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.
36. All drawings submitted for formal review shall be provided in the following formats, to be agreed with the Engineer:
37. AutoCAD DWG format
38. PDF
39. The following standards shall also apply:
40. Each transfer shall be fully documented to detail items such as layer use, cross-referenced files, necessary directory structure, etc.
41. Data transfers shall be readable using equipment currently employed by the Engineer.
42. 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 Engineer's computer systems.

124 Site security

1. The Contractor shall provide for safeguarding the works, materials and plant against damage and theft including providing all necessary watching and lighting for the security of the works and the protection of the public.
2. The Contractor shall provide shelter and heat for any watchmen so required. Provide 24 hour static security to the site compound.
3. The Contractor is to provide for clearly identifying the site perimeter and surroundings for the full duration of the works. The Contractor shall make provisions for protection of the public from site operations and arrangements for protection of third parties and visitors to the site in accordance with all statutory requirements. The Contractor shall acquaint himself fully with the nature, extent and sequence of security arrangements required in connection with the work to be carried out. The Contractor shall safeguard the site, the works, material and plant against unauthorised entry, damage and theft and provide watching and lighting as necessary.
4. The Contractor shall ensure that all openings and the like broken out or formed are adequately secured against trespassers and in particular children during and outside normal working hours and provide adequate protection for personnel. Security on the site is the absolute responsibility of the Contractor who must ascertain in advance the likely requirements of security in the general area.
5. The Contractor shall include in his tender all costs associated with all security, by day and by night, from the commencement to the completion of the project and no claims for extra costs under this heading will be entertained.
6. The Contractor must ensure that security companies or persons who provide a security service are licenced in accordance with Section 38 of the Private Security Services Act 2004 that users of Private Security are prohibited from employing an unlicensed security contractor as an employee. The Contractor shall provide for the employment of security personnel to protect the contractor's personnel during working hours, overtime working, or at other times as appropriate. Security personnel must be licenced in accordance with the Security Services Act 2004.

125 Levels and setting out

1. All levels shall be referred to Ordnance Datum, Malin Head and shall be taken from a datum, or from permanent benchmarks which have been established on site. The Contractor shall be responsible for the accuracy of any benchmarks on site.
2. The Contractor shall set out the works to line and level as shown on the Drawings.: **All setting out shall be carried out using digital electronic instruments, either by the Contractor's**

trained staff or by a specialist surveying firm. The Engineer shall be notified when any setting out to line or level is complete and ready for checking.

3. The Contractor shall provide, when required, the services of a labourer together with all necessary instruments and materials for the use of the Engineer in checking the setting out of any works.

131 Quality procedures

1. The Contractor shall establish and implement quality assurance procedures as required by the Works Requirements, including procedures for establishing quality assurance systems for itself and subcontractors. The Engineer may monitor, spot check and audit the Contractor's quality assurance procedures. If the Contractor / sub-contractor / Specialist operate an approved quality system a quality plan for the project must be submitted to the Engineer. If no quality system is in operation the Contractor / sub-contractor / Specialist must comply with the following minimum requirements
2. Establish and implement quality assurance procedures as required by the Works Requirements.
3. The quality assurance procedures shall be reflected in appropriate quality plans.
4. Identify the personnel responsible for the project management, site management, safety, and for inspection and testing of the Works and for the verification of such tests.
5. Ensure that an adequate document control procedure is in place for the project which will ensure that
6. i) A drawing register is maintained to record details of all drawings received relating to the project including revision status and circulation record.
7. ii) All documents are date stamped and identified with the project.
8. iii) Superseded drawings are marked Superseded and removed from use.
9. iv) All documentation is safely filed and easily retrievable.
10. Have clear purchasing procedures which will document individual orders for all materials to be incorporated in the project. Such documentation or purchase order should incorporate the project number and date of order, the supplier's name, address and telephone number, description of materials ordered including requirements to conform to international standards and / or references to drawings or specifications. The date for delivery should be clearly stated on the purchase order.
11. All deliveries to site must be checked by a designated person and materials not meeting specifications to be identified, segregated where practical and details of non-conforming product and the remedial action to be taken.
12. Provide evidence to the Engineer if required of specialised training of site personnel.
13. Provide a schedule of inspections and tests to the Engineer which will list the relevant tests, the persons responsible for carrying out the tests and the personnel responsible for verifying that the tests have been carried out.
14. The Contractor shall give to the Engineer copies of all reports prepared in accordance with the Contractor's quality assurance procedures.
15. The Contractor shall implement all QA procedures and requirements regarding the Preliminary Inspection Plan (PIP), Inspection Notification Framework (INF) and associated certificates as shall be required under BC(A)R 2014.
16. Ensure that all Change Orders to the Contract are authorised by the Engineer and recorded in accordance with the Conditions.

132 Site supervision

1. The Contractor shall ensure that there is a sufficient number of suitably qualified and experienced staff on-site at all times to supervise all work carried out by the Contractor and to advise and assist the Employer in taking possession of the works. Prior to project commencement, the Contractor must appoint a Contractor's Representative and supervisor and inform the Employer of these appointments. The Contractor's Representative must have full authority to act on Contractor's behalf and the supervisor must work full time on the Works and have full authority to receive the Employer's instruction on behalf of the Contractor.

134 Construction products regulations 2013

1. In accordance with the Construction Products Regulations 2013, all construction products covered by a harmonised technical specification must carry a CE mark. A Declaration of Performance (DOP) must be made available for any product that requires a CE mark.

135 Temporary works

1. The Contractor shall provide, at his own expense, all temporary works required for the completion of the Contract. Excavations shall be kept free of water at all times by pumping or otherwise. Where pumping is required the sump shall be kept clear of any concrete works. Control of installations of underpinning micropiles, sizing of steel beam supports to transfer loading from the existing masonry structure through to new supports during initial phases of construction, to be supplemented with system for ongoing monitoring of vertical settlements relative to lateral load supports including ground anchors to secant walls during excavation phases. Contractor designs to establish proposals and detailing of required systems for consistent.

140 Independent check certificates for temporary works

1. 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 Chartered Engineer with suitable relevant experience (minimum: 5 years experience in the design of temporary works). The checker may not make reference to the temporary works designer's calculations in order to fulfil his/her duties. All temporary works designs and check certificates are to be submitted a minimum of 4 weeks prior to the erection of any temporary works on site. Please refer to Appendix C for the required Independent Check Certificate.
2. The following non-exhaustive list of elements of work require independent check certification
3.
 - 3.1. **New Item:** Traffic management and planning;
 - 3.2. **New Item:** Site hoarding, fencing and temporary signage;
 - 3.3. **New Item:** Excavations deeper than 1.2m including dewatering;
 - 3.4. **New Item:** Site environmental protection measures.

145 Materials and equipment

1. All materials which the Contractor proposes to use shall conform to the latest edition of the appropriate Irish Standard Specification where such exists, or with the appropriate British Standard or Eurocode Specification. If no appropriate Standard Specification exists the materials and equipment shall be of the best of their kind available and subject to the prior approval of the Engineer.
2. Where reference is made to the "D.O.E. Specification", it shall mean "Specification for Road Works" of the National Roads Authority, or the Department of the Environment published by The Stationery Office (in the event of the material not being covered by the NRA Standard)
3. The Contractor shall provide and maintain for the duration of the Contract such storage compounds and buildings as are necessary to store and protect all materials on site to the satisfaction of the Engineer.
4. Samples of all materials to be used on the works shall be provided by the Contractor for the Engineer's approval. All material used on site shall be of a quality equal to, or better than, the approved samples, which may be retained by the Engineer.
5. Where National Standards to which equipment or materials must comply are cited, goods meeting other authoritative standards which ensure an equal or higher quality than the standards mentioned, may also be accepted. Where reference is made in the Works Requirements to specific brand names, catalogue numbers or type of equipment or a specific manufacturer, offer of alternative equipment, articles or materials which have similar characteristics and provide equal performance and quality to those specified may also be considered. Any substitutions which the

Contractor proposes to make in this respect must be approved by the Engineer in writing before incorporation into the

6. Works.
7. Any approval given by the Engineer in this respect shall not relieve the Contractor from his responsibility for the performance and quality of his proposed substitutions. Materials, goods and workmanship are to be of the best quality of their respective kinds and those for which there is an Irish or British Standard or Code of Practice are to comply therewith unless otherwise stated. The Engineer shall be the sole judge as to the fulfilment of these requirements.
8. Equivalent means materials or products that are equivalent in respect of material, safety, reliability, function, performance, compatibility with adjacent construction, availability of compatible accessories, cost of replacements, appearance, ease of cleaning, durability, running costs, ease of maintenance, and energy consumption. Documentary evidence in support of these criteria must be submitted for review by the Engineer and Employer. If, on the basis of the information submitted, the product is deemed by the Engineer "As Equivalent", the Engineer will seek the Employer's approval to instruct the use of the "Substitute" product. Any known defects in a product, if critical to aesthetics, performance or compatibility with related works would disqualify it. The decision of the Employer will be final.
9. Should the Contractor wish to use a "Substitute" product the reasons for considering an alternative must be given and the alternative must be demonstrated to be of equal quality or better in all respects to the specific product included in the tender design and/or specification. Proposals for the use of "Substitute" products must be put forward during the tender period so that all "Equivalent" products that are accepted are identified in the Project Specification Document. "Substitute" products will only be considered following the signing of the contract where there is a compelling reason such as the original specified product no longer being available. The Contractor, in this situation, is to submit all the information required to the Engineer 4 weeks before a decision is required and an order needs to be placed. Failure by the Contractor to request approval for the use of an "Equivalent" product in sufficient time to obtain the Engineer decision prior to needing to order the product to meet the construction programme will not be accepted as a valid reason for a claim for delay.
10. If an "Equivalent" product to that specified is proposed the Contractor must submit the following information to the Engineer:
11. Reasons: Submit reasons for the proposed substitution.
12. Provide manufacturer and product reference
13. Provide cost information
14. List proposed revisions to drawings and specifications to be prepared.
15. Provide documentary evidence that the following properties of the alternative product, where relevant, are equal or better:
16. cost
17. material
18. safety
19. reliability
20. function
21. performance
22. compatibility with adjacent construction
23. availability of compatible accessories
24. cost of replacements
25. appearance (to be demonstrated with photographs, samples and where necessary visits to existing installations)
26. ease of cleaning
27. durability
28. running costs

29. ease of maintenance
30. energy consumption
31. compliance with relevant standards including Irish Board Agreement Certification (or equivalent),
32. availability of manufacturer's insurance backed guarantee, test certification etc.
33. Written confirmation by the Engineer must be obtained before ordering the product that, on the basis of the information submitted, the product is deemed by the Engineer to be "Equivalent" and has been accepted by the Client. The Employer will not, except by specific agreement, pay any additional cost for the use of an "Equivalent or Substitute" product. The Contractor will be required to accept design liability for any products selected by the Contractor and any design revisions arising from the use of that product. The Client's Design Team will undertake only minor revisions to drawings in the event of adjustments to the construction details being required both for construction and record purposes as a consequence of an "Equivalent or Substitute" product being used. In these circumstances the Contractor is to provide the Design Team with all relevant information to facilitate making revisions to the drawings, in particular those details showing the junction of the "Equivalent or Substitute" products and adjacent materials.
34. **Where the adoption of an "Equivalent " product requires extensive revisions to the construction and record drawings the Contractor will be required to include the cost of any major revisions to the design in its estimate of the cost of utilising an " Equivalent or Substitute" product**

160 Prevention of pollution and waste management

1. The Contractor shall not discharge any polluting material into any streams or ditches adjacent to the site. Where a concrete mixer is used on site a catch pit shall be constructed through which all water from the mixer shall pass.
2. The Contractor is required to comply with all waste management statutory requirements. A Construction Waste Management Plan is to be submitted prior to commencement of works. Waste generated on site during the course of construction shall be disposed off site to licenced waste disposal facilities by licenced disposal contractors in accordance with the Planning Acts. Allow for all costs associated with the preparation of Waste Management Plan and implementation of the agreed plan for the duration of the contract

170 Condition surveys

1. On taking possession of the site the Contractor will be required to produce within 3 weeks and submit to the Engineer a photographic record and a detailed condition survey of the existing access road, boundary walls, miscellaneous structures, etc. in the environs of the site, and all adjacent lands, if applicable; and site compound area to be taken possession of and all surrounding access and egress routes. These condition surveys will be held as a record on the condition of the existing areas when possession was granted. It is requirement of this contract for the Contractor to reinstate at his own expense all areas damaged by the Contractor to the pre-occupation condition, unless otherwise advised.
2. These surveys are to be carried out by a Chartered Surveying company, details of which are to be submitted to the Engineer prior to commencement of works on site. Copies of these conditions surveys are to be provided to all relevant landowners within two weeks of the carrying out of the surveys.
3. The Contractor will be held responsible for any damage to adjoining property and any other properties adjacent to the site, which may be caused by the works. He is to provide any necessary protection for this purpose and remove same when no longer required and make good any damage at his own expense. He is to indemnify the Employer in respect of any claim for disturbance or damage arising out of the foregoing.
4. Upon completion of the works and within a maximum of 4 weeks from Substantial Completion, the Contractor will carry out and produce post-works condition surveys matching the above reports. Copies of these reports will be submitted to the Engineer and all relevant land owners. The condition survey of the constructed access road shall include photos taken at 5m centres along the length of the road, at the left hand side, centre and right hand side of the road.

180 Protection of the works

1. The Contractor shall, at his own expense take all necessary precautions to protect existing and new works at the site and the immediate approaches thereto from damage by traffic, weather or other causes (dewatering, vibro-compaction and/or piling) and shall make good to the satisfaction of the Engineer any works so damaged.

190 Protection of public, lighting and temporary fencing

1. The Contractor shall provide all necessary lighting, watching, hoarding, temporary fences, barriers, guard rails, temporary bridges and all other things necessary for the protection and convenience of the general public and for the safety of the workmen at all public and private roads and footpaths and elsewhere on the site. He shall also provide and erect such temporary fences as may be necessary to protect the lives and property of adjoining owners or occupiers. All the cost of the foregoing shall be covered by and included in the Contract Sum.
2. The Contractor shall indemnify the Employer and the Local Authority against all claims, costs, expenses, damages or proceedings resulting from the absence, failure, insufficiency or suitability of any of the foregoing safeguards or provisions.

200 Traffic management

1. The Contractor shall at all times during the carrying out of the Works, keep open and free from obstruction all private and public roads and footpaths in or near the site. 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 Works.
2. Phasing of the Works - The Contractor shall phase the construction of any work, which affects the public traffic in a manner acceptable to the Local Authority, An Garda Síochána and the Engineer. It is anticipated that during the various stages of the project the following traffic management measures will be required, but not limited to:
3. Refer to Architects Drawings including limitations on working hours in the Planning Permission.
4. Traffic must be maintained at all times on emergency routes as well as main access routes.
5. The use of one way systems and/or flagmen will be acceptable subject to the acceptance of the Employers Representative and the Client.
6. The Contractor shall appoint a Traffic Management Engineer, who shall be a Chartered Engineer, suitably experienced in Traffic Management to prepare traffic management plans. At least four weeks prior to carrying out any works, which will affect public traffic, the Contractor shall consult with the Employer, the host hospital, the appropriate road authority, An Garda Síochána (if required), and any other bodies that may be impacted on such as Bus Éireann or others. At least two weeks prior to commencement of any works which will affect public traffic, which shall have been previously agreed, the Contractor shall issue a traffic management plan prepared by the approved Traffic Management Engineer. This traffic management plan shall provide the following minimum information:
7. Drawings showing the Contractor's temporary traffic management layout to a scale not less than 1/2500, supplemented by drawings at 1/1000 or 1/500 scales as necessary, including:
8. (a) Extent of existing trafficked road being interfered with;
9. (b) Location and width of temporary traffic lanes;
10. (c) Duration of interference with traffic flows;
11. (d) Provision for Emergency services;
12. (e) Sequence of construction at junctions;
13. (f) Geometric design;
14. (g) Width of lanes;
15. (h) Working areas;
16. (i) Safety zones;
17. (j) Access and exit locations for construction vehicles;

18. (k) Barriers;
19. (l) Signing;
20. (m) Road markings;
21. (n) Temporary lighting;
22. (o) Crossovers.
23. **Timing of operations:**
24. The erection and removal of any traffic management or temporary diversion shall be in accordance with the Planning Conditions.
25. **Temporary Safety Barriers:** :
26. The Contractor shall employ H2 containment barriers ("Varioguard" or approved equivalent systems) to delineate and segregate the trafficked lanes from the working areas during construction of these works on all public roads. Barriers on private roads shall be suitable for the actual speed of the traffic.
27. **Road lighting requirements:**
28. The Contractor shall supply, erect and maintain lighting to the satisfaction of the road authority and Client. Any road lighting that exists over a length of road covered by a traffic management system shall be maintained or modified such that the standard of lighting is equal to that of the existing.
29. The Contractor shall supply, erect and maintain all signs, driver information signs, and barriers to the satisfaction of the road authority. The Contractor shall supply and erect information signs informing the public of any proposed road closures at least four weeks in advance of the proposed road closure date. These information signs shall state the road closure date and be erected in locations agreed with the road authority, Engineer and the Employer.
30. **Maintenance Requirements:** :
31. The Contractor shall maintain and keep clean all public and private road (including temporary roads), footpaths, kerbs, etc. and keep the approaches to the site clear of mud. The Contractor is to make good any damage caused by his own or any sub-contractor's or Supplier's transport at his own expense and pay all costs and charges in connection therewith. The Contractor shall clean by brushing and hosing all walkways and roadways used by his crews and vehicles (or those of sub-contractors or Specialists) at least once per day and/or as often as necessary to keep the roadways free of dirt, dust and mud. The Contractor will supply his own hoses and connections to water supply points approved by the Local Authority/Employer.
32. The Contractor shall provide a wheelwash facility within the site compound, maintain for the contract duration, remove and make good on completion.
33. The Contractor shall ensure that no damage is caused to the existing roads due to the delivery of materials, the execution of works, or the removal of rubbish. All vehicles entering or leaving the site carrying loads which constitute a potential dust or dirt nuisance such as aggregate, sand, gravel, soil or the like shall be secured so that no materials shall leave the vehicle. The Contractor shall be responsible for keeping all highways adjacent to the job site free from mud droppings or other materials which are due to his own and all other operations and safeguard the Employer from any liability resulting therefrom.
34. The Contractor is expected to take reasonable care to ensure that all vehicles entering and leaving the jobsite are free of mud on the wheels or tracks, and the loads are secure. In the event of fouling of any roads due to any operations he will be expected to clean them expeditiously at his own expense to the satisfaction of the Engineer. The Contractor shall be entirely responsible for any damage due to his failure to comply with this clause.
35. 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. The Contractor shall provide a 1.4m high temporary solid pedestrian guardrail/barrier between works areas and pedestrian areas with suitable means of access and egress.
36. 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 Engineer on the following day, until the completion of those Works requiring the lane or carriageway occupation.

37. The Contractor shall be subject to all Legal Requirements in relation to temporary closures. The period for traffic diversions or restrictions shall be the absolute minimum required to facilitate construction of the works.
38. All applications relating to road closures, traffic orders, lane occupations, signs or signals shall be submitted to the road authority in writing and require the following notice (over and above the time allowed for the submission of the Traffic Management Plan to the Engineer):
39. (a) amending or making traffic orders – 6 weeks
40. (b) requests for road closures, lane closures or traffic diversions - 6 weeks;
41. (c) authorising of non-prescribed signs – 6 weeks.
42. (d) authorising temporary traffic signals - 6 weeks; and
43. (e) moving signs to be compatible for Road Works with the state of the Works - 6 weeks

44. Road Safety Audits

45. The Contractor shall be subject to the full statutory procedures outlined in the Temporary Closing of Roads Regulations. The period of closure shall be the minimum to facilitate construction of the works. Stage 2 and Stage 3 of the Road Safety Audits: shall be carried out on temporary traffic management stages unless they are not judged by the Engineer, following discussions with the Roads Authority, Employer and the Garda Siochana (as required), to be sufficiently complex or major to require a Road Safety Audit. Stage 3 safety audits shall be carried out for traffic management in place for longer than 3 working days. For a Stage 2 Road Safety Audit, the Contractor shall submit to the Engineer 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 Engineer within seven days of receipt. For a Stage 3 Road Safety Audit, the Contractor shall submit to the Engineer, two signed copies of a Road Safety Audit Certificate for each audited stage no less than three days after implementation of the traffic management. One copy will be returned to the Contractor signed in acknowledgement of receipt by the Engineer within seven days of receipt. No awaited temporary traffic management stage shall be put into operation until a Road Safety Audit Certificate has been signed by the Designer and the Contractor.

46. Traffic Accidents and Emergencies

47. In the event of a traffic accident occurring adjacent to any of the Works, the Contractor shall immediately contact An Garda Siochana and the Engineer informing them of the following:
48. Location of the accident; and
49. 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.

50. Safety of Operatives

51. 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 high visibility 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.
52. All drivers including those delivering plant and materials shall be given clear instructions regarding the traffic arrangements applicable at any particular time.
53. 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. 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. Contractor's vehicles shall not be permitted to park on public roads adjacent to the works. All Contractors' vehicles shall park in designated parking areas as agreed by the Engineer.

54. All vehicles and plant engaged in the Works, or entering/exiting the working areas shall have roof mounted amber flashing lamp. Hazard warning lights shall not be used as an alternative to the roof mounted amber flashing lamp.

210 Work outside normal hours

1. If the Contractor wishes to carry out works at night, or outside normal working hours, he shall give five days notice in writing to the Engineer. Any such work carried out without notice being given shall be deemed not to be work done under this Contract and shall not be measured up for the purpose of Certification. It should be noted that such work may be forbidden under the grant of planning permission, where relevant.

220 Items of archaeological interest

1. If any item of archaeological interest is encountered in the course of the work, the Contractor shall cease work in the immediate vicinity of the item and shall notify the Engineer at once. Work in the vicinity of the find shall not be resumed until the area has been properly investigated. Anything found shall become the property of the Employer.

230 Provisions for testing

1. The Contractor shall provide without extra charge all labour and items required by the Engineers for testing or measuring the works. The proving or testing of the quality of the ground shall be carried out by an approved laboratory. All testing laboratories will have ISO 9001 or similar accreditation. In the event of any materials failing, partly or wholly, any test the Contractor shall be responsible for all charges in connection therewith.
2. The following equipment shall be available on site and in proper working order at all times.
 - 2.1. 6 No. Steel or Cast Iron Cube moulds 150mm size
 - 2.2. 2 Standard Rammers
 - 2.3. 1 Slump test Apparatus.

235 Restoration of surfaces

1. The Contractor shall be responsible for the restoration of all surfaces interfered with by him and he shall maintain them to the satisfaction of the Public Authorities or persons concerned and to the satisfaction of the Engineer.

245 Formation and formation level

1. The terms "formation" and "formation level" shall mean the level of the ground after excavation has been carried out to the level of the bottom of the pipe bed in the case of sewers, the level of the bottom of the site concrete in the case of structures, the level of the bottom of the base in the case of manholes and the level of the bottom of the sub base i.e. top of sub grade in the case of a road.

255 Rock excavation and soft excavation

1. The term "rock" in this Specification is intended to mean hard Limestone, Granite, Sandstone, etc., in mass formation and boulders of the same materials greater than one third of a cubic metre in volume and which cannot be readily removed from the excavations without the use of blasting or hammers and wedges. Soft surface rock or the soft top of the hard rock or rock readily divided by cleavage planes to allow easy excavation will be regarded as earth excavation.
2. All kinds of material other than rock as defined above, shall be regarded as soft excavation.
3. The Engineer shall decide the classification of excavated material and their decision will be final and binding.

265 Control of noise and vibration

1. The Contractor shall comply with all statutory regulations governing the control of noise and pollution.

2. The Contractor is obliged to comply with (as a minimum) the British Standard 5228 "Noise Control on Construction and Open Sites Part 1. Code of Practice for basic information and procedures for noise control".
3. The Contractor shall fit all noise compressors, percussion tools and vehicles with effective silencers of a type recommended by manufacturers of the compressors, tools and vehicles. The Contractor shall ensure that the noise level from all mechanical appliances is kept to a minimum and shall provide where necessary noise reducing aids. Noise from the development shall not give rise to the sound pressure levels (LeQ 15 minutes) measured at noise sensitive locations which exceed the following limits: 85db (A) between the hours of 8am and 6pm Monday to Friday and 8am and 1pm on Saturdays inclusive. (excluding bank holidays)
4. The Contractor shall select the piling equipment with the least possible induced vibration. All vibrations shall be controlled at all times and shall be kept at levels below (PPV =) 3mm/s at 2m away from the machinery.

There shall be no clearly audible tonal component or impulsive component in the noise emission from the development at any noise sensitive locations. Noise sensitive locations are given to mean 1) any dwelling house, 2) hotel or hostel, 3) health building , educational establishment, place of worship or entertainment. 4) any other facility of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.

275 Essential items not specifically mentioned

1. The Contractor shall be responsible for carrying out, at his own expense, everything necessary for the proper completion of the specified works, even though such things may not be specifically mentioned in the Specification nor shown on the drawings.

285 Eurocodes and other standards

1. All references to BS EN documents in this Specification (eg BS EN 1991-1-4) should be taken to read as the equivalent Irish Standard (IS EN) and the Irish National Annex applies. In the event of a product for which no Irish Standard exists the equivalent British Standard is acceptable. It is the responsibility of the Contractor to prove to the Engineer that the proposed standard is equivalent and the decision of the Engineer is final on whether to accept same.

300 S.i. no. 9/2014 - building control (amendment) regulations 2014 and programme of works

1. In order to allow the Engineer to comply with the requirements of S.I. No. 9/2014 - Building Control (Amendment) Regulations 2014 and subsequent revisions and Code of Practice for Inspecting and Certifying Building and Works 2014 (and any subsequent revisions), the Contractor is required to provide a weekly summary to the Design team outlining planned works for the upcoming week.

Ω End of Section

C20 Demolition

Clauses - Not Used

General requirements

110A Desk study/ survey

1. **Scope:** Before starting demolition work, examine available information, carry out a survey of the structures, site and surrounding area.
2. **Report and method statements:** Submit, describing:
 - 2.1. Form, condition and details of the existing building and structures, site and surrounding area.
 - 2.1.1. **Extent:** within site boundary
 - 2.2. Form, location and removal methods of flammable, toxic or hazardous materials.
 - 2.3. Form, location and removal methods of materials for reuse or recycling.
 - 2.4. Type and location of adjoining or surrounding premises which may be adversely affected by noise, vibration and/ or dust generated during deconstruction/demolition.
 - 2.5. Identification and location of services above and below ground, including those required for the Contractor's own use. Arrangements for disconnection and removal of services.
 - 2.6. Type and location of features of historical, archaeological, geological or ecological importance.
 - 2.7. Sequence and method of demolition including details of specific pre-weakening.
 - 2.8. Arrangements for protection of HSE staff/personnel and the public including exclusion of unauthorised persons.
 - 2.9. Arrangements for control of site transport and traffic.
 - 2.10. Proposed programme of work.
 - 2.11. **Special requirements:** If necessary carry out and submit for review structural calculations in support of method statements
3. **Format of report:** PDF

120A Extent of demolition

1. **General:** Subject to retention requirements specified elsewhere, deconstruct/ demolish structures down to levels as shown on drawings. .

130A Groundworks

1. **Old foundations, slabs and the like:** Break out where and to the extent stated. Remove offsite.
2. **Contaminated material:** Remove and carry out remediation required by the Enforcing Authority.

140 Bench marks

1. **Unrecorded bench marks and other survey information:** Give notice when found. Do not remove or destroy.

Services affected by deconstruction/ demolition

210 Services regulations

1. **Work carried out to or which affects new or existing services:** Carry out in accordance with the Byelaws or Regulations of the relevant Statutory Authority.

220 Location of services

1. **Services affected by the Works:** Locate and mark positions.
2. **Mains services:** Arrange with the appropriate authorities for location and marking of positions.
3. **Standard:** In accordance with National Joint Utilities Group (NJUG) 'Guidelines on the positioning and colour coding of underground utilities' apparatus'.

230 Services disconnection arranged by contractor

1. **General:** Arrange with the appropriate authorities for disconnection of services and removal of fittings and equipment prior to starting demolition.

240 Disconnection of drains

1. **General:** Locate disconnect and seal disused drain connections.
2. **Sealing:** Within the site and permanent.

250 Live foul and surface water drains

1. **General:** Protect drains, manholes, inspection chambers, gullies, vent pipes and fittings still in use and ensure that they are kept free of debris.
2. **Damage:** Make good damage arising from demolition work. Leave clean and in working order at completion.

260A Bypass connections

1. **General:** Provide as necessary to maintain continuity of services to occupied areas of the same and adjoining properties.
2. **Minimum notice to adjoining owners and all affected occupiers:** 72hrs, if shutdown is necessary during changeover.

270 Services to be retained

1. **Damage:** Give notice and notify relevant service authority and/ or owner/occupier regarding damage arising from the execution of the works.
2. **Repairs:** Complete as directed, and to the satisfaction of the service authority or owner.

Deconstruction/ demolition work

310A Workmanship

1. **Standard:** Demolish structures in accordance with the provisions of BS 6187.
2. **Operatives:**
 - 2.1. Appropriately skilled and experienced for the type of work.
 - 2.2. Holding or in training to obtain relevant CITB Certificates of Competence.
3. **Site staff responsible for supervision and control of work:** Experienced in the assessment of risks involved and methods of demolition to be used.

320A Gas or vapour risks

1. **Precautions:** Prevent fire or explosion caused by gas or vapour.
2. The contractor should ensure all utilities (gas, electricity) are decommissioned by competent personnel and pipes and equipment removed in area where opening is proposed.

330A Dust control

1. **General:** Reduce airborne dust by periodically spraying demolition works with an appropriate wetting agent. Keep public roadways and footpaths clear of mud and debris.

2. 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.
3. **Lead dust:** Submit method statement for control, containment and clean-up regimes.

340 Health hazards

1. **Precautions:** Protect site operatives and general public from hazards associated with vibration, dangerous fumes and dust arising during the course of the Works.

350A Adjoining property

1. **Temporary support and protection:** Provide. Maintain and alter as necessary as work progresses. Do not leave unnecessary or unstable projections.
2. **Damage:** Minimise. Promptly repair.
 - 2.1. Make good to ensure safety, stability, weather protection and security.
3. **Support to foundations:** Do not disturb. Provide underpinning throughout identified locations to control potential for ground movements affecting the structure, subject to consent.
4. **Defects:** Report immediately on discovery.

360 Structures to be retained

1. **Parts which are to be kept in place:** Protect.
2. **Extent of work:** Cut away and strip out with care to reduce the amount of making good to a minimum.

370 Partly demolished structures

1. **General:** Leave in a stable condition, with adequate temporary support at each stage to prevent risk of uncontrolled collapse. Keep safe outside working hours.
2. **Temporary works:** Prevent debris from overloading.
3. **Unauthorised persons:** Prevent access.

380 Dangerous openings

1. **General:** Provide guarding at all times, including outside of working hours. Illuminate during hours of darkness.
2. **Access:** Prevent access by unauthorized persons.

390 Asbestos-containing materials – known occurrences

1. **General:** None. Refer to clause 391.

391 Asbestos-containing materials – unknown occurrences

1. **Discovery:** Give notice immediately of suspected asbestos containing materials discovered during demolition work. Avoid disturbing such materials.
2. **Methods for safe removal.** Submit details and statutory risk assessments.

410 Unforeseen hazards

1. **Discovery:** Give notice immediately when hazards such as unrecorded voids, tanks, chemicals, are discovered during deconstruction/ demolition.
2. **Methods for safe removal, filling, etc:** Submit details of proposed methods for filling, removal, etc.

442 Site surface at completion

1. **Levels:** Grade the site to follow the levels of adjacent areas.

450 Site condition at completion

1. Debris: Clear away and leave the site in a tidy condition.
2. Other requirements: Groundworks completed as per contract drawings.

Materials arising

510 Contractor's property

1. Components and materials arising from the demolition work: Property of the Contractor except where otherwise provided.
2. Action: Remove from site as work proceeds where not to be reused or recycled for site use.

511 Employer's property

1. Components and materials to remain the property of the Employer:
 - 1.1. Material included in BOQ and Contract drawings
 - 1.2. Materials provided to the contractor for the works remain the property of the employer.
2. Protection:
 - 2.1. Maintain until these items are removed by the Employer, reused in the Works or the end of the Contract.

520 Recycled materials

1. Materials arising from demolition work: May be recycled or reused elsewhere in the project, subject to compliance with the appropriate specification and in accordance with any site waste management plan.
2. Evidence of compliance: Submit full details and supporting documentation.
3. Verification: Allow adequate time in programme for verification of compliance: Allow adequate time in programme for verification of compliance.

Construction monitoring - Not Used

Ω End of Section

D20

Excavating and filling

Clauses - Not Used

Generally/the site

145 Variations in ground water level

1. Give notice: If levels encountered are significantly different from levels in the site investigation report or previously measured.

150 Existing services, features and structures

1. Services: See section A12 for locations.
2. Site features to be retained: See section A12 for details.
3. Structures: See section A34 for details of protection.

Clearance/excavating

168 Site clearance

1. Timing: Before topsoil stripping, if any.
2. General: Clear site of rubbish, debris and vegetation. Do not compact topsoil.
3. Treatment: Apply a suitable residual herbicide to areas to receive gravel surfacing

170 Removing small trees, shrubs, hedges and roots

1. Identification: Clearly mark trees to be removed.
2. Small trees, shrubs and hedges: Cut down
3. Roots: Grub up and dispose of without undue disturbance of soil and adjacent areas
4. Safety: Comply with HSE/ Arboriculture and Forestry Advisory Group safety leaflets.

180 Chipping and shredding

1. General: Permitted, remove arisings from site

220A Stripping topsoil

1. General: Before beginning general excavation or filling, strip topsoil from areas where there will be regrading, buildings, pavings/ roads and other areas shown on drawings.
2. Depth:
 - 2.1. Remove to a minimum depth of: as per contract drawings
 - 2.2. Give notice where the depth of topsoil is difficult to determine.
3. Around trees: Remove topsoil to a 150mm unless approval for deeper removal from arborist.
4. Site storage: Not required

225 Handling topsoil

1. Standard: To BS 3882.
2. Aggressive weeds
 - 2.1. Species: Included in the Weeds Act, section 2 or the Wildlife and Countryside Act, Schedule 9, part II.
 - 2.2. Give notice: Obtain instructions before moving topsoil.

3. **Contamination:** Do not mix topsoil with:
 - 3.1. Subsoil, stone, hardcore, rubbish or material from demolition work.
 - 3.2. Other soil or material containing aggressive weeds, sharps, plastics and non soil forming materials and notifiable animal or plant diseases.
 - 3.3. Oil, fuel, cement or other substances harmful to plant growth.
 - 3.4. Other classifications of topsoil.
4. **Multiple handling:** Keep to a minimum. Use topsoil immediately after stripping.

240 Adjacent excavations

1. **Requirement:** Where an excavation encroaches below a line drawn at an angle from the nearest formation level of another higher excavation, the lower excavation, all work within it and backfilling thereto, must be completed before the higher excavation is made.
2. **Angle of line below horizontal:** 45°
3. **Backfill material:** Compacted T1 crushed rock or plain concrete.

242 Excavations adjacent to existing backfilled trenches

1. **Proximity:** When width of undisturbed ground between the two excavations will be less than
2. **Action:** Assume that the ground between the trenches is unstable and provide side support accordingly.

244A Excavations adjacent to existing foundations

1. **Prior to commencing excavation:**
 - 1.1. **New Item:** Pile around tunnels to facilitate dewatering in Fellow's square.
 - 1.2. Excavate trial pits adjacent to existing foundations where applicable to determine extent and formation levels.
 - 1.3. Allow for inspection of trial pits.
 - 1.4. Allow time for amendment of details if required.
 - 1.4.1. Time period: 5 working days .
2. **Backfill material to new excavation:** Leanmix concrete

245A Crack Monitoring

1. Visual inspections must be carried out by the contractor subsequent to any excavation/drilling works taking place in the vicinity of the existing structure and results of the crack monitoring circulated to the client and design team as soon as is reasonably practical after these works taking place.
2. Crack monitoring tell-tale equipment to be installed at all external piers/building envelope to record any differential movements.
3. Any crack propagation should be reported to the client and Structural Engineer for assessment prior to further works taking place on site.
4. The procedure and controls for the above should be covered in the Contractor's Noise Assessment.

250A Permissible deviations from formation levels

1. **Beneath mass concrete foundations:** ± 25 mm.
2. **Beneath ground bearing slabs and r.c. foundations:** ± 15 mm.
3. **Embankments and cuttings:** ± 50 mm.
4. **Ground abutting external walls:** ± 50 mm, but such as to ensure that finished level is not less than 150 mm below dpc where applicable.

255 Accuracy – linear dimensions

1. **Permissible deviations from linear dimensions generally:** as per the recommendations of CIRIA Publication C709 "Setting Out Procedures for the Modern Built Environment"

260A Inspecting formations

1. **Give notice:** Make advance arrangements for inspection of formations for: temporary works.
 - 1.1. **Notice (minimum):** To be decided by the Temporary Works Specialist.
2. **Preparation:** To be decided by the Temporary Works Specialist.
3. **Trim to required profiles and levels.**
 - 3.1. **Loose material:** To be decided by the Temporary Works Specialist.
4. **Seal:** immediately after inspection, seal formations with: To be decided by the Temporary Works Specialist.

265A Inspecting formations in sand and gravel

1. **Notice for inspection (minimum):** 3 days
2. **Preparation:** Just before inspection remove the last 150 mm of excavation. Trim to required profiles and levels and mechanically compact formation.
3. **Seal:** Within 4 hours of inspection, seal formations with: Leanmix concrete

267 Inspection of formations in shrinkable soils

1. **Inspect formation:** For signs of conducting and fine moisture absorbing roots.
2. **Give notice:** If significant quantities of roots are visible in the formation or in the bottom 75 mm of the walls of the excavation.

270A Foundations generally

1. **Give notice if:**
 - 1.1. **New Item:** Artesian groundwater is encountered during excavation.
 - 1.2. Ground conditions vary significantly from those assumed in the design.
 - 1.3. The formation contains soft or hard spots or highly variable material.
 - 1.4. **New Item:** Buried services are encountered during excavation.
 - 1.5. **New Item:** Accidental striking of temporary supports by plant or equipment during excavation.

310 Unstable ground

1. **Generally:** Ensure that the excavation remains stable at all times.
2. **Give notice:** Without delay if any newly excavated faces are too unstable to allow earthwork support to be inserted.
3. **Take action:** If instability is likely to affect adjacent structures or roadways, take appropriate emergency action.

320A Recorded features

1. **Recorded foundations, beds, drains, manholes, etc.:**
2. **Contaminated earth:** Remove and disinfect as required by local authority.

330 Unrecorded features

1. **Give notice:** If unrecorded foundations, beds, voids, basements, filling, tanks, pipes, cables, drains, manholes, watercourses, ditches, etc. not shown on the drawings are encountered.

360 Excess excavation

1. Excavation taken wider than required
 - 1.1. Backfill: With hardcore as clause 710A
2. Excavation taken deeper than required
 - 2.1. Backfill: With lean mix concrete

Disposal of materials

415 Excavated topsoil removal

1. General: Remove from site.

450A Water

1. Generally: Keep all excavations free from water until:
 - 1.1. Formations are covered.
 - 1.2. Below ground constructions are completed.
 - 1.3. Basement structures and retaining walls are able to resist leakage, water pressure and flotation.
2. Drainage: Form surfaces of excavations and fill to provide adequate lowering of groundwater levels.
3. Removal of water: Provide sump system inside the excavation as per the drawing. Contractor to determine the pump power and whether a vacuum system is required based on soil description and include within the tender price. The Contractor shall engage a qualified surveyor, to perform all layouts and measurements. The surveyor shall layout the work to the lines and grades required before installation and shall determine the location of each sump, and monitoring piezometer and other data. Refer to BH09A and BH012, as required.
4. New Item: The sump system shall be able to draw water both from the groundwater in overburden as and in limestone and shale bedrock aquifer. The surveyor shall record and maintain all information pertinent to each sump and piezometer.
5. New Item: Extracted water to be collected in bowsters, tanks or other temporary storage and discharged at suitable location in accordance with the planning requirements. Do not pollute watercourses with silt laden water. See clause 454 below for limitations to water extraction.
6. Performance requirements:: The Contractor shall:
 - 6.1. New Item: Design, furnish, install, test, operate, monitor and maintain the sump system as specified herein, including all discharge piping and connections at point of discharge, sufficient to lower the groundwater level or hydrostatic head below the bottom of the excavation, or lower, so as to prevent seepage of water into the excavation horizontally through gaps in the walls or vertically through the formation level of the excavation to facilitate dry construction.
 - 6.2. New Item: Design, furnish and install, test, operate, monitor and maintain whatever additional system may be necessary to supplement the sump system as specified and to maintain the excavation free of groundwater seepage and rain water, or flood water resulting from a burst watermain.
 - 6.3. New Item: The periphery of the entire excavation shall be suitably bunded to prevent rainwater or flood water entering the excavation outside the line of piled walls.
 - 6.4. New Item: All water seeping, falling or running into the excavation as it is being dug, and until the temporary dewatering system is removed as specified, shall be promptly pumped out.
 - 6.5. New Item: Dispose of all seepage and surface water removed from the project, regardless of source by methods approved by the Engineer.
 - 6.6. New Item: All excavated soils to be removed immediately from the site.

457 Pumping

1. **General:** Do not disturb excavated faces or stability of adjacent ground or structures.
2. **Pumped water:** Extracted water to be collected in bowzers, tanks or other temporary storage and discharged at suitable location in accordance with the planning requirements. Do not pollute watercourses with silt laden water. See clause 454 below for limitations to water extraction.
3. **Sumps:** Required. Construct clear of excavations. Fill on completion.
 - 3.1. **Locations:** Contractor's choice
4. **Maintenance::** The Contractor shall provide system maintenance including, but not limited to, at least daily supervision by someone skilled in operation, maintenance and replacement of system components and shall provide one (1) spare (connected) diesel powered pump; and all other equipment and work required by the Engineer to maintain the excavation in a dewatered and hydrostatically relieved condition. Dewatering and pressure relief shall be a continuous operation and interruptions due to power outages, or any other reason shall not be permitted. A responsible operator capable of starting, finishing and maintaining the dewatering system and starting standby equipment shall be on duty at all times. Some responsible persons shall continuously monitor the dewatering and surface water central systems, until the Contractor has received approval from Engineer that he may discontinue surface and groundwater control.
5. **Correction of Work::** The Contractor shall be fully responsible for the failure of any components of the temporary dewatering work and for all damages to work in the excavation area caused by the failure to provide, maintain and operate the temporary dewatering system, as specified.
6. **Job Conditions::** The Contractor shall provide protection of persons and property by at least:
 - 6.1. **New Item:** Barricading open excavations occurring as part of this work and post with warning lights. Operate warning lights during the hours from dusk to dawn, each day.
7. **Protection::** Protect existing structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by temporary dewatering system installation and operation.
8. **Measurement::** The Contractor shall provide system maintenance including, but not limited to, at least daily supervision by someone skilled in operation, maintenance and replacement of system components and shall provide one (1) spare (connected) diesel powered pump; and all other equipment and work required by the Engineer to maintain the excavation in a dewatered and hydrostatically relieved condition.

460 Permanent drainage system

1. **Disposal of water from the excavations through system:** Not permitted unless licenced discharge permit obtained by contractor for this purpose

Filling

500A Proposed fill materials

1. **Details:** Submit full details of proposed fill materials to demonstrate compliance with specification, including:
 - 1.1. Type and source of imported fill.
 - 1.2. Proposals for processing and reuse of material excavated on site.
 - 1.3. Test reports as required elsewhere.
 - 1.4. Project-specific test results shall be forwarded to the Engineer for his records stating compliance with the maximum contents of 0.2% SO₃ acid soluble sulphate (ASS) and 1% S total sulfur (TS) in fill materials respectively comply with the values in SR21. IS SR21, Guidance on the use of IS EN 13242 - Aggregates for unbound and Hydraulically bound materials for use in Civil Engineering work and road construction.
 - 1.5. T₃, T₂, T₁ & T₀ layers to be provided in accordance with Annex E of SR21 for the specified depths, T₃ Blinding (max 50mm), T₁ Structural (<900mm) and T₀ Structural (>900mm):

- 1.6. Structural fill to be 300mm C12/16 Plain concrete over the entire basement area footprint to allow for soft spots.:
2. Timing: At least 14 days before starting filling
3. IN ADDITION TO THE ABOVE it must also be confirmed and certified by the fill supplier that an assessment of the project-specific material has been carried out to determine the % pyrite by mass of sample in relation to oxidisable sulphide (OS) using the guidance in Clause C5.12 of BRE Special Digest 1. Fill material containing an equivalent pyrite content greater than 0.5% by mass of sample shall not be used (material containing up to 0.5% pyrite equivalent is considered 'negligible to low potential' for chemical swelling potential of a fill material in accordance with acceptance criteria in Comité Technique Québécois d'étude de problèmes de gonflement associés à la pyrite - Appraisal existing buildings. Procedure CTQ M200).
4. Alternatively the hardcore is to be categorised in accordance with I.S.398: Part 1, Reactive Pyrite in Sub-Floor Hardcore Material - Part 1: Testing and Categorisation Protocol and submitted to the Engineer for approval.

510A Hazardous, aggressive or unstable materials

1. **General:** Do not use fill materials which would, either in themselves or in combination with other materials or ground water, give rise to a health hazard, damage to building structures or instability (in particular refer to Acid Soluble Sulfate and Total Sulphur and Pyrite Assessment) in the filling, including material that is:
 - 1.1. Frozen or containing ice.
 - 1.2. Organic.
 - 1.3. Contaminated or noxious.
 - 1.4. Susceptible to spontaneous combustion.
 - 1.5. Likely to erode or decay and cause voids.
 - 1.6. With excessive moisture content, slurry, mud or from marshes or bogs.
 - 1.7. Clay of liquid limit exceeding 80 and/or plasticity index exceeding 55.
 - 1.8. Unacceptable, class U2 as defined in the NRA Roadworks Specification, Clause 601.

510B Fill materials; hazardous, aggressive or unstable materials

1. Fill Material shall be tested in accordance with IS EN 1744-1 for the following:
2. (i) the water-soluble sulfate (WS) content shall not exceed 300 mg of sulfate (as SO₄) per litre; and
3. (ii) the oxidisable sulfides (OS) content shall not exceed 0.06 % of sulfate as SO₄; and
4. (iii) water to soil extract prepared for the determination of water soluble sulfate in (i) must have a pH value of less than 7.2, when tested using the electrometric method of pH determination in accordance with BS 1377-3.
5. At least five samples of each material shall be tested for WS, OS and pH value. The mean of the highest two values shall be used for comparison with the limiting values. This also applies if six to nine results are available. If ten or more results are available, the mean of the highest 20% of the results shall be used for comparison with the limiting values.

517 General requirements; cutting and sloping

1. 1 The Contractor shall employ only plant and working methods which are suited to the materials to be handled and traversed. He shall be responsible for maintaining the nature of the acceptable material so that when it is placed and compacted it remains acceptable in accordance with the Contract. Acceptability shall be determined in accordance with Table 6/1 of Series 600 of NRA Specification.
2. 2 The Contractor shall:
3. (i) comply with all relevant legislation in respect of all operations including the excavation and disposal off-Site of all contaminated unacceptable materials, including any construction and demolition materials.

4. (ii) comply with all relevant legislation in respect of treatment of any areas of contaminated material known to exist or encountered in the execution and completion of the Works.
5. (iii) produce as part of the Environmental Operating Plan a "Construction and Demolition Waste Management Plan" in accordance with the provisions of current guidance and
6. (iv) prepare as part of the Quality Assurance System an "Execution Quality Assurance Plan" that shall include all of the following:
 7. (a) all the necessary procedures to ensure relevant testing and classifying of all materials to ensure that all unacceptable contaminated material shall not be designated as acceptable material in accordance with the Specification and to ensure that there shall be documentary control and written evidence of all materials that shall be required to be disposed off-Site to any licensed landfill site in accordance with the provision of current legislation.
 8. (b) all the necessary procedures to ensure that the relevant authority shall be notified 2 working days in advance of the excavation or disposal of any contaminated unacceptable material as part of the execution of the Works, whose personnel or advisers shall be entitled to witness any such activities and all the necessary procedures to ensure the documentation of the chain of custody for all materials classified as "contaminated unacceptable material" that is disposed off-Site to any licensed landfill site.
9. 3 Where the excavation reveals a combination of acceptable and unacceptable materials the Contractor shall carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the Works without contamination by the unacceptable materials. Classes of fill material required to be deposited separately shall be excavated separately without contamination by other Classes of material.
10. 4 The Contractor shall make his own arrangements for stockpiling of acceptable material, and unacceptable material to be processed, and for the provision of sites for the purpose.
11. 5 The Contractor shall ensure that he does not adversely affect the stability of excavations or fills by his methods of stockpiling materials, use of plant or siting of temporary buildings or structures.
12. 7 Excavations for foundations and trenches shall be adequately supported at all times. The additional work and materials shall be provided by the Contractor. Sheeting and other excavation supports shall be removed as filling proceeds.
13. 8 Excavations requiring backfilling shall remain open only for the minimum period necessary.
14. 9 Excavations requiring backfilling in existing paved or other surfaces shall be carried out and reinstated.
15. 10 Contractor shall form and maintain cuttings, embankments and other areas of fill with appropriate falls and gradient and smooth closed up surfaces
16. 11 The Contractor shall keep groundworks free of water including measures:
 17. (i) arranging for the rapid removal of water;
 18. (ii) lowering and maintaining by appropriate measures, the water level in excavations, sufficiently to enable the Works to be constructed.
 19. (iii) provide where necessary temporary watercourses, drains, pumping and the like;
 20. (iv) discharge accumulated water and groundwater into the permanent outfalls of the drainage system where practicable;
 21. (v) provide adequate means for trapping silt on temporary systems discharging into permanent drainage systems.
22. 12 Where materials are designated as Class U2 hazardous material (in accordance with Series 600 of NRA Specification), the Contractor shall carry out any special requirements for their handling. Where hazardous materials are encountered during the progress of the Works, the Contractor shall make all necessary arrangements for their safe handling and disposal as Class U2 material after consultation with the Employer's Representative and the appropriate statutory bodies.

520A Frost susceptibility

1. **General:** Except as allowed below, fill must be non frost-susceptible

2. **Test reports:** If the following fill materials are proposed, submit a laboratory report confirming they are non frost- susceptible:
 - 2.1. Fine grained soil with a plasticity index less than 20%.
 - 2.2. Coarse grained soil or crushed granite with more than 10% retained on a 0.063 mm sieve.
 - 2.3. Crushed chalk.
 - 2.4. Crushed limestone fill with average saturation moisture content in excess of 3%.
3. **Frost-susceptible fill:** May only be used within the external walls of buildings below spaces that will be heated. Protect from frost during construction.

525 Testing of suitability of fill materials before start of filling

1. **Laboratory:** Irish National Accreditation Board (INAB) accredited laboratory or similar national body
2. **Submit report to:** Engineer (electronically - PDF)
 - 2.1. **Timing:** 14 days before starting filling
3. **Samples:** Deliver to laboratory as required.
 - 3.1. **Additional requirements:** none
4. **Tests:** As directed
5. **Frequency:** Submit with tender proposed rate and frequency of testing to demonstrate continuing compliance of imported or reprocessed fill with specified properties

530 Placing fill

1. **Surfaces of excavations and areas to be filled:** Free from loose soil, topsoil, organic material, rubbish and standing water.
2. **Freezing conditions:** Do not place fill on frozen surfaces. Remove material affected by frost. Replace and recompact if not damaged after thawing.
3. **Adjacent structures, membranes and buried services**
 - 3.1. Do not overload, destabilise or damage.
 - 3.2. Submit proposals for temporary support necessary to ensure stability during filling.
 - 3.3. Allow 14 days (minimum) before backfilling against in situ concrete structures.
4. **Layers:** Place so that only one type of material occurs in each layer.
5. **Earthmoving equipment:** Vary route to avoid rutting.

530A Construction of fills

1. 1 All fills, including embankments, shall be constructed:
2. (i) in the locations as it is indicated on the drawings; refer to the existing site levels and to the proposed site levels shown on the drawings;
3. (ii) of Classes of materials as specified complying with Table 6/1 of series 600 of NRA Specification;
4. (iii) by depositing, as soon as practicable after excavation, in layers to meet the compaction requirements as required for each Class of material in Table 6/1 of series 600 of NRA Specification, except that material requiring end product compaction shall be deposited in layers not exceeding 250 mm uncompacted thickness;
5. (iv) with a maximum gradient of 1 vertical to 2.5 horizontal
6. (v) The Contractor shall take all reasonable measures to prevent damage to the underlying strata, which may include the use of lighter spreading plant or the reduction of the number of passes of the compaction plant.
7. 2 Embankments and other areas of fill shall be constructed evenly over their full width and the Contractor shall control and direct construction plant and other vehicular traffic uniformly over them. Damage by construction plant and other vehicular traffic shall be made good by the

Contractor with material having the same characteristics and strength as the material had before it was damaged.

8. 3 Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cuttings, other fills and excavations, such faces shall be benched immediately before placing the subsequent fill.
9. 4 During construction of embankments and other fills, exposed fill material shall be protected against scour and erosion from any source.
10. 5 The use of light weight fill as a permanent fill material is not acceptable under this specification.

530B Fill adjacent to structures

1. 1 Materials of Classes 808 or 6N1, 6N2 or 6P and complying with Table 6/1 of Series 600 of NRA Specification shall be used as fill to structures,
2. 2 The Contractor shall compact, in compliance with Clause 530C, end-product compaction, Class 6N1, 6N2 and 6P material to satisfy the compaction requirements for those Classes as listed in Table 6/1 of Series 600 of NRA Specification, but subject to the restrictions in sub-Clauses 3 and 4 of this Clause.
3. 3 Where fill to structures is required to the same level on more than one side of a structural element or buried structure it shall be maintained at heights not differing by more than 150mm after compaction on opposing sides of the structural element as filling proceeds.
4. 4 The Contractor shall restrict compaction plant used on fill to structures, within 2 m of a structure, to the following items :
 5. (i) vibratory roller having a mass per metre width of roll not exceeding 1,300 kg/m and with a total mass not exceeding 1,000 kg;
 6. (ii) vibrating plate compactor having a mass not exceeding 1,000 kg;
 7. (iii) vibro-tamper having a mass not exceeding 75 kg.
8. The compacted level of the fill within this zone shall not differ during construction from the compacted level of the remainder of the adjoining fill to structures by more than 250 mm.

530C Compaction of fills

1. 1 The Contractor shall carry out compaction in compliance with this Clause, as soon as practicable after deposition, on all those Classes of fill which require to be compacted.
2. 2 Compaction shall be carried out as required for the Class of fill in Table 6/1 of Series 600 of NRA Specification, using plant appropriate to the Class of fill and the site conditions.
3. 4 Method compaction shall comply with sub-Clauses 5 to 9 (inclusive) of this Clause.
4. 5 Except as stated in sub-Clause 6 of this Clause, method compaction shall be undertaken using the plant and methods in Table 6/4, of Series 600 of NRA Specification, appropriate to the compaction requirements as listed in Table 6/1 of Series 600 of NRA Specification for the Class of material being compacted.
5. 6 Plant and methods not included in Table 6/4 of Series 600 of NRA Specification shall only be used providing the Contractor demonstrates at site trials that a state of compaction is achieved by the alternative method equivalent to that obtained using the specified method.
6. 7 Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account when assessing the amount of compaction required for any layer.
7. 8 If more than one Class of material is being used in such a way that it is not practicable to define the areas in which each Class occurs, the Contractor shall compact with plant operating as if only the material which requires the greater compacted effort is being compacted.
8. 9 For the purpose of Table 6/4 of Series 600 of NRA Specification the following shall apply:
 9. (i) The minimum number of passes N is the minimum number of times that each point on the surface of the layer being compacted shall be traversed by the item of compaction plant in its operating mode, or struck by power rammers or falling weight compactors. D is the maximum depth of the compacted layer.

10. (ii) In column headed N # the number of passes shown is to be doubled for material Classes 1A, 1B, 2A, 2B, 2C1, 2C2 and 2D when such materials occur within 600 mm of sub-formation (if capping is required) or formation. Such extra compaction shall either be carried out for the full width of the embankment or, in other areas of fill which are to receive a pavement, between the outer extremities of the verges.
11. (iii) The compaction plant in Table 6/4 is categorised in terms of static mass. The mass per metre width of roll is the total mass on the roll divided by the total roll width. Where a smooth wheeled roller has more than one axle the category of the machine shall be determined on the basis of the axle giving the highest value of mass per metre width.
12. (iv) A grid roller is a machine with a compacting roll or rolls constructed of heavy steel mesh of square pattern.
13. (v) tamping roller is a machine with a roll or rolls from which 'feet' project and where the projected end area of each "foot" exceeds 0.01 m² and the sum of the areas of the feet exceeds 15% of the area of the cylinder swept by the ends of the feet. The requirements for tamping rollers apply to machines that have 2 rolls in tandem. If only one tamping roll traverses each point on the surface of the layer on any one pass of the machine, the minimum number of passes shall be twice the number given in Table 6/4 plus any further doubling required to satisfy (ii) above.
14. (vi) For pneumatic-tyred rollers the mass per wheel is the total mass of the roller divided by the number of wheels. In assessing the number of passes of pneumatic-tyred rollers the effective width shall be the sum of the widths of the individual wheel tracks together with the sum of the spacings between the wheel tracks provided that each spacing does not exceed 230 mm. Where the spacings exceed 230 mm the effective width shall be the sum of the widths of the individual wheel tracks only.
15. (vii) Vibratory rollers are self-propelled or towed smooth-wheeled rollers having means of applying mechanical vibration to one or more rolls except that vibratory rollers employed for Method 5 compaction shall be single roll types. The requirements for vibratory rollers are based on the use of the lowest gear on a self-propelled machine with mechanical transmission and a speed of 1.5 to 2.5 km/h for a towed machine, or a self-propelled machine with hydrostatic transmission. If higher gears or speeds are used an increased number of passes shall be provided in proportion to the increase in speed of travel. Where the mechanical vibration is applied to two rolls in tandem, the minimum number of passes shall be half the number given in Table 6/4 for the appropriate mass per metre width of one vibrating roll but if one roll differs in mass per metre width from the other the number of passes shall be calculated as for the roll with the smallest value. Alternatively the minimum number of passes may be determined by treating the machine as having a single vibrating roll with a mass per metre width equal to that of the roll with the higher value.
16. Vibratory rollers operating without vibration will be classified as smooth-wheeled rollers.
17. Vibratory rollers shall be operated with their vibratory mechanism operating only at the frequency of vibration recommended by the manufacturers. Where more than one amplitude setting is available and/or a range of frequencies is recommended, the machine shall be operated at the maximum amplitude setting and at the maximum recommended frequency for that setting.
18. Vibratory rollers shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel. Both devices shall be capable of being read by an inspector alongside the machine.
19. (viii) Vibrating-plate compactors are machines having a base-plate to which is attached a source of vibration consisting of one or two eccentrically weighted shafts and:
20. (a) the mass per square metre of the base-plate of a vibrating-plate compactor is calculated by dividing the total mass of the machine in its working condition by its area in contact with compacted material;
21. (b) vibrating-plate compactors shall be operated at the frequency of vibration recommended by the manufacturers. They shall normally be operated at travelling speeds of less than 1 km/h but if higher speeds are necessary the number of passes shall be increased in proportion to the increase in speed of travel.
22. (ix) Vibro-tampers are machines in which an engine-driven reciprocating mechanism acts on a spring system through which oscillations are set up in a base-plate.

23. (x) Power rammers are machines which are actuated by explosions in an internal combustion cylinder, each explosion being controlled manually by the operator.
24. (xi) Dropping weight compactors are machines in which a dead weight is dropped from a controlled height using a hoist mechanism and they include self-propelled machines with
25. mechanical traversing mechanisms capable of compacting soil in trenches and close to structures.
26. (xii) In the case of power rammers and dropping-weight compactors one pass will be considered as made when the compacting shoe has made one strike on the area in question.
27. (xiii) For items marked * in the Method 3 column of Table 6/4 the roller shall be towed by track-laying tractors. Self-propelled rollers are unsuitable.
28. (xiv) Where combinations of different types or categories of plant are used, the following shall apply:
29. (a) the depth of layer shall be that for the type of plant requiring the least depth of layer; and
30. (b) the number of passes shall be that for the type of plant requiring the greatest number of passes.

530D Sub-formation and capping

1. 1 Capping shall be constructed with Class 6F1 or 6F2 material as shown on the drawings and shall comply with Table 6/1 of Series 600 of NRA Specification.
2. 2 Capping shall consist of one Class of capping material throughout its depth.
3. 3 The Contractor shall limit any unprotected area of sub-formation, which is to receive capping to suit the output of the plant in use and the rate of deposition of capping.
4. 4 No unprotected sub-formation which is to receive capping shall remain continuously exposed to rain causing degradation, nor, be left uncovered overnight. Sub-formation which is to receive capping shall be kept free of groundwater, infiltration water and the effects of weather and every means shall be taken to ensure that the formation shall be protected.
5. 5 In cuttings the Contractor shall excavate below formation level to a depth to accept the capping, trim the surface to form the sub-formation and immediately compact with one pass of a smooth-wheeled roller having a mass per m width of roll not less than 2,100 kg or a vibratory roller having a mass per m width of roll not less than 700 kg or a vibrating plate compactor having a mass per m² of not less than 1,400 kg, and immediately deposit and compact above it, in one or more layers, the capping material
6. 6 The finished capping surface shall be kept free of groundwater, infiltration water and not be left exposed to the effects of weather for a prolonged period of time.

535 Compaction generally

1. **General:** Compact fill not specified to be left loose as soon as possible after placing.
2. **After compaction:** Surface of each layer must be well closed, showing no movement under compaction plant, and without cracks, holes, ridges, loose material and the like.
3. **Defective areas:** Remove and recompact to full thickness of layer using new material.

540 Benching in fill

1. **Adjacent areas:** If, during filling the difference in level between adjacent areas of filling exceeds 600 mm, cut into edge of higher filling to form benches 600 mm minimum width and height equivalent to depth of a layer of compacted filling.
2. **New filling:** Spread and compact to ensure maximum continuity with previous filling.

540A Crack monitoring

1. Visual inspections must be carried out by the contractor subsequent to any excavation/drilling works taking place in the vicinity of the existing structure and results of the crack monitoring circulated to the client and design team as soon as is reasonably practical after these works taking place.

2. Crack monitoring tell-tale equipment to be installed at all external piers/building envelope to record any differential movements.
3. Any crack propagation should be reported to the client and Structural Engineer for assessment prior to further works taking place on site.
4. The procedure and controls for the above should be covered in the Contractor's Noise Assessment.

550 Geotextile sheet

1. **Manufacturer:** Submit proposals; Refer to Clause 550A
 - 1.1. **Product reference:** Submit proposals; Refer to Clause 550A
2. **Type:** Contractor's choice; Refer to Clause 550A
3. **Polymer type:** Contractor's choice
4. **Recycled content:** None permitted
5. **Jointing:** 300 mm minimum overlap
6. **Preparation of subgrade:** Before laying sheet, remove humps and sharp projections. Fill hollows
7. **Protect from**
 - 7.1. Exposure to light.
 - 7.2. Contaminants.
 - 7.3. Materials listed as potentially deleterious by geotextile manufacturer.
 - 7.4. Wind uplift.

550A Geotextiles used to separate earthworks materials

1. 1 Geotextiles required as part of the Works to separate materials at locations as shown on he drawings and indicated in the specification shall be manufactured from synthetic or other fibres as required therein and be in the form of thin permeable membranes. All geotextile products incorporated into the works shall be affixed with a CE marking symbol and the accompanying documents in accordance with EN 13249.
2. 2 The Contractor shall provide evidence to the Engineer, before the geotextile is incorporated in the Works, that the geotextile will be sufficiently durable when installed in contact with the materials to be separated. The Contractor shall also provide evidence to the Engineer that the geotextile is capable of maintaining its integrity for at least the life period. Durability testing in accordance with EN ISO 13249 shall be undertaken to demonstrate this.
3. 3 Geotextiles shall be protected at all times against mechanical or chemical damage and shall not be uncovered between manufacture and incorporation in the Works. Unless demonstrated otherwise by performing resistance to weathering tests in accordance with EN ISO 12224, all geotextiles shall be completely covered within three days of installation.
4. 4 The geotextile shall sustain a tensile load of not less than 13kN/m, when tested in any direction, determined in a wide strip tensile test carried out in accordance with EN ISO 10319. The minimum elongation at maximum strength tested in accordance with EN ISO 10319 shall not be less than 25%. The characteristic strength shall be taken as the value of the strength of the material below which not more than 5% of the test results may be expected to fall. This represents the strength at 1.64 standard deviations below the mean strength.
5. 5 The geotextile shall have a CBR Puncture Resistance of not less than 2kN, determined in accordance with EN ISO 12236. The characteristic CBR puncture strength shall be taken as the value of the strength of the materials below which not more than 5% of the test results may be expected to fall. This represents the strength at 1.64 standard deviations below the mean strength.
6. 6 The geotextile shall allow water to flow through it, at right angles to its principal plane, in either direction, at a rate of not less than 10 litres/m²/s under a constant head of water of 50 mm, determined in accordance with EN 11058. The flow rate determined in the test shall be corrected to that applicable to a temperature of 20°C using published data on variation in viscosity of water with temperature.

7. 7 The geotextile shall have a characteristic size distribution of pore openings such that the mean 090, determined in accordance with EN ISO 12956, is between 50 microns and 200 microns.
8. 5 The geotextile shall be laid and lapped as described in this Clause or as described in Cause 550. Where lapping is employed adjacent sheets or strips of geotextile shall be overlapped by at least 1000 mm.
9. 6 The layer of material on which the geotextile is to be placed shall not have protrusions or sharp projections which are likely to damage the geotextile during installation or in service. The method of installation shall ensure that the geotextile is in continuous contact with the surface on which it is to be placed and the geotextile shall not be stretched or bridged over hollows or humps. Operation of construction plant directly on the installed geotextile will not be permitted and its covering with fill material shall take place immediately after it's laying and as described in sub- clause 3 of this clause.

650 Protection of compacted filling

1. **Temporary protective filling:** Before allowing construction traffic, raise level of compacted cohesive soil filling at least 150 mm above formation level using properly compacted temporary filling.
2. **Removal:** Remove temporary protective filling from site before permanent construction.

700A Backfilling around foundations

1. **Under oversite concrete and pavings:** Hardcore as clause 710A.
2. **Under grassed or soil areas:** Material excavated from the trench, laid and compacted in 300 mm maximum layers.

710A Hardcore filling

1. **Fill:** T.0 Struc or T.1 Struc unbound granular fill, SR21 Annex E Certified.
2. **Filling:** Spread and level in maximum 150mm thick layers. Thoroughly compact each layer and the number of passess for the Contractor's selected plant must be clearly identified on the Contractor's method Statement.

715A Venting hardcore layer

1. **Fill:** T.2 Perm, SR21 Annex E Certified.
2. **Filling:** Spread and level in maximum 150mm thick layers. Thoroughly compact each layer whilst maintaining enough voids to allow efficient venting.

730A Blinding

1. **Surfaces to receive sheet overlays or concrete:**
2. **Blind with:**
 - 2.1. Concrete where shown on drawings; T.3 Blind to SR 21 Annex E; or
 - 2.2. Sand, fine gravel, or other approved fine material applied to fill interstices. Moisten as necessary before final rolling to provide a flat, closed, smooth surface.
3. **Sand for blinding:** To BS EN 12620, grade 0/4 or 0/2 (MP).
4. **Permissible deviations on surface level:** +0 -25 mm.

Bioremediation - Not Used

'specification for highway works: earthworks specification' appendices - Not Used

Ω End of Section

E05

In situ concrete construction generally

To be read with preliminaries/general conditions.

220A Design of structural concrete

1. Standards:
 - 1.1. Design to : IS EN 1992: Eurocode 2 Design of Concrete Structures. Unless noted otherwise.
 - 1.2. Drawings: To
 - 1.2.1. IS EN ISO 3766
 - 1.2.2. IS EN ISO 4157-1; and
 - 1.2.3. IS EN ISO 4157-2.
 - 1.3. Reinforcement schedules: TO IS EN ISO 3766
2. Finished product: To comply with the requirements of the design standard.

225 Temperature records

1. Requirement: Throughout period of concrete construction record:
 - 1.1. Daily: Maximum and minimum atmospheric shade temperatures
 - 1.2. Under adverse temperature conditions: Temperature at commencement and end of placing.
2. Equipment: Contractor's choice, measurement device to be calibrated
 - 2.1. Location: In the shade, close to the structure.

235 Openings, inserts and fixings

1. Requirement: Collate all information.
2. Submit: Details where openings, inserts and fixings can only be accommodated by adjustments to reinforcement.
3. Locate reinforcement: To ensure specified minimum cover at openings and inserts and to be clear of fixing positions.

290 Accuracy of construction

1. Setting out: To BS 5964-1.
2. Geometrical tolerances: To Section 10 of the 'National Structural Concrete Specification for Building Construction'
 - 2.1. Conflicts: Notwithstanding tolerances specified elsewhere, do not exceed requirements for compliance with the designated code of practice.
 - 2.2. Substitution of alternative requirements: None

430 Surface cracking

1. Description: Concrete floors
2. Method of measurement: Crack Measurement Ruler at positions agreed in writing with the Engineer, generally as per clause 8.5 of 'National Structural Concrete Specification'
3. Critical crack width: In general reinforced concrete isolated flexural crack widths not exceeding 0.3mm and 0.17mm for intrinsic cracking. In concrete slabs cast on metal deck formwork as part of a composite structure isolated flexural crack widths up to 0.3mm.
4. Action: Should cracks occur that are wider than the critical crack width:
 - 4.1. Survey: Frequency and extent of such cracks and investigate cause.

4.2. Report: Findings together with recommendations for rectification.

Ω End of Section

E10

Mixing/casting/curing in situ concrete

Clauses

E10 To be read with preliminaries/general conditions.

Concrete

101A Specification

1. Concrete generally: As per Works Requirements
2. Exchange of information: Provide concrete producer with information required by 8500-1.

105A Designated concrete

1. Description: All structural concrete works
2. As per Works Requirements.
3. All Mixes to be submitted for approval prior to use on site.

Materials, batching and mixing

215A Ready-mixed concrete

1. Production plant: Currently certified by a body accredited by the National Standards Authority of Ireland for product conformity certification of ready-mixed concrete, or similar national accreditation body.
2. Source of ready-mixed concrete: Obtain from one source if possible. Otherwise, submit proposals .
 - 2.1. Name and address of depot: Submit before any concrete is delivered .
 - 2.2. Delivery notes: Retain for inspection .
3. Declarations of non-conformity from concrete producer: Notify immediately .

218A Site mixed concrete: non-structural concrete only

1. Batching by mass:
 - 1.1. Restrictions: Maximum pour size 3 m³
 - 1.2. Accuracy of measuring devices: To IS EN 206-1, clause 9.6.2.2.
 - 1.2.1. Tolerances for quantity of constituent material: To IS EN 206-1, Table 21.
2. Batching by volume:
 - 2.1. Restrictions: None for mix C1 Blinding/Lean-mix. Otherwise,,: maximum pour size 0.5 m³
3. Mixing: To IS EN 206-1.

221A Information about proposed concretes

1. Submit when requested:
 - 1.1. Details listed in IS EN 206-1.
 - 1.2. Additional information: Data concerning the anticipated rate of strength gain

225 Changes to specification

1. Changes to specification of fresh concrete (outside concrete producer's responsibility): Submit proposals

230 Interruption of supply during concreting

1. **Elements without joints:** Where elements are detailed to be cast in a single pour without joints, make prior arrangements for a back-up supply of concrete.
2. **Elsewhere**
 - 2.1. **Preparation:** Manage pour to have a full face, and have materials available to form an emergency construction joint while concrete can still be worked.
 - 2.2. **Before pour is completed:** Submit location and details of joint, make proposals for joint preparation.

315 Aggregates for exposed visual concrete

1. **Limitations on contaminants:** Free from absorbent particles which may cause 'popouts', and other particles such as coal and iron sulfide which may be unsightly or cause unacceptable staining .
2. **Colour:** As per Contract drawings.
3. **Supply:** From a single source and maintained throughout the contract .
4. **Samples:** Submit on request .

325 Materials for exposed visual concrete

1. **Alterations to sources, types and proportions:** Submit proposals .

415 Admixtures

1. **Calcium chloride and admixtures containing calcium chloride:** Do not use .

Project testing/ certification

505A Project testing of concrete - general

1. **Testing:** IS EN 206-1, Annex B
 - 1.1. **Nonconformity:** Refer to clause 506.
2. **Recording:** Maintain complete correlated records including:
 - 2.1. Concrete designation.
 - 2.2. Sampling, site tests, and identification numbers of specimens tested in the laboratory.
 - 2.3. Location of the parts of the structure represented by each sample.
 - 2.4. Location in the structure of the batch from which each sample is taken.

506A Action in the event of non-conformity

1. Any test or inspection report which show that any part of the concrete doesn't meet the specified criteria shall be reported to the Employer's Representative as soon as the results are available.
2. The Contractor shall provide proposals for addressing the non-conformity to the Employer's Representative within five working days of reporting the results.
3. The cost of additional testing and remedial works shall be at the Contractor's expense.

508A Regular project testing of concrete

1. **Tests:** Early age compressive strength testing at 7 and 28 days
2. **Sampling:**
 - 2.1. **Point:** At point of discharge from delivery truck
 - 2.2. **Rate:** Three samples (cubes) per 30 m³
3. **Other requirements:** Cubes for early age strength testing to be stored under same conditions as concrete in members

520A Testing laboratory

1. **Laboratory:** Accredited by INAB or other national equivalent.
 - 1.1. **Name and INAB reference number:** Submit well in advance of making trial mixes or concrete for use in the works.

530A Tests results

1. **Submission of reports:** Within one day of completion of each test.
 - 1.1. **Number of copies:** Electronic copies acceptable
2. **Reports on site:** A complete set, available for inspection.
3. **If a concrete sample fails to achieve the specified criteria, inform the Engineer without delay and submit:**
 - 3.1. confirmation of the validity of the test results, and/or
 - 3.2. proposals for further tests to assess the strength of the concrete in the structure, as set out in BS 6089, and/or
 - 3.3. proposals for rectification.
4. Obtain approval of all such evidence and proposals before proceeding. The Employer's Representative may issue instructions for the work to be stopped or delayed until reasons for the failure have been determined, possible consequences assessed, and appropriate preventative and remedial measures taken.

540A Failures

1. Whenever the specified sampling, testing and compliance procedures show that a concrete mix is not in accordance with the specification (even if the work is eventually accepted), and measures are taken to help in establishing whether or not the work is acceptable, such measures:
 - 1.1. will be at the expense of the Contractor, and
 - 1.2. will not be considered as grounds for extension of time.

Placing/ compacting/ curing and protecting

620 Temperature of concrete

1. **Application:** To all concrete members
2. **Objective:** Limit maximum temperature of concrete to minimize cracking during placing, compaction and curing. Take account of:
 - 2.1. **High temperatures and steep temperature gradients:** Prevent build-up during first 24 hours after casting. Prevent coincidence of maximum heat gain from cement hydration with high air temperature and/ or solar gain.
 - 2.2. **Rapid changes in temperature:** Prevent during the first seven days after casting.
3. **Proposals for meeting objective:** Submit.

630 Premature water loss

1. **Requirement:** Prevent water loss from concrete laid on absorbent substrates .
 - 1.1. **Underlay:** Select from:
 - 1.1.1. **Polyethylene sheet:** 250 micrometres thick .
 - 1.1.2. **Building paper:** To BS 1521, grade B1F .
 - 1.2. **Installation:** Lap edges 150 mm .

640 Construction joints

1. **Location of joints:** Submit proposals when not shown on drawings

2. Preparation of joint surfaces: Submit proposals

645 Spacing of construction joints

1. Type of construction: Refer to contract drawings
 - 1.1. Distance between joints (maximum): Refer to contract drawings and or submit proposals.
 - 1.2. Area of pour (maximum): Submit proposals
 - 1.3. Other requirements: None

648 Adverse temperature conditions

1. Requirement: Submit proposals for protecting concrete when predicted ambient temperatures indicate risk of concrete freezing or overheating.

650 Surfaces to receive concrete

1. Cleanliness of surfaces immediately before placing concrete: Clean with no debris, tying wire clippings, fastenings or free water .

660 Inspection of surfaces

1. Notice: Give notice to allow inspections of reinforcement and surfaces before each pour of concrete.
 - 1.1. Period of notice: Obtain instructions.
2. Timing of inspections: When reinforcement and formwork are ready for concreting

670 Transporting

1. General: Avoid contamination, segregation, loss of ingredients, excessive evaporation and loss of workability . Protect from heavy rain .
2. Entrained air: Anticipate effects of transport and placing methods in order to achieve specified air content .

680 Placing

1. Records: Maintain for time, date and location of all pours.
2. Timing: Place as soon as practicable after mixing and while sufficiently plastic for full compaction.
3. Temperature limitations for concrete: 30°C (maximum) and 5°C (minimum), unless otherwise specified. Do not place against frozen or frost covered surfaces.
4. Continuity of pours: Place in final position in one continuous operation up to construction joints. Avoid formation of cold joints.
5. Discharging concrete: Prevent uneven dispersal, segregation or loss of ingredients or any adverse effect on the formwork or formed finishes.
6. Thickness of layers: To suit methods of compaction and achieve efficient amalgamation during compaction.
7. Poker vibrators: Do not use to make concrete flow horizontally into position, except where necessary to achieve full compaction under void formers and cast-in accessories and at vertical joints.

690 Compacting

1. General: Fully compact concrete to full depth to remove entrapped air. Continue until air bubbles cease to appear on the top surface.
 - 1.1. Areas for particular attention: Around reinforcement, under void formers, cast-in accessories, into corners of formwork and at joints.

2. **Consecutive batches of concrete:** Amalgamate without damaging adjacent partly hardened concrete.
3. **Methods of compaction:** To suit consistence class and use of concrete.

720 Vibrators

1. **General:** Maintain sufficient numbers and types of vibrator to suit pouring rate, consistency and location of concrete .
2. **External vibrators:** Obtain approval for use .

730A Plastic settlement

1. **Settlement cracking:** Inspect fresh concrete closely and continuously wherever cracking is likely to occur, including the top of deep sections and at significant changes in the depth of concrete sections .
 - 1.1. **Timing:** During the first few hours after placing and whilst concrete is still capable of being fluidized by the vibrator .
2. **Practice to minimise the risk of plastic settlement cracking:**
 - 2.1. Wet the subgrade before placing concrete to avoid excessive water loss from the base of the concrete
 - 2.2. set all formwork accurately and rigidly so that it will not move during concrete placement
 - 2.3. Place concrete in deep sections first (including columns) and let it settle prior to placing and compacting the top layers (ensuring that the two layers blend together)
 - 2.4. Fully compact the concrete
 - 2.5. Cure the concrete promptly and properly.
 - 2.6. Contractor to submit specific proposals (including any contingency measures for detrimental weather conditions on the day of the pour)
3. **Repair of of cracks:**
4. **(a) In pre-hardened concrete:**
 - 4.1. Submit proposals to engineer for prior review
 - 4.2. Revibrate concrete while concrete is still plastic to the satisfaction of the engineer
5. **(b) In hardened concrete:**
 - 5.1. Contractor to submit proposals to engineer for prior approval.

810A Curing generally

1. **Requirement:** Keep surface layers of concrete moist throughout curing period, including perimeters and abutments, by either restricting evaporation or continuously wetting surfaces of concrete.
 - 1.1. **Surfaces covered by formwork:** Retain formwork in position and, where necessary to satisfy curing period, cover surfaces immediately after striking.
 - 1.2. **Top surfaces:** Cover immediately after placing and compacting. If covering is removed for finishing operations, replace it immediately afterwards.
2. **Surface temperature:** Maintain above 5°C throughout the specified curing period or four days, whichever is longer.
3. The curing period shall be extended by the full amount of any time during which the air temperature remains below 5 degrees Celsius plus half the amount of any time during which the air temperature is between 5 degrees Celsius and 10 degrees Celsius.
4. **Records:** Maintain details of location and timing of casting of individual batches, removal of formwork and removal of coverings. Keep records on site, available for inspection.

811 Coverings for curing

1. Sheet coverings: Suitable impervious material .
2. Curing compounds: Selection criteria:
 - 2.1. Curing efficiency: Not less than 75% or for surfaces exposed to abrasion 90% .
 - 2.2. Colouring: Fugitive dye .
 - 2.3. Application to concrete exposed in the finished work: Readily removable without disfiguring the surface .
 - 2.4. Application to concrete to receive bonded construction/ finish: No impediment to subsequent bonding .
3. Interim covering to top surfaces of concrete: Until surfaces are in a suitable state to receive coverings in direct contact, cover with impervious sheeting held clear of the surface and sealed against draughts at perimeters and junctions .

812A Preventing early age thermal cracking

1. Deep lifts or large volume pours: Submit proposals for curing to prevent early age thermal cracking, taking account of:
 - 1.1. Temperature differentials across sections .
 - 1.2. Coefficient of thermal expansion of the concrete .
 - 1.3. Strain capacity of the concrete mix (aggregate dependent) .
 - 1.4. Restraint .
 - 1.5. Insulation of steel members encased in the concrete section.

817A Curing class

1. Standard: To IS EN 13670: Table 4, Curing class 4

818 Curing periods generally

1. Minimum periods: When not otherwise indicated, to BS EN 13670, Annex F.8.5.

821A Minimum curing periods

1. Minimum curing periods of all structural concrete shall conform with Curing Class 4 in accordance with Annex F of IS EN 13670: 'Execution of Concrete Structures'

840 Protection

1. Prevent damage to concrete, including
 - 1.1. Surfaces generally: From rain, indentation and other physical damage .
 - 1.2. Surfaces to exposed visual concrete: From dirt, staining, rust marks and other disfiguration .
 - 1.3. Immature concrete: From thermal shock, physical shock, overloading, movement and vibration .
 - 1.4. In cold weather: From entrapment and freezing expansion of water in pockets, etc .

Ω End of Section

E20

Formwork for in situ concrete

Clauses - Not Used

Generally/ preparation

110 Loadings

1. Requirement: Design and construct formwork to withstand the worst combination of the following:
 - 1.1. Total weight of formwork, reinforcement and concrete.
 - 1.2. Construction loads including dynamic effects of placing, compacting and construction traffic.
 - 1.3. Wind and snow loads.

121A Formwork cleanliness

1. Formwork shall be clean and clear of all debris, water, snow and ice before concrete is placed.

145A Permanent formwork

1. Location and materials: Submit proposals.
2. Standard: Design profiled steel shuttering as permanent formwork in accordance with IS EN 1993-1-3.

160A Cambers

1. Application of specified upward cambers: To the concrete immediately before formwork is struck.
 - 1.1. Formwork: Allow for deflection under weight of fresh concrete.
 - 1.2. Top surfaces of concrete: Camber to maintain the required structural depths and profiles.
2. Checks after striking of formwork and removal of props: Levels to determine extent of any residual camber. Submit results.

235A Embedded steelwork

1. Remove all loose millscale and loose rust before encasing in concrete.

Construction

310 Accuracy

1. General requirement for formwork: Accurately and robustly constructed to produce finished concrete in the required positions and to the required dimensions.
2. Formed surfaces: Free from twist and bow (other than any required cambers).
3. Intersections, lines and angles: Square, plumb and true.

320 Joints in forms

1. Requirements including joints in form linings and between forms and completed work
 - 1.1. Prevent loss of grout, using seals where necessary.
 - 1.2. Prevent formation of steps. Secure formwork tight against adjacent concrete.

330 Inserts, holes and chases

1. Positions and details
 - 1.1. Dimensioned on drawings provided on behalf of the Employer: Do not change without consent.

- 1.2. Undimensioned or from other sources: Submit proposals.
2. Positioning relative to reinforcement: Give notice of any conflicts well in advance of placing concrete.
3. Method of forming: Fix inserts or box out as required. Do not cut hardened concrete without approval.

340 Kickers

1. Method statement: Submit proposals including means of achieving quality of concrete consistent with that specified for the column or wall.
 - 1.1. Kicker height: As per Works Requirements, or minimum of 150mm

350A Form ties

1. Metal associated with form ties/ devices: Prohibited within cover to reinforcement. Compatible with reinforcement metal.
2. Through ties may be used only to support faces of formwork other than in water-resisting structures or as agreed with the Engineer.

Striking

510 Striking formwork

1. Timing: Prevent any disturbance, damage or overloading of the permanent structure.

521A Minimum period for retaining formwork/ temporary supports in position

1. Concrete strength at time of formwork removal (minimum): To IS EN 1992-1-1+NA
2. Assumptions: Imposed load will not exceed 0.5 kN/m² until concrete reaches full maturity
 - 2.1. Before removing formwork: Submit proposals if assumptions will not be realised.
3. Method to be used in assessing early age strength of concrete: Application of appropriate table in CIRIA report R136
4. Striking times shall comply with Section 5.7 and with the Curing Class in accordance with IS EN 13670: 'Execution of Concrete Structures'.

Formed finishes

605A Control samples (part of the finished work)

1. Sample areas that are part of the finished work: Any area of exposed concrete
2. Approval of appearance: Obtain before proceeding with remainder of the work.

606A Finishes

1. All finishes to concrete shall comply with the Annex F of IS EN 13670: 'Execution of Concrete Structures'

610A Basic finish

1. Location: All areas
2. Finish: Faces fully compacted.

615 Finish to receive asphalt tanking

1. Finish: Even and suitable to receive asphalt.
2. Permissible deviation of surfaces

- 2.1. Sudden irregularities (maximum): 3 mm.
- 2.2. Gradual irregularities (maximum): 3 mm, when measured from underside of a 1 m straightedge, placed anywhere on surface.
3. Surface blemishes
 - 3.1. Permitted: Blowholes less than 10 mm in diameter.
 - 3.2. Not permitted: Voids, honeycombing, segregation and other large defects.
4. Projecting fins: Remove.
5. Formwork tie holes: Filled with mortar.

620A Plain smooth finish

1. Finish: Even and dense. Arrange formwork panels in a regular pattern as a feature of the surface.
2. Permissible deviation of surfaces:
 - 2.1. Sudden irregularities (maximum): 3 mm.
 - 2.2. Gradual irregularities (maximum): 3 mm, when measured from the underside of a 1 m straightedge, placed anywhere on surface.
3. Variations in colour:
 - 3.1. Permitted: Those caused by impermeable formwork linings.
 - 3.2. Not permitted: Those caused by contamination or grout leakage.
4. Surface blemishes:
 - 4.1. Permitted: Blowholes less than 2 mm in diameter and at an agreed frequency.
 - 4.2. Not permitted: Voids, honeycombing, segregation and other large defects.
5. Formwork tie holes: In a regular pattern and filled with matching mortar.
6. Any exposed decorative finish in accordance with locations indicated on architect's documentation.

710 Finish for tooling

1. Finish: Even with accurate, true and even joints.
2. Permissible deviation of surfaces
 - 2.1. Gradual irregularities when measured from the underside of a 1 m straightedge, placed anywhere on surface (maximum): 5 mm.
3. Cover spacers: Do not use
4. Surface blemishes
 - 4.1. Permitted: Blowholes less than 10 mm in diameter and at an agreed frequency.
 - 4.2. Not permitted: Voids, honeycombing, segregation and other large defects.
5. Formwork tie holes: In a regular pattern and filled with matching mortar.

Ω End of Section

E30 Reinforcement for in situ concrete

Clauses - Not Used

Reinforcement

110A Quality assurance of reinforcement

1. Standards:
 - 1.1. Reinforcement: To BS 4449, BS 4482, BS 4483 or BS 6744.
 - 1.2. Cutting and bending: To IS EN ISO 3766.
2. Source of reinforcement: Companies holding valid certificates of approval for product conformity issued by the UK Certification Authority for Reinforcing Steels (CARES).
3. Submit Certificates of Approval for product conformity as above prior to commencement of works.

140 Plain bar reinforcement

1. Standard: To BS 4482.
 - 1.1. Strength grade: 250.

150 Ribbed bar reinforcement

1. Standard: To BS 4449.
 - 1.1. Strength grade: Generally B500B, but B500C where detailed

210 Standard fabric reinforcement

1. Standard: To BS 4483.
2. Strength grade: B500B

245B Prefabricated reinforcement

1. Prefabricated elements: As per Works Requirements.
2. Source: Obtain from a manufacturer holding valid certification of approval for welded fabrications issued by the UK Certification Authority for Reinforcing Steels (CARES).
 - 2.1. Certification required: Achievement of CARES appendix 6 for tack welding and appendix 10 for semi-structural/ structural welding.
3. Storage: All reinforcement shall be delivered in properly identifiable tagged bundles. Mats and prefabricated reinforcement shall be stored on site in a manner so as not to become contaminated by deleterious materials or otherwise damaged; fabric shall be stored flat.
4. Handling: Reinforcement shall not be dropped from height, mechanically damaged or shock loaded in any way.

255 Prefabricated continuity reinforcement strips

1. Source: Obtain from a manufacturer holding a valid Technical Product Approval certificate issued by the UK Certification Authority for Reinforcing Steels (CARES) or equivalent.

265 Mechanical couplers

1. Locations:
2. Source: Obtain from a manufacturer holding a valid Technical Product Approval certificate issued by the UK Certification Authority for Reinforcing Steels (CARES) or equivalent.

Workmanship

310 Cutting and bending reinforcement

1. General: To schedules and to IS EN ISO 3766.
2. Bending on site, including minor adjustments: Not permitted for reinforcement bars greater than 12 mm diameter

320 Protection of reinforcement

1. Dropping from height, mechanical damage and shock loading: Prevent.
2. Cleanliness of reinforcement at time of pouring concrete: Free from corrosive pitting, loose mill scale, loose rust and contaminants which may adversely affect the reinforcement, concrete, or bond between the two.

410 Laps or splices

1. Details not shown on drawings: Obtain instructions.

425A Laps not detailed on drawings

1. All laps shall be in accordance with Section 8.7 of IS EN 1992-1-1: including Irish National Annex.
2. Laps in bar reinforcement (minimum): 50 x bar diameter
3. Laps in fabric reinforcement (minimum): 50 x bar diameter
 - 3.1. Laps at corners: Avoid four layer build-up by nesting or other approved method. Use flying ends for fabric in concrete.

427 Laps in fabric reinforcement

1. Terms: As defined in BCA publication 97.321.
2. Lap type
 - 2.1. Long edge of fabric: Nested in plane lap with bars in centre layer bundled and bars in outer layers spaced apart to ensure full encapsulation in concrete
 - 2.2. Short edge of fabric: Nested in plane lap with bars in centre layer bundled and bars in outer layers spaced apart to ensure full encapsulation in concrete
3. Other requirements: None

451A Fixing reinforcement

1. Standard: To BS 7973-1 and -2.
2. Installation: Spacers and chairs - provide adequate support, tie securely and maintain the specified cover. Use concrete proprietary spacers only. Masonry or concrete elements/pieces, stones, timber, pieces of rebar are not permitted to be used as spacers for reinforcement.
3. Tying:
 - 3.1. Wire type: 16 gauge black annealed. Use stainless steel wire for stainless steel reinforcement.
 - 3.2. Ends of tying wire: Prevent intrusion into the concrete cover. Remove loose ends.
4. Compatibility of metals: Prevent contact between ordinary carbon steel and stainless or galvanized reinforcement.

454 Fixing reinforcement for spraying concrete

1. First reinforcement layer: Install prior to concreting, with chairs or other means of support fixed ready for installation of subsequent reinforcement layer.
2. Subsequent reinforcement layer: Fabricate as a mat prior to concreting. Install when first reinforcement layer is fully encapsulated in concrete.

470 Tolerances on cover

1. Tolerance (maximum): 5 mm
2. Checking specified cover dimensions: Before concreting check that cover dimensions will be achieved.

Ω End of Section

E40

Designed joints in in situ concrete

To be read with preliminaries/general conditions.

120 Construction/ movement joints generally

1. **Accuracy:** Position and form joints accurately, straight, well-aligned and truly vertical or horizontal or parallel with setting out lines of the building.
2. **Modifications to joint design or location:** Submit proposals.
3. **Placing concrete to form movement joints**
 - 3.1. Maintain effectiveness of joints. Prevent concrete entering joints or penetrating or impregnating compressible joint fillers.
 - 3.2. Do not place concrete simultaneously on both sides of movement joints.

132A Additional construction joints

1. **Joints additional to those required by the Designer:**
 - 1.1. Permitted, but subject to restrictions in section E10 and subject to Engineer's approval.
2. **Approval of additional joints:** Submit proposals.

210A Formed joints

1. **Forms/ stop ends generally:** Rigid and grout-tight. Use split shutters.
2. **Forms/ stop ends for projecting continuity reinforcement:** To accommodate bars or fabric without temporary bending or displacement.
3. Use of PU foam to be carefully controlled on site so as not to reduce concrete sections.

211 Formed joints in concrete wearing surfaces

1. **Temporary forms:** Square edged with a steel top surface.
2. **Placing concrete:** Compact thoroughly at edges to give level, closely abutted joints with no lipping.

230 Preparation of construction joints

1. **Roughening of joint surfaces:** Select from:
 - 1.1. **Brushing and spraying:** Expose coarse aggregate while concrete is still green with compressed water.
 - 1.2. **Other methods:** Submit proposals.
2. **Condition of joint surfaces immediately before placing fresh concrete:** Clean and damp.

260A Sawn crack inducing grooves

1. **Groove dimensions**
 - 1.1. **Depth:** 1/3 of slab depth unless noted otherwise in the Works Requirements
 - 1.2. **Width:** Refer to contract drawings
2. **Sawing:** Sufficiently early to prevent random cracking (within 24 hours of casting slab) and to produce strong, well defined arrises.
3. **Groove filling:** expandable closed cell polythene foam backup chord and two part polysulphide sealant

410 Carbon steel tie bars

1. **Standard:** To: BS 4449

- 1.1. Product form: Ribbed
- 1.2. Strength grade: B500B
2. Cleanliness: Free from corrosive pitting, loose mill scale, loose rust and contaminants which may adversely affect the tie bars, reinforcement, concrete, or bond between the two.
3. Position: Centred on joint.
4. Other requirements: None

420 Fabric tie strips

1. Standard: To BS 4483.
2. Cleanliness: Free from corrosive pitting, loose mill scale, loose rust and contaminants which may adversely affect the fabric, concrete, or bond between the two.
3. Position: Width of the mesh strip centred on the joint.

430A Carbon steel dowel bars

1. Standard: To: BS 4482
 - 1.1. Product form: Plain.
 - 1.2. Strength grade: 250.
 - 1.3. Properties: Perfectly straight, with sawn (not sheared) ends.
2. Debonding: Achieve effective debonding of each bar
 - 2.1. Material: Suitable proprietary debonding compound. submit proposals
 - 2.2. Extent: As per Manufacturer's requirements
3. Position: At right angles to and centred on joint.
4. Other requirements: Fit debonded ends of bars in expansion joints with an approved type of cap 100 mm long with an expansion space 20 mm longer than the thickness of joint filler, filled with compressible material

437 Debonding compound

1. Manufacturer: submit proposals for approval.
 - 1.1. Product reference: submit proposals for approval.

Ω End of Section

E41

Worked finishes to in situ concrete

To be read with preliminaries/ general conditions.

100A General finishes information

1. Where a finished concrete surface is exposed to view in the completed structure the Contractor shall provide a fair faced finish, Type C, BS8110-Part 1. Otherwise adopt Type B finish.
2. Adopt Type A finish for all underground concrete.

145 Control samples

1. Sample areas that are part of finished work: Refer to Architect's drawings
2. Location: To be agreed
3. Approval of appearance: Obtain before proceeding with remainder of the work.

150 Finishing

1. Timing: Carry out at optimum times in relation to setting and hardening of concrete.
2. Prohibited treatments to concrete surfaces
 - 2.1. Wetting to assist surface working.
 - 2.2. Sprinkling cement.

210 Tamped finish

1. Surface on completion: Even array of parallel ribs

230 Brushed finish

1. Surface on completion: Light even texture.

240 Wood floated finish

1. Surface on completion: Slightly coarse, even texture with no ridges or steps.

310 Smooth floated finish

1. Surface on completion: Even with no ridges or steps.

320 Trowelled finish

1. Surface on completion: Uniform, smooth but not polished, free from trowel marks and blemishes, and suitable to receive specified flooring material.

330 Trowelled finish for wearing surfaces

1. Surface on completion: Uniform and smooth, free from trowel marks and blemishes.

510 Surface hardener

1. Manufacturer: Submit proposals
 - 1.1. Product reference: Submit proposals
2. Condition of substrate prior to application: Cured, clean and free from surface contaminants.
3. Application: Evenly to dry surfaces. After absorption, wash surface immediately with clean water.
 - 3.1. Additional applications: As manufacturer's recommendations
4. Solutions and wash water: Do not discharge to drains. Store and dispose of safely.

Ω End of Section

E42

Accessories cast into in situ concrete

Clauses - Not Used

General

110 Accessories specified elsewhere

1. Item/ location: As manufacturer's recommendations

Products

320A Cast-in sockets/couplers/channels

1. Description: Couplers/channels
2. Material: As per Works Requirements
 - 2.1. Coating or treatment: As per Works Requirements
3. Manufacturer: As per Works Requirements
 - 3.1. Product reference: As per Works Requirements
4. Cleanliness: Plug inside as necessary to prevent ingress of grout during concreting. Cap after concreting to exclude dust and dirt until fixings are installed.
5. All cast-in couplers and accessories shall be flush with concrete surface.

380 Ducts

1. Description: THROUGH SLABS THROUGH BEAMS THROUGH TRENCH FILL FOUNDATIONS
2. Material: As per Contract Drawings
3. Shape: Circular.
 - 3.1. Size: As per Contract drawings
4. Location: Submit proposals for ducts greater than 100mm diameter
5. Other requirements:

390 Galvanized coatings

1. Standard: To BS 7371-6 and BS EN ISO 1461.
2. Galvanizing: Applied and passivated by component manufacturer. Threaded items tapped after galvanizing.

395 Sherardized coatings on metal fasteners

1. Standard: To BS 7371-8.

Execution

610 Hollow accessories

1. Filling/ sealing: Temporally fill or seal accessory to prevent ingress of grout during concreting. Leave filling/ seals in position until accessory is used.

620 Temporary supports

1. Location: Provide to hold accessories for casting into unshuttered surface of concrete, set at a level that will not adversely affect finish of concrete surface remote from accessory.
2. Position: Hold securely to prevent lateral movement or rotation of accessory during concreting.

630 Protective coatings

1. **Inspect:** Immediately prior to casting concrete.
2. **Damage to coatings**
 - 2.1. **Minor:** Submit proposals for coating repair.
 - 2.2. **Significant:** Replace accessory.

640 Installation

1. **Cleanliness:** At time of casting, surfaces in contact with concrete to be free from contaminants which may adversely affect accessory, reinforcement, concrete, or bond between accessory and concrete.
2. **Position:** Hold accessory firmly in position, preventing displacement during concreting.
3. **Other requirements:** Tolerances for all cast-in sockets/couplers/channels and other accessories shall adhere to the latest addition of 'National Structural Concrete Specification'

Ω End of Section

Q10

Kerbs/ edgings/ channels/ paving accessories

Clauses

2 To be read with preliminaries/ general conditions.

Types of kerbs/edgings and channels

112A Precast concrete

1. Description: Kerbs
2. Standard: To BS EN 1340.
3. Recycled content: Contractor's choice
4. Designations: as per drawing
5. Size (width x height x length): as per drawings
6. Special shapes: dish kerbs and transition kerbs, as per drawings
7. Finish: As cast
8. Colour: Grey
9. Bending strength: No requirement
10. Weathering resistance: No requirement
11. Abrasion resistance: No requirement
12. Slip/ skid resistance: No requirement
13. Bedding: as per drawings
14. Joints generally: as per manufacturers requirements
15. Sealant movement joints: At 3m (maximum) centres
16. Accessories: none

Roads/paving accessories/ marking/ demarcation

325A Traffic calming speed cushions

1. Material: As per contract drawings.
2. Finish and colour: As per contract drawings
3. Method of installation: As per contract drawings & contractors choice
4. Accessories: Thermoplastic paint markings as per contract drawing

395A Road marking (thermoplastic)

1. Standard: To TII Specification for Works.
2. Manufacturer: Contractor's choice
 - 2.1. Product reference: Contractor's choice
3. Colour: as per drawings
4. Retroreflectivity to BS EN 1436: required

Laying

510 Laying kerbs, edgings and channels

1. Cutting: Neat, accurate and without spalling. Form neat junctions.
 - 1.1. Long units (450 mm and over) minimum length after cutting: 300 mm.

- 1.2. **Short units minimum length after cutting:** The lower of one third of their original length or 50 mm.
2. **Bedding of units:** Positioned true to line and levelled along top and front faces, in a mortar bed on accurately cast foundations or on a race of fresh concrete.
3. **Securing of units:** After bedding has set, secured with a continuous haunching of concrete or on a race of fresh concrete with backing concrete cast monolithically.

520 Adverse weather

1. **Conditions:** Do not construct if the temperature is below 3°C on a falling thermometer or 1°C on a rising thermometer. Adequately protect foundations, bedding and haunching against frost and rapid drying by sun and wind.

530 Concrete for foundations, races and haunching

1. **Standard:** To BS 8500-2.
2. **Designated mix:** Not less than GEN0 or Standard mix ST1.
3. **Workability:** Very low.

540 Cement mortar bedding

1. **General:** To section Z21.
2. **Mix (Portland cement:sand):** 1:3.
 - 2.1. **Portland cement:** Class CEM I 42.5 to BS EN 197-1.
 - 2.2. **Sand:** to BS EN 12620, grade 0/4 or 0/2 (MP).
3. **Bed thickness:** 12-40 mm.

570 Channels

1. **Installation:** To an even gradient, without ponding or backfall.
2. **Lowest points of channels:** 6 mm above drainage outlets.

590 Drainage channel systems with built in fall

1. **Installation:** Top of channels level, installed in correct sequence to form an even gradient without ponding or backfall. Commence laying from outlets.
2. **Silt and debris:** Removed from entire system immediately before handover.
3. **Washings and detritus:** Safely disposed without discharging into sewers or watercourses.

600A Radius kerbs/ channels

1. **Usage:** Radii as per drawing.

610 Angle kerbs

1. **Usage:** Internal and external 90° changes of direction.
2. **Cutting of mitres:** Not permitted.

620 Accuracy

1. **Deviations (maximum)**
 - 1.1. **Level:** ± 6 mm.
 - 1.2. **Horizontal and vertical alignment:** 3 mm in 3 m.

625 Regularity of paved surfaces

1. **Maximum undulation of (non-tactile) paving surface:** 3 mm.

- 1.1. **Method of measurement:** Under a 1 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface).
2. **Difference in level between adjacent units (maximum)**
 - 2.1. **Joints flush with the surface:** Twice the joint width (with 5 mm max difference in level).
 - 2.2. **Recessed, filled joints:** 2 mm.
 - 2.2.1. **Recess depth (maximum):** 5 mm.
 - 2.3. **Unfilled joints:** 2 mm.
3. **Sudden irregularities:** Not permitted.

Ω End of Section

Q20

Granular sub-bases to roads/ pavings

To be read with preliminaries/ general conditions.

110A Thicknesses of sub-base/ subgrade improvement layers

1. Thicknesses: See drawings:
 - 1.1. Q22 Coated macadam/asphalt roads/pavings

120A Checking of subgrades

1. Subgrade variation: If material appears to vary from anticipated conditions, or if there are extensive soft spots, If material appears to vary from anticipated conditions, or if there are extensive soft spots, test subgrade CBR to BS 1377-4 or BS 1377-9
2. Submit: Results and obtain instructions before proceeding.

140 Excavation of subgrades

1. Final excavation to formation or subformation level: Carry out immediately before compaction of subgrade.
2. Soft spots and voids: Give notice.
3. Old drainage and service trenches: Give notice
4. Wet conditions: Do not excavate or compact when the subgrade may be damaged or destabilized.

145 Preparation and compaction of subgrades

1. Timing: Immediately before placing sub-base.
2. Soft or damaged areas: Give notice
3. Compaction: Thoroughly, by roller or other suitable means, adequate to resist subsidence or deformation of the subgrade during construction and of the completed roads/ pavings when in use. Take particular care to compact fully at intrusions, perimeters and where local excavation and backfilling has taken place.

150A Subgrades for vehicular areas

1. Preparation and treatment: To TII Specification for Works, To Highways Agency 'Specification for highway works', clauses 616 and 617.

170 Geotextile filter/ separator membrane

1. Description:
2. Manufacturer: Submit proposals
 - 2.1. Product reference: Submit proposals
3. Jointing: 300 mm overlap
4. Protect from
 - 4.1. Exposure to light, except during laying (maximum five hours).
 - 4.2. Contaminants.
 - 4.3. Materials listed as potentially deleterious by geotextile manufacturer.
 - 4.4. Damage, until fully covered by fill.
 - 4.5. Wind uplift, by laying not more than 15 m before covering with fill.
5. Preparation: Remove humps and sharp projections and fill hollows before laying.

175A Impermeable and permeable membrane

1. **Description:** To footpaths and roads
2. **Manufacturer:** Contractor's choice
 - 2.1. **Product reference:** Contractor's choice
3. **Jointing:** 300 mm overlap
4. **Protect from:** the following
 - 4.1. Exposure to light, except during laying (maximum five hours).
 - 4.2. Contaminants.
 - 4.3. Materials listed as potentially deleterious by geotextile manufacturer.
 - 4.4. Damage, until fully covered by fill.
 - 4.5. Wind uplift, by laying not more than 15 m before covering with fill.
5. **Preparation:** Remove humps and sharp projections and fill hollows before laying.

180 Notice

1. **Give notice:** - After preparation and compaction of subgrades;- For inspection of granular sub-base material before spreading; and- On completion of compaction of sub-base
 - 1.1. **Period of notice:** 2 working days

200A Subgrade improvement layer (capping)

1. **Material:** To National Roads Authority 'Specification for road works', table 6/1, Class: 6F2
2. **Standard:** Placed and compacted to National Roads Authority 'Specification for road works', table 6/1, clauses 612 and 613, and Section D20 of this Specification.

211 Granular material

1. **Quality:** Of a known suitability for use in sub-bases, free from excessive dust, well graded, all pieces less than 75 mm in any direction, minimum 10% fines value of 50 kN when tested in a soaked condition to BS 812-111 or a resistance to fragmentation of LA50 for the Los Angeles test to BS EN 1097-2, and in any one layer only one of the following:
 - 1.1. Crushed rock (other than argillaceous rock) or quarry waste with not more binding material than is required to help hold the stone together.
 - 1.2. Crushed concrete, crushed brick or tile, free from plaster, timber and metal.
 - 1.3. Gravel or hoggin with not more clay content than is required to bind the material together, and with no large lumps of clay.
 - 1.4. Natural gravel.
 - 1.5. Natural sand.
2. **Filling:** Spread and levelled in 150 mm maximum layers, each layer thoroughly compacted.

340 Protection

1. **Sub-bases:** As soon as practicable, cover with subsequent layers, specified elsewhere.
2. **Subgrades and sub-bases:** Prevent degradation by construction traffic, construction operations and inclement weather.

Ω End of Section

Q21

In situ concrete roads/ pavings/ bases

Clauses - Not Used

Types of paving

110A Unreinforced paving (designated concrete)

1. Description: Footpaths
2. Subgrade improvement layer: as per contract drawings
 - 2.1. Compacted thickness: as per contract drawings
3. Geotextile filter: As section Q20
4. Granular sub-base: as per contract drawings
 - 4.1. Compacted thickness: as per contract drawings
5. Separation membrane: Polyethylene sheet 125 micrometres thick, edges lapped 300 mm minimum.
6. Concrete: To IS EN 206.
 - 6.1. Designation: as per contract drawings
 - 6.2. Fibres: Not required
 - 6.3. Aggregate:
 - 6.3.1. Size (maximum): 20 mm
 - 6.3.2. Coarse recycled concrete aggregate: Not permitted.
 - 6.3.3. Additional aggregate requirements: None
 - 6.4. Consistence class: Contractor's choice
 - 6.5. Additional mix requirements:
7. Slab thickness (minimum): 150 mm
8. Finish: as per Architects drawings

118 Paving with embedded metal (designed concrete)

1. Subgrade improvement layer: As per contract drawings
 - 1.1. Compacted thickness: As per contract drawings
2. Geotextile filter: As section Q20
3. Granular sub-base: As per contract drawings
 - 3.1. Compacted thickness: As per contract drawings
4. Separation membrane: Polyethylene sheet 125 micrometres thick, edges lapped 300 mm.
5. Embedded metal: As per contract drawings
6. Designed concrete: To BS 8500-2.
 - 6.1. Compressive strength class minimum (cylinder/ cube): As per contract drawings
 - 6.2. Target density (oven-dry): As per contract drawings
 - 6.3. Fibres: As per contract drawings
 - 6.4. Aggregate
 - 6.4.1. Size (maximum): Submit details
 - 6.4.2. Type/ Density: Submit details
 - 6.4.3. Coarse recycled aggregate: Not permitted
 - 6.4.4. Additional aggregate requirements: None

- 6.5. Design chemical class: Contractor's choice
- 6.6. Limiting values for composition
 - 6.6.1. Water:cement ratio (maximum): As per contract drawings
 - 6.6.2. Cement/ Combination content (minimum): As per contract drawings
 - 6.6.3. Cement/ Combination content (maximum): As per contract drawings
 - 6.6.4. Air content in situ (minimum): As per contract drawings
- 6.7. Consistence class: As per contract drawings
- 6.8. Permitted cement/ combinations: As per contract drawings
- 6.9. Chloride class: As per contract drawings
- 6.10. Admixtures: As per contract drawings
- 6.11. Colour: As per contract drawings
- 6.12. Additional mix requirements: As per contract drawings
- 7. Slab thickness (minimum): As per contract drawings
- 8. Finish: As per contract drawings

General/ preparation

140A Ready-mixed concrete

- 1. Production plant: Currently certified by a body accredited by National Standards Authority for Ireland for product conformity certification of ready-mixed concrete, or similar national accredited body.
- 2. Source of ready-mixed concrete: Obtain from one source if possible. Otherwise, submit proposals.
 - 2.1. Name and address of depot: Submit before any concrete is delivered.
 - 2.2. Delivery notes: Retain for inspection.
- 3. Declarations of nonconformity from concrete producer: Notify immediately.

145 Admixtures

- 1. Calcium chloride and admixtures containing calcium chloride: Do not use.

155A Project testing of concrete - general

- 1. Testing: To IS EN 206-1, annex B.
- 2. Recording: Maintain complete correlated records including:
 - 2.1. Concrete designation.
 - 2.2. Sampling, site tests, and identification numbers of specimens tested in the laboratory.
 - 2.3. Location of the parts of the structure represented by each sample.
 - 2.4. Location in the structure of the batch from which each sample is taken.
- 3. Testing laboratory: Accredited by UKAS or other national equivalent.
- 4. Tests results:
 - 4.1. Submission of reports: Within one day of completion of each test.
 - 4.1.1. Number of copies: 2
 - 4.2. Reports on site: A complete set, available for inspection.
- 5. Nonconformity: Obtain instructions immediately

165 Regular project testing of concrete

- 1. Description: In-situ concrete to footpaths, kerbs, lighting columns, manholes and bases
- 2. Tests: Compressive strength;

- 2.1. Air content:: To BS 2350
- 2.2. Consistence:: To BS 2350
- 2.3. Early age compressive strength testing at 7 and 28 days:: To BS 2350
3. Sampling
 - 3.1. Point: At point of discharge from delivery truck
 - 3.2. Rate: On a daily basis, the Contractor shall perform one slump test and make a set of three 150mm test cubes from each sample of concrete taken as follows:
 - 3.2.1. " one sample from each subsequent delivery of 30 cubic metres of concrete;
4. Separate samples shall be taken from each grade of concrete delivered to the site on a particular day, and separate samples shall also be taken if there is a change in the readymix plant supplying the concrete. Each cube shall be identified by a unique reference number.
5. Other requirements: Cubes for early age strength testing to be stored under same conditions as concrete in members

240 Sub-base preparation

1. Surface: Sound, free of debris, mud and soft spots, and suitably close textured.
2. Levels and falls: Within specified tolerances:
 - 2.1. Vehicular areas: ± 20 mm.
 - 2.2. Pedestrian areas: ± 12 mm.
 - 2.3. Drainage outlets: +0 to -10 mm of required finished level.
3. Kerbs and edgings: Complete, adequately bedded and haunched, and to required levels.

250 Laying fabric reinforcement

1. Flatness: Lay in flat sheets, straight and out of winding.
2. Main reinforcement: Parallel to long axis of slab.
3. Temporary support: Securely fix and support fabric during construction of slab.
4. Lapping at joints (minimum)
 - 4.1. Longitudinal bars: 450 mm
 - 4.2. Transverse bars: 450 mm
5. Extent of fabric: Fully within slab.
 - 5.1. Stopping short of slab edges by: 60 ± 20 mm
 - 5.2. Stopping short of centre line of transverse joints by: 60 ± 20 mm
 - 5.3. Stopping short of centre line of longitudinal joints: 60 ± 20 mm
6. Alternative placing method: Fabric may be placed on top of first compacted layer of concrete, followed by top layer of concrete, placed within two hours of the first layer.

Laying concrete

310 Transporting concrete

1. General: Avoid contamination, segregation, loss of ingredients, excessive evaporation and loss of workability. Protect from heavy rain.
2. Entrained air: Anticipate effects of transport and placing methods in order to achieve specified air content.
3. Placing: Use suitable walkways and barrow runs for traffic over reinforcement and freshly placed concrete.

320 Laying concrete generally

1. **Timing:** Place as soon as practicable after mixing and while sufficiently plastic for full compaction. After discharge from the mixer do not add water or retemper.
2. **Temperature of concrete at point of delivery**
 - 2.1. In hot weather (maximum): 30°C.
 - 2.2. In cold weather (minimum): 5°C.
3. **Cold weather**
 - 3.1. Do not use frozen materials.
 - 3.2. Do not place concrete against frozen or frost covered surfaces.
 - 3.3. Do not place concrete when air temperature is below 3°C on a falling thermometer. Do not resume placing until rising air temperature has reached 3°C.
4. **Surfaces on which concrete is to be placed:** Free from debris and standing water.
5. **Placing in final position:** Place in one continuous operation up to construction joints.
 - 5.1. Do not place concrete simultaneously on both sides of movement joints.
6. **Spreading:** Spread and strike off with surcharge sufficient to obtain required compacted thickness.
7. **Adjacent work:** Form neat junctions and prevent damage. Keep clean all channels, kerbs, inspection covers, etc.

330 Compacting

1. **General:** Fully compact concrete to full depth (until air bubbles cease to appear on the surface) especially around reinforcement, cast-in accessories, into corners and at joints.
2. **Poker vibrators:** Do not use to make concrete flow into position. Do not allow to come into contact with fabric reinforcement.
3. **Wet formed joint grooves:** Rectify any irregularities by means of a vibrating float.
4. **Finish:** A dense, even textured surface free from laitance or excessive water.
 - 4.1. **Excess concrete:** Remove from top of groove formers.

340 Manhole cover and gully grating frames

1. **General:** Set frames in independent concrete slabs placed over, but slightly larger than, exterior of manhole shaft or gully pot and any concrete surround.
2. **Positioning of joints in main slab:** Set out so that manhole/ gully slabs are adjacent to a main transverse joint, wherever possible.
3. **Joints:** Separate the independent slabs from main slabs with 25 mm thick joint filler board. Set board 20 mm below top of slab to form a sealing groove.

350 Levels

1. **Lines and levels of finished surface:** Smooth and even, with regular falls to prevent ponding.
2. **Finished surfaces:** Within ± 6 mm of required levels (+6 or -0 mm adjacent to gullies and manholes).

360 Surface regularity

1. **General:** Where appropriate in relation to the geometry of the surface, the variation in gap under a 3 m straightedge (with feet) placed anywhere on the surface to be not more than 5 mm.
2. **Sudden irregularities:** Not permitted.

Joins

410 Joints generally

1. **Layout:** All joints to be accurately located, straight and well aligned.
2. **Construction joints made at end of working day:** Form as contraction joints.
3. **Modifications to joint design or location:** Submit proposals.
4. **Temporary support:** Prior to concreting, set formwork, dowel bars, tie bars, joint filler boards, sealing groove fillets and the like rigidly in position and support to prevent displacement. Maintain support until concrete has set.
5. **Keep clean**
 - 5.1. Do not allow concrete to enter gaps or voids in formwork or to render movement joints ineffective.
 - 5.2. Do not allow concrete to impregnate or penetrate materials used as compressible joint fillers.

430A Dowel bars

1. **Standard:** To BS EN 13877-3
 - 1.1. **Material/ Designation:** Carbon steel
 - 1.2. **Strength:** 250
 - 1.3. **Profile:** Plain, round.
 - 1.4. **Condition:** Free from oil, dirt, loose rust and scale.
2. **Bar dimensions:** 20 mm diameter x 500 mm long
3. **Location:** Place dowel bars in movement joints at mid depth of the slab ± 20 mm, centred on joint and at 300 mm centres. Bars to be parallel to longitudinal axis and top surface of the slab.
 - 3.1. **Misalignment tolerance per 300 mm length of dowel bar:** ± 3 mm
4. **Debonding of bars:** Flexible plastics sleeve covering, not less than 0.6 mm thick
5. **Bars in expansion joints:** Provide 100 mm long plastics caps for free bar movement. Before placing concrete, ensure there is a space between the end of the cap and the end of the dowel bar 10 mm greater than the thickness of the joint filler board.

440 Longitudinal construction joints

1. **Definition:** Longitudinal joints are those parallel to the main axis of the paving.
2. **Standard:** To Concrete Society Technical Report 28.
3. **Formed groove**
 - 3.1. **Size (minimum width x depth):** 15 x 13 mm.
 - 3.2. **Preparation:** Repair damaged edges of initially cast slab prior to forming groove.
 - 3.3. **Method:** Fix preformed fillet against top edge of the initially cast slab before placing the adjacent slab. Remove when concrete is fully cured.
4. **Completion:** Round upper edges of slabs at joints to 5 mm radius. Do not overwork concrete.

450 Contraction joints with sawn groove

1. **Standard:** To Concrete Society Technical Report 28.
2. **Temperature:** Do not start sawing if temperature is falling.
3. **Sawn groove**
 - 3.1. **Timing:** Cut as early as possible after the slab has been placed but without causing edges of groove to spall.
 - 3.2. **Width (minimum):** 3 mm.

- 3.3. Depth: 3 mm per 10 mm depth of slab or 50 mm, whichever is the greater.
- 4. Upper portion of joint: Enlarge by sawing a groove:
 - 4.1. Width (minimum): 13 mm.
 - 4.2. Depth: 25 mm

460 Contraction joints with wet formed groove

- 1. Standard: To Concrete Society Technical Report 28.
- 2. Bottom crack inducer: Preservative treated softwood, triangular section, height 50 mm
 - 2.1. Locate vertically below the top groove within a horizontal tolerance of ± 10 mm.
 - 2.2. Fix to sub-base to retain in position when concrete is placed.
- 3. Wet formed groove: Form when surface of concrete is plastic.
 - 3.1. Groove depth: 20 mm
 - 3.2. Temporary fillet: 20 mm wide. Remove when concrete is fully cured.
- 4. Completion: Recompact displaced concrete without overworking. Round edges of groove to 5 mm radius.

470A Expansion joints

- 1. Joint filler board:
 - 1.1. Type: Bitumen impregnated fibre board
 - 1.2. Standard: To TII 'Specification for Pavement Design
 - 1.3. Thickness: 25 mm.
 - 1.4. Depth: Joint filler board must extend from underside of sealing groove fillet to full depth of slab to provide complete separation of adjacent slabs.
 - 1.5. Holes for dowel bars: Accurately bored or punched holes to form a sliding fit for dowel bars.
- 2. Completion: Round upper edges of slabs at joints to 5 mm radius. Do not overwork concrete.

Surface finish

530 Brushed finish

- 1. Direction: At right angles to longitudinal direction of the slab
- 2. Texture depth: Approximately 1 mm with finished surface having an overall even texture.

Curing/ protection/ finishing

610 Curing

- 1. General: Immediately after completion of surface treatment prevent evaporation from surface and exposed edges of slabs for a minimum period of seven days.
- 2. Early curing
 - 2.1. Cover with waterproof sheeting held clear of surface. Seal against draughts at edges and junctions.
 - 2.2. Do not apply sprayed compounds or sheets in direct contact until surface is in a suitable state and will not be marked.
- 3. Coverings for curing: Contractor's choice of:
 - 3.1. Impervious sheet material.
 - 3.2. Resin based aluminized curing compound containing a fugitive dye and with an efficiency index of 90% when tested to BS 7542.
 - 3.3. Sprayed plastics film.

630 Surface sealer

1. Manufacturer: Contractor's choice
 - 1.1. Product reference: Contractor's choice

660 Protection

1. Prevent damage to concrete
 - 1.1. From rain, indentation, physical damage, dirt, staining, rust marks and other disfiguration.
 - 1.2. From thermal shock.
 - 1.3. In cold weather, from freezing expansion of water trapped in pockets, etc.
 - 1.4. By use as a building platform or for storing, mixing or preparing materials.

670 Opening to traffic

1. Light vehicles: 7 days after placing concrete
2. Heavy vehicles: 28 days after placing concrete

Ω End of Section

Q22

Asphalt roads/ pavings

Clauses - Not Used

Types of paving

110A Asphalt concrete paving

1. Description: To all roads and footpaths
2. Standard: as per drawings
3. Subgrade improvement layer: as per drawings
 - 3.1. Compacted thickness: as per drawings
4. Geotextile: as per drawings
 - 4.1. Manufacturer: as per drawings
 - 4.1.1. Product reference: as per drawings
5. Granular sub-base: as per drawings
 - 5.1. Compacted thickness: as per drawings
6. Base: as per drawings
 - 6.1. Compacted thickness: as per drawings
7. Binder course: as per drawings
 - 7.1. Compacted thickness: as per drawings
8. Surface course: as per drawings
 - 8.1. Compacted thickness: as per drawings
9. Reclaimed content:
 - 9.1. Standard: To BS EN 13108-8.
 - 9.2. Value (maximum): Submit proposals
10. Surface treatment: as per drawings
11. Other requirements: At locations where roads are to be surfaced (at tie-ins to existing carriageway), the existing wearing course shall be planed off. Planed surface shall then be treated with "Tack Coat Emulsified Bitumen Binder" to EN 13108, and surfaced as specified on the drawings and this Clause.

Preparatory work/ requirements

220 Bituminous materials generally

1. Suppliers names: Submit.
 - 1.1. Timing (minimum): Two weeks before starting work.
2. Test certificates: At the time of delivery for each manufacturing batch submit certificate:
 - 2.1. Confirming compliance with this specification and the relevant standard.
 - 2.2. Stating full details of composition of mix.

240 Acceptance of surfaces

1. Surface: Sound, clean and suitably close textured.
2. Level tolerances: To BS 594987.
3. Kerbs and edgings: Complete, adequately bedded and haunched and to the required levels.

250 Abutments

1. Vertical edges of manholes, gullies, kerbs and other abutments: Clean and paint with a thin uniform coating of hot applied 40/60 paving grade bitumen.
2. Finishing: Tamp surface around projections.
 - 2.1. Level: Flush or not more than 3 mm above projections.

Laying

310 Laying generally

1. Preparation: Remove all loose material, rubbish and standing water.
2. Adjacent work: Form neat junctions. Do not damage.
3. Channels, kerbs, inspection covers etc: Keep clean.
4. New paving
 - 4.1. Keep traffic free until it has cooled to prevailing atmospheric temperature.
 - 4.2. Do not allow rollers to stand at any time.
 - 4.3. Prevent damage.
 - 4.4. Lines and levels: With regular falls to prevent ponding.
 - 4.5. Overall texture: Smooth, even and free from dragging, tearing or segregation.
 - 4.6. State on completion: Clean.

320 Adverse weather

1. Frozen materials: Do not use.
2. Suspend laying
 - 2.1. During freezing conditions
 - 2.2. If the air temperature reaches 0°C, or in calm dry conditions -3°C, on a falling thermometer.
 - 2.3. Hot rolled asphalt: During periods of continuous or heavy rain or if there is standing water on the base.

330 Levels

1. Permissible deviation from the required levels, falls and cambers (maximum): In accordance with BS 594987, clause 5.2.

340 Flatness/ Surface regularity

1. Deviation of surface: Where appropriate in relation to the geometry of the surface, the variation in gap under a 3 m straightedge placed anywhere on the surface to be not more than:
 - 1.1. Base: 14mm
 - 1.2. Binder course: 10mm
 - 1.3. Surface course: 5mm
 - 1.4. Where a straightedge cannot be used the surface must be of a comparable standard of accuracy when judged by eye.

351 Contractor's use of pavements

1. Preparation for final surfacing
 - 1.1. Timing: Defer laying until as late as practicable.
 - 1.2. Immediately before laying final surfacing: Clean and make good the base/ binder course. Allow to dry.
 - 1.3. Adhesion: Tack coat to BS 434-1 or BS EN 13808

- 1.3.1. Application rate: As manufacturer's recommendation
- 1.3.2. Accuracy: Uniform, without puddles.
- 1.4. Finishing: Allow emulsion to break completely before applying surface.

370 Coated chippings

- 1. Chippings and application: To BS EN 13108-4.
 - 1.1. Type/ Source: Contractor's choice
 - 1.2. Size: 14 mm, nominal
 - 1.3. Colour: Red chippings with red coating

Completion

390 Documentation

- 1. Standard: - BS EN 13108-1;- BS EN 13108-4; and- BS EN 13108-7
 - 1.1. Declaration of conformity: Submit.
- 2. Number of copies: 1 Electronic Copy
- 3. Submission: Two weeks prior to date when Contractor expects work to be complete

Ω End of Section

Q25

Slab/ brick/ sett/ cobble pavings

Clauses

2 To be read with preliminaries/ general conditions.

General

120 Concrete flag paving system

1. Description: As per contract drawings
2. Subgrade improvement layer: As per contract drawings
 - 2.1. Compacted thickness: As per contract drawings
3. Granular sub-base: As per contract drawings
 - 3.1. Compacted thickness: As per contract drawings
4. Base: As per contract drawings
 - 4.1. Thickness: As per contract drawings
5. Laying course: As per contract drawings
 - 5.1. Accessories: As per contract drawings
6. Paving units: As per contract drawings
7. Jointing: As per contract drawings
 - 7.1. Bond: As per contract drawings
8. Accessories: As per contract drawings

190 Hard landscaping materials specification

1. Minimum BRE 'Green Guide to Specification' online rating: A

System performance - Not Used

Products

320 Tactile flags and slabs

1. Description: As shown
2. Standard: To DD CEN/TS 15209.
3. Material: Precast concrete
 - 3.1. Manufacturer: Submit proposals
 - 3.1.1. Product reference: Submit proposals
4. Recycled content: 75% (minimum) to BS EN ISO 14021
5. Nominal sizes: 400 x 400 mm
6. Colour: As per drawings
7. Type of surface: As per drawings

465 Sealant for movement joints

1. Description:
2. Sealant
 - 2.1. Type: High performance trafficable joint
 - 2.2. Manufacturer: Submit proposals

2.2.1. Product reference: Submit proposals

2.3. Colour: Grey

Execution

610 Material samples

1. Samples representative of colour and appearance of designated materials: Submit before placing orders.
 - 1.1. Designated materials: Concrete slab paving

620 Adverse weather

1. General
 - 1.1. Temperature: Do not lay or joint paving if the temperature is below 3°C on a falling thermometer or below 1°C on a rising thermometer.
 - 1.2. Frozen materials: Do not use. Do not lay bedding on frozen or frost covered bases.
2. Paving with mortar joints and/ or bedding
 - 2.1. Protect from frost damage, rapid drying out and saturation until mortar has hardened.
3. Paving laid and jointed in sand:
 - 3.1. Stockpiled bedding sand: Protect from saturation.
 - 3.2. Exposed areas of sand bedding and uncompacted areas of sand bedded paving: Protect from heavy rainfall.
 - 3.3. Saturated sand bedding: Remove and replace, or allow to dry before proceeding.
 - 3.4. Laying dry-sand jointed paving in damp conditions: Brush in as much jointing sand as possible. Minimize site traffic over paving. As soon as paving is dry, top up joints and complete compaction.

625 Laying pavings – general

1. Appearance: Smooth and even with regular joints and accurate to line, level and profile.
2. Falls: To prevent ponding.
3. Bedding of paving units: Firm so that rocking or subsidence does not occur or develop.
 - 3.1. Bedding/ Laying course: Consistently and accurately graded, spread and compacted to produce uniform thickness and support for paving units.
4. Slopes: Lay paving units upwards from the bottom of slopes.
5. Paving units: Free of mortar and sand stains.
6. Cutting: Cut units cleanly and accurately, without spalling, to give neat junctions with edgings and adjoining finishes.

630 Levels of paving

1. Permissible deviation from specified levels
 - 1.1. Generally: ± 6 mm.
2. Height of finished paving above features
 - 2.1. At gullies: +6 to +10 mm.
 - 2.2. At drainage channels and kerbs: +3 to +6 mm.

637 Regularity of paved surfaces

1. Maximum undulations in the surface of pavings (except tactile paving surfaces) under a 1 m straight edge placed anywhere on the surface (where appropriate in relation to the geometry of the surface): 3 mm.

2. Joints between paving units or utility access covers
 - 2.1. Joints flush with the surface: difference in level between adjacent units to be no more than twice the joint width (with a 5 mm max difference in level).
 - 2.2. Recessed, filled joints: difference in level between adjacent units to be no greater than 2 mm; the recess to be no deeper than 5 mm.
 - 2.3. Unfilled joints: difference in level between adjacent units to be no greater than 2 mm.
3. Sudden irregularities: Not permitted.

645 Protection

1. Cleanliness: Keep paving clean and free from mortar droppings, oil and other materials likely to cause staining.
2. Materials storage: Do not overload pavings with stacks of materials.
3. Handling: Do not damage paving unit corners, arrises, or previously laid paving.
4. Mortar bedded pavings: Keep free from traffic after laying:
 - 4.1. Pedestrian traffic (minimum): 2 days
 - 4.2. Vehicular traffic (minimum): 10 days
5. Access: Restrict access to paved areas to prevent damage from site traffic and plant.

650 Cementitious bases and sub-bases

1. General: Protect from moisture loss, if not covered by another pavement course within 2 hours of completion.

655 Condition of sub-bases/ bases before spreading laying course

1. Trenches and excavation of soft or loose spots in subgrade: Fill and thoroughly compact.
2. Granular surfaces: Lay and compact so as to be sound, clean, smooth and close-textured enough to prevent migration of bedding/ laying course materials into the sub-base during compaction and use, free from movement under compaction plant and free from compaction ridges, cracks and loose material.
3. Prepared existing and new bound bases (roadbases): Sound, clean, free from rutting or major cracking. Remove sharp stones, projections and debris.
4. Sub-base/ Roadbase level tolerances: To BS 7533-7, Annex A.
5. Levels and falls: Accurate and within the specified tolerances.
6. Drainage outlets: Within 0-10 mm of the required finished level.
7. Features in sand bedded paving (including mortar bedded restraints and drainage ironwork): Complete to required levels; adequately bed and haunch in mortar.
8. Sub-bases containing cement/ hydraulic binder: Cure for minimum times specified in BS 7533-4.

715 Laying flag and slab paving – mortar laying course and jointing

1. Standard generally: In accordance with BS 7533-4.
2. Flag installation and cutting: To Interpave 'Concrete flag paving'.
3. Laying course
 - 3.1. Nominal thickness: 30 mm before laying paving slabs
4. Laying and jointing: as per architects details
5. Joint width (nominal): 10 mm

Completion

930 Slip resistance testing

1. Surfaces to be tested: All
 - 1.1. Surface condition: Dry and wet
2. Timing: As agreed with contract administrator
3. Period of notice (minimum): 3 working days.
4. Test standard: To BS 1134
 - 4.1. Testing authority: An approved laboratory
 - 4.2. Witnessing/ Certification: Arrange for tests to be witnessed/ certified by: Consultant.
 - 4.3. Report: Submit.
 - 4.3.1. Format: As required under BS 1134

Ω End of Section



APPENDIX A

Civil & Structural Specification



THESE MIXES BELOW SHALL BE SUPPLIED AS DESIGNED MIXES IN ACCORDANCE WITH THE RELEVANT CLAUSES OF EN 206-1									D=DESIGNER CONTRACTOR=C
REQUIREMENT		COMMENTS	SCHEDULE						
			BLINDING/LEAN-MIX	MANHOLE BASES	PRECAST CONCRETE MANHOLE SURROUNDS, THRUST BLOCKS	IN-SITU CONCRETE MANHOLES, MANHOLES LIDS,	RETAINING WALLS	CONCRETE FOOTPATHS AND KERBS	
SECTION A	1. MIX REFERENCE	FOUNDATION, GROUND BEAMS, GROUND FLOOR SLAB, COLUMNS, ELEVATED SLABS ETC...	SD0	SD1	SD2	SD3	SD4	SD5	D
	2. MINIMUM COMPRESSIVE STRENGTH CLASS*	REFER TO TABLE 7 OR 8 TO I.S. EN 206-1:2002 E.G. C12/15, C25/30, C30/37, C35/45, C40/50 ETC.	C8/10	C30/37	C30/37	C30/37	C30/37	C32/40	D
	3. NOMINAL MAXIMUM SIZE OF AGGREGATES, IN mm (D _{max})	E.G. 10mm, 20mm, 40mm ETC...	20mm	20mm	40mm	10mm	10mm	20mm	D
	4. TYPES OF AGGREGATES COARSE FINE OTHER (SPECIFY REQUIREMENTS)	I.S. EN 12620 I.S. EN 12620	I.S. EN 12620 I.S. EN 12620	I.S. EN 12620 I.S. EN 12620	I.S. EN 12620 I.S. EN 12620	I.S. EN 12620 I.S. EN 12620	I.S. EN 12620 I.S. EN 12620	I.S. EN 12620 I.S. EN 12620	D
	5. CEMENT OR COMBINATION TYPE(S) COMPLYING WITH: (DELETE AS APPROPRIATE) GUIDANCE BASED ON INFORMATION FROM CEMENT MANUFACTURERS IRELAND	CEMENTS CEM I (42.5)..... CEM II / A-V (42.5)..... CEM II / A-V (42.5)..... SULPHATE RESISTANT PORTLAND CEMENT TO BS 4027..... COMBINATIONS CEM I (42.5) + UP TO 70% GGBS (EQUIVELANT STRENGTH 42.5)..... CEM I (42.5) + UP TO 35% FLY ASH (k VALUE CONCEPT)..... CEM II /A-V (42.5) + UP TO 50% GGBS EQUIVELANT STRENGTH 42.5)..... CEM II /A-L (42.5) + UP TO 50% GGBS EQUIVELANT STRENGTH 42.5)..... CEM II /A-V (42.5) + UP TO 35% FLY ASH (k VALUE CONCEPT, k = 0.4)..... CEM II /A-L (42.5) + UP TO 35% FLY ASH (k VALUE CONCEPT, k = 0.4).....	TICK APPROPRIATE CEMENT/COMBINATION TYPE(S)						D
			X	X	X	X	X	X	
			X	X	X	X	X	X	
			X	X	X	X	X	X	
			X	X	X	X	X	X	
			✓	✓	✓	✓	✓	✓	
			X	X	X	X	X	X	
			✓	✓	✓	✓	✓	✓	
			X	X	X	X	X	X	
			X	X	X	X	X	X	
6. ADDITIONS COMPLYING WITH (DELETE AS APPROPRIATE)	PFA} SEE LIST IN NA 2.7 AND KEY TO ABBREVIATIONS IN GGBS} TABLE NO 2	✓	✓	✓	✓	✓	✓	D	
7. SULPHATE CLASS, IF APPLICABLE (DELETE AS APPROPRIATE)	XA1 [200-600 SO ₄ ²⁻] XA2 [200-1400 SO ₄ ²⁻] XA2 [1400-3000 SO ₄ ²⁻] XA3 [3000-6000 SO ₄ ²⁻]	-	-	-	-	-	-	D	
8. EXPOSURE CLASS (AS IN TABLE 1 OF I.S. EN 206-1) (OR COMBINATIONS)	X0 (NO RISK OF CORROSION OR ATTACK) XC1, XC2, XC3, XC4 (CARBONATION-INDUCED CORROSION) XS1, XS2, XS3 (CHLORIDE-INDUCED CORROSION – SEA WATER) XD1, XD2, XD3 (CHLORIDE-INDUCED CORRSION – OTHER THAN SEA WATER) XF1,XF2,XF3,XF4 (FREEZE/THAW ATTACK) XA1, XA2, XA3 (AGGRESSIVE CHEMICAL ENVIRONMENT)	--	XC4	XC2	XC4	XF2	XF4	D	
9. CHLORIDE CLASS	CL 1.0 CL 0.40 CL 0.20 CL 0.10 } REFER TO TABLE 10 AND TABLE	-	Cl 0.40	Cl 0.40	Cl 0.40	Cl 0.40	Cl 0.40	D	
10. MINIMUM CEMENT CONTENT, kg/m³	IN ACCORDANCE WITH TABLE N.A.5 OF I.S. EN 206-1:2002	-	-	-	-	-	-	D/C	
11. MAXIMUM FREE WATER	IN ACCORDANCE WITH TABLE N.A.5 OF I.S. EN 206-1:2002	-	-	-	-	-	-	D/C	
12. QUALITY ASSURANCE REQUIREMENTS	I.S. EN ISO 9001 OR EQUIVALENT ACCREDITED THIRD PARTY PRODUCT CONFORMITY CERTIFICATION YES / NO	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	D	
13. OTHER REQUIREMENTS		MINIMUM 50% GGBS IN COMBINATION WITH CEM I OR MINIMUM 30% GGBS IN COMBINATION WITH CEM II	MINIMUM 50% GGBS IN COMBINATION WITH CEM I OR MINIMUM 30% GGBS IN COMBINATION WITH CEM II	MINIMUM 50% GGBS IN COMBINATION WITH CEM I OR MINIMUM 30% GGBS IN COMBINATION WITH CEM II	MINIMUM 50% GGBS IN COMBINATION WITH CEM I OR MINIMUM 30% GGBS IN COMBINATION WITH CEM II	MINIMUM 50% GGBS IN COMBINATION WITH CEM I OR MINIMUM 30% GGBS IN COMBINATION WITH CEM II	AIR ENTRAINED CONCRETE AND MINIMUM 50% GGBS IN COMBINATION WITH CEM I OR MINIMUM 30% GGBS IN COMBINATION WITH CEM II	D	
IN THE CASE OF FRESH CONCRETE THE FOLLOWING SHALL BE COMPLETED BY THE CONTRACTOR									
SECTION B	14. CONSISTENCE (CHOOSE ONE METHOD) SLUMP CLASS VEBE CLASS COMPACTION CLASS FLOW CLASS	S1, S2, S3, S4, S5 (REFER TO TABLE 3) V0, V1, V2, V3, V4 (REFER TO TABLE 4) C0, C1, C2, C3, C4 (REFER TO TABLE 5) F1, F2, F3, F4, F5, F6 (REFER TO TABLE 6)						C	
	16. RATE OF SAMPLING INTENDED BY PURCHASER FOR STRENGTH TESTING (FOR INFORMATION)							C	
	17. OTHER REQUIREMENTS BY THE PURCHASER OF FRESH CONCRETE. (ONLY IF APPROPRIATE)							C	
EXCHANGE OF INFORMATION									
SECTION C	18. OTHER KEY INFORMATION							C	
	19. INTENDED METHOD OF PLACEMENT	PUMPING, SKIP, DIRECT DISCHARGE, TAMPED, HAND FLOATED, POWER FLOATED.						C	
	17. OTHER REQUIREMENTS BY THE PURCHASER OF FRESH CONCRETE (ONLY IF APPROPRIATE)							C	

*e.g. C32/40 → 32 = cylinder strength
→ 40 = cube strength

Table A2: Site Development (Civil) Concrete Mixes

APPENDIX B

Civil & Structural Specification



Compressive Strength Class ^a	Equivalent Prescribed Mortars (Proportion of Materials by Volume) <i>(see Note)</i>			Mortar Designation
	Cement:Lime:Sand with or without Air Entrainment	Masonry Cement:Sand	Cement:Sand with or without Air Entrainment	
M12	1:0 to 1/4:3	Not suitable	Not suitable	(i)
M6	1:1/2:4 to 4 1/2	1:2 1/2 to 3 1/2	1:3 to 4	(ii)
M4	1:1:5 to 6	1:4 to 5	1:5 to 6	(iii)
M2	1:2:8 to 9	1:5 1/2 to 6 1/2	1:7 to 8	(iv)
^a The number following the M is the compressive strength for the class at 28 days in N/mm ²				
NOTE When the sand portion is given as, for example, 5 to 6, the lower figure should be used with sands containing a higher proportion of fines whilst the higher figure should be used with sands containing a lower proportion of fines.				

Table B.1: Mix Proportions – To be read in conjunction with Clause F10/460A of the Civil and Structural Engineering Specification

APPENDIX C

Civil & Structural Specification



Merlin Park CNU Additional Car Park Works

Independent Check Certificate for Temporary Works

Name of Structure/Element _____

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:

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

- ii. 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)

- iii. 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 _____

APPENDIX D

Civil & Structural Specification



CONTRACTOR'S CERTIFICATION SCHEDULE

Non-exhaustive list of materials and components requiring contractor's submissions of certificates - Civil & Structural discipline.		Compliance with the TGD Part D of the Building Regulations	Ancillary Certificate of Compliance: Design - Commencement (SD RIAI ACD 02)	Ancillary Certificate of Compliance: Design - Completion (SD RIAI ACCD 02)	Ancillary Certificate of Compliance: on Completion - Inspection (SD RIAI ACI 02)	Declaration of Performance	Production Control Certificates
1	Mortar sand	✓					✓
2	Proprietary/ready mix mortars	✓				✓	✓
3	Fill material CL 804, CL 808, CL 809, 6N	✓				✓	✓
4	Coatings to concrete	✓				✓	✓
5	Structural Grouts	✓				✓	✓
6	Structural Concrete Mix Design	✓	✓	✓	✓	✓	✓
7	Steel Reinforcement	✓				✓	✓
8	Aggregate for concrete	✓				✓	✓
9	Cement and Cement compositions	✓				✓	✓
10	Admixtures to concrete	✓				✓	✓
11	Bituminous products for pavement.	✓				✓	✓
12	Tactile Paving Tiles	✓				✓	✓
13	Road Line Marking Paint	✓				✓	✓
14	Drainage & Utility pipes (concrete, pvc, etc)	✓				✓	✓
15	Manholes including covers	✓				✓	✓
16	Road gullies including covers	✓				✓	✓