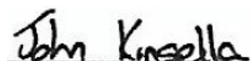
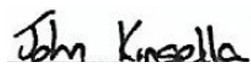




Farmyard Development
at Teagasc
Solohead Farm,
Knockaneduff, Donohill,
Co. Tipperary

Civil & Structural Specification

Contents Amendment Records**Document:** Civil & Structural Specification**Doc. Number:** W25100-X-XX-RP-MOR-01004**Project:** Farmyard Development at Teagasc Solohead Farm**Client:** Teagasc**Job Number:** W25100**Prepared By:** Leon BothaSigned: **Checked By:** John KinsellaSigned: **Approved By:** John KinsellaSigned: **Revision Record**

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1.0 GENERAL

1.1 General

Teagasc Solohead Farm are constructing a single storey milking parlour shed with underground slurry storage tank, yard area including base and above ground effluent storage tank, 2no. silage pits, proposed dungstead and bale storage area and associated site works including proposed effluent drainage network, surface water management drainage network and all ancillary site works at Teagasc Solohead Farm, Knockaneduff, Donohill, Co. Tipperary. The site is located off the L4213 (Ballyryan East), north of the Tipperary Races race course and Limerick Junction off the N24.

1.2 Drawings

The works are shown on the attached Drawings included as part of this Tender Package. Refer to Drawing Issue Sheets.

1.3 Construction Programme

The programme required in accordance with the Contract shall be in the form of a time locations Bar Chart, covering all the main items of work laid out in the format which will permit progress of the various items to be indicated throughout the execution of the works. It shall be supported by a critical path network of all requisite operations which shall be submitted with the programme.

1.4 Method Statement, Risk Assessments and Traffic Management Plan

The Method Statement and Risk Assessment shall include a detailed Method Statement and Risk Assessment describing how the Contractor proposes to carry out each element of each phase of the works in order to ensure that the completed works will be constructed safely, will achieve the required standards and will be completed on time.

All works that will require a Method Statement and a Risk Assessment which shall be submitted to the Employers Representative and to the PSCS at least 5 working days in advance of the proposed start of the particular work item. Work shall not commence until the PSCS has approved the documentation.

1.5 Safety

The Contractor will be the Project Supervisor Construction Stage (PSCS) and Malone O'Regan will undertake the role of Project Supervisor for Design Process (PSDP). A Preliminary Health and Safety Plan accompany these Tender Documents. The Contractor shall take account of the contents and requirements of the Preliminary Health and Safety Plan and include for all costs associated with complying with its requirements in his tender. A number of the key items have been specifically itemised in the Bill of Quantities. These requirements include provision and maintenance of safety signage, permit to work procedures, maintaining a high level of house keeping and provision of Heras or equivalent fencing to separate the construction works from the rest of the Farm activities.

The Contractor shall compile the Safety File and hand it over to the PSDP and Client at the end of the project.

1.6 Welfare

The Contractor shall comply with the requirements of Health and Safety Legislation. The provision and maintenance of hot and cold water, canteen facilities, toilets and a Drying Room are required.

1.7 Extent of Site

The site comprises the various areas described on the Drawings. Note that the Contractor will not be given full possession of the whole of the site for the duration of the works and will be expected to liaise and to co-operate with the Employer to ensure that the Employers operations will not be affected. If additional space is required the Contractor shall make his own arrangements.

1.8 Working Hours

Working hours shall be restricted to 08.00am to 18.00pm Monday to Friday. Work outside these times shall be agreed in advance with Solohead Farm staff.

1.9 Access to the Site

The access to the site shall be via the main entrance area off the L4213 Road.

1.10 Materials

New Materials

All materials used in the works shall be new unless otherwise described.

Quality

Where materials or components are specified to comply with a National or EU Standard Specification, the relevant Standard Number shall be marked on the commodity itself or on the delivery note accompanying the commodity.

Manufactured Articles

Within six weeks of appointment, the Contractor shall provide a schedule of all manufactured articles which it is proposed to use, together with the manufacturers' details of manufacture and the recommendations for use.

Manufacturers' Certificates

The Contractor shall provide in respect of materials or components manufacturers' certificates of compliance with the standards when requested by the Engineer.

The Contractor shall obtain approval from the Engineer for manufacturers.

Test and Samples

The Contractor shall provide samples of materials for testing in an approved laboratory if requested by the Engineer.

Storage of Materials

Store materials in a tidy manner. Separate different materials and protect them from dirt, physical damage, reaction with other materials, marking or staining, micro-organisms, mildew, fungus and vermin.

Storage of Materials, Precautions

Do not store materials in ways which may cause damage to the Works or to the materials or endanger the safety of people or of property.

Manufacturers Recommendations

Handle and store materials in accordance with the manufacturer's recommendations. Do not use materials which have been stored for a period in excess of the manufacturers recommended shelf life.

1.11 Information*Standards*

The provision of the latest edition of the Standards listed in this Specification shall be held to be incorporated in the Specification unless specifically stated otherwise.

Conflicting Information

Where there is conflict between Clauses of this Specification and the appropriate standard, the relevant Clauses of this Specification shall apply.

If there is conflict between information on drawings and in the Specification the instructions conveyed by the Drawings shall prevail.

1.12 Setting Out*Ordinance Datum*

The datum level indicated on the drawings is Malin Head Datum.

Bench Marks

The Contractor shall establish a master Bench Mark on the site for the duration of the contract. The permissible deviation in level between the Master Bench Mark and any other Bench Mark established on the site shall be plus/minus (+/-) 2 mm.

Setting Out

The Contractor shall set out the works in accordance with the drawings.

Measurements

Do not scale the drawings. Use dimensioned figures on the drawings for setting out the works.

1.13 Temporary Works

Within two weeks from the date of order to commence, the Contractor shall submit to the Engineer for his approval complete design calculations and drawings for any temporary works he may require for the purpose of carrying out the works. The Contractor shall be responsible for all such design and construction of temporary works.

Any alterations which the Engineer may require to have made to drawings supplied by the Contractor for approval shall be made by the Contractor, at his own expense and to the Engineer's satisfaction.

The Engineer will provide the Contractor with such design criteria relating to the permanent works that the Contractor may need to finalise his temporary works proposals. Approval of the Contractor's proposals shall in no way relieve the Contractor of any of his duties or responsibilities under the Contract. The Contractor shall be responsible for any necessary negotiations with third parties relating to temporary works. The Contractor shall appoint a competent temporary works designer who shall have responsibility for the overall stability of the building and for all temporary works design during construction. Professional Indemnity Insurance to a minimum level of 2,500,000.00 euro for each and every claim shall be in place from the commencement of the design to 6 years after the date of substantial completion of the works. Any shoring or support systems or temporary works of a similar nature will require a completed and signed off Temporary Works Certificate – refer to Guidelines to the 2013 Construction Regulations published by the HSA. Temporary Works Certificates will be required to be fully signed off prior to the works or systems being installed. Health and Safety Authority Guidance on what are to be considered temporary works will be utilised for the Project.

1.14 Protecting

Pollution

Do not deposit deleterious material into the drainage system. Comply with the requirements of the Rivers Pollution Act, the Public Health (Ireland) Acts and the Fisheries Acts. In the event of any spillage the Contractor will be required to pay the full cost of the clean-up operation and associated costs.

All drains pipes and cables whether above or below ground that are encountered during the course of the work are to be left in position and carefully supported and guarded from injury by the Contractor to the satisfaction of Teagasc Solohead so that such drains, pipes and cables may continue in full use until the completion of the Works or authorised diversions have been brought into operation.

All fuels and chemicals shall be stored in bunded areas. Spill trays shall be used at all filling areas. Facilities to clean up spillages shall be available on the site. Refuelling areas shall be of concrete construction with drainage to a Class 1 interceptor.

1.15 Access Roads

Ensure all roads leading to and from the site are kept clean. Ensure trucks are not overfilled and that wheels are free from dirt. Ensure all road signs and markings are kept clean.

1.16 Existing Services

The successful Contractor shall locate all services prior to any excavation work on site.

The Contractor is also advised of the presence of watermain, telecommunications ducts and cables and drainage lines throughout the site (non-exhaustive list). The successful Contractor shall identify the location of all these services and shall ensure such services are protected and maintained. The location of known services are shown on Drawings. Nevertheless, the successful Contractor shall use specialised equipment or other methods to check for the presence of live services throughout the site.

Current Health and Safety Authority guidance and best practice advice on the avoidance of hazards from services to be adhered to as minimum standard. Any use of CAT scanners or similar systems must be by a trained and ticketed CSCS operative.

1.17 Notice of Operations

No important operation e.g. pouring of concrete shall be carried out without adequate notice being given to the Engineer sufficiently in advance of the operation to enable him to make such arrangements as he may deem necessary for its inspection.

The PSCS will require reviewed and approved Method Statements for all operations. Safety Method Statements must be submitted for review at least 5 working days in advance of the planned operations.

1.18 Water and Power

The Contractor shall make all arrangements and payments for any temporary electricity supply. He shall maintain installation in accordance with the ESB's requirements especially with regard to all safety aspects. Teagasc Solohead will charge the Contractor for all power used by the Contractor on the site at cost.

The Contractor shall make his own arrangements for a suitable and adequate supply of potable water to cover all his requirements in connection with the execution of the Works. Solohead Farm will facilitate the Contractor by providing a source of water for the Contractor.

The Contractor will be permitted to use portable electrical tools on the site only if they are energised from an electricity supply of 110 volts or lower. Where the available supply of energy is at a higher voltage the Contractor shall make his own arrangements by means of a suitable transformer or otherwise to connect to a lower voltage or to provide an independent low voltage supply. He shall in all cases ensure by means of suitable apparatus that protection for his operators is given against the leakage of electrical energy.

All Transformers and Electrical leads used on site must be in good operational condition. Any damaged leads or equipment must be taken out of use and removed from site.

All arrangements for the supply and utilisation of electricity shall be in accordance with the Regulations published by the Institution of Electrical Engineers and be to the approval of the Engineer.

1.19 Particulars of Existing Work

Information as to the present condition form, dimensions and character of the existing structures including particulars of pipes and ducts is given without guarantee of accuracy and neither the Employer nor the Engineer will be liable for any discrepancy therein.

1.20 Site Conditions

It is advised that the Contractor visits site to familiarise themselves with site conditions and restrictions prior to submitting their Tender.

1.21 Temporary Fencing

Tenderers shall include for all temporary markers, bollards, cones, fencing or hoarding required for the duration of the works in order to separate the Contractors activities from Teagasc Solohead Farm activities on the site. Heras fencing or equivalent shall be used to separate the construction site from Teagasc Solohead Farm activities.

1.22 Phasing of the Works

Teagasc Solohead Farm will continue to operate for the duration of the works. The successful Contractor will be required to phase the works by agreement with the Employer to ensure that the Teagasc Solohead Farm activities on the site including access and deliveries to and from the site can be maintained for the duration of the works. Tenderers shall include in their price for the cost of carrying out the work in phases.

1.23 As-Built Drawings and Records

The Contractor shall supply at his own cost all records that may be required by the Engineer relating to strata passed through, dates and details of all engineering operations, temperatures and other weather conditions. The Contractor shall also record on copies of the working drawings details of all amendments carried out.

Within four weeks of the Completion of the Works the Contractor shall furnish the Engineer with two sets of drawings in hard copy and compact disc giving full particulars, in accurate and clear detail, of the Permanent Works as actually constructed and set out in the detail given in the working drawings. The "As-Built" drawings shall draw attention to any alterations from the Contract Drawings which may have been made in executing the Works.

1.24 Measurement of Additional Works

In the event of the Contractor having to execute any work or provide any material in regard to which he may propose to claim additional payment, he shall at once make arrangements to take the measurements of the said work or material with the Engineer or his authorised deputy.

The Contractor shall submit daily record sheets detailing quantities of materials and times expended by various plant and labour in the erection of such additional works or pursuant to the Contractor having notified the Engineer of his intention to claim additional monies as a result of unforeseen or unexpected circumstances.

1.25 Compliance with Regulatory Requirements

The Contractor shall comply with the following and other Regulatory requirements:

- Planning Permission

- Site Rules and regulations stipulated by Teagasc

1.26 Noise Control

The Contractor shall adopt BATNEEC (best available technology not entailing excessive cost) to minimise noise from construction operations.

1.27 Control of Dust and Spillages

The Contractor shall take effective dust suppression measures to prevent dust emissions creating a nuisance beyond the site boundary.

Haulage routes and working areas if required shall be constructed and managed to minimise dust emissions from the surface. Public roads shall be kept clear of all spillage from this traffic and any spillages promptly removed.

The Contractor shall be responsible for the repair and maintenance of any access roads for the duration of the Contract to minimise fugitive dust emissions.

The total dust emission arising from the Works when measured as deposition of total particulate matter at any point outside the boundary of the site in the locality shall not exceed the background levels by more than 50 milligrams/square meter/day averaged over 30 days.

1.28 Waste Management Plan

The Contractor shall prepare a Waste Management Plan for the construction stage and agree it with Teagasc Solohead Farm. The Plan shall be prepared in accordance with the Department of the Environment, Heritage and Local Governments Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects.

All costs associated with the development and administration of the Waste Management Plan will be deemed to be included in the Contractors Tender. In addition, the total cost of waste management and disposal and all associated costs shall be deemed to be included in the Contractors Tender.

1.29 Definitions

The terms “equal approved” or “similar approved” shall mean that (a) the alternative item proposed is at least equal in performance, quality, workmanship and durability to the item originally specified and (b) the Engineer must give his specific approval to the alternative item proposed. If the Engineers approval is not obtained the Contractor must provide the item originally specified.

SECTION 2.0 SITE CLEARANCE

2.1 Site Clearance

Stripping topsoil

CODES AND LEGISLATION PERTAINING TO DEMOLITION WORKS

BS 6187:2011	Code of Practice for Full and Partial Demolition
BS 5975:2008+A1 2011	Code of Practice for Temporary Works Procedures and the Permissible Stress Design of Falsework
Guidelines on Working with Materials Containing Asbestos Cement	Health and Safety Authority.
Remediation programmes	Department of Education and Skills. Safety, Health and Welfare at Work Act, 2005 Safety, Health and Welfare at Work (Construction Regulations), 2013.
Statutory Instruments	The Safety, Health and Welfare at Work (Construction) Regulations, 2013 (S.I. No. 291 of 2013).
Exposure to Asbestos	Safety, Health and Welfare at Work (Amendment) Regulation 2010 S.I. no. 589/2010.
GS29/1, 3 and 4	Health and Safety Executive Guidance Notes; Health and safety in Demolition Work.
GS51	Health and Safety Executive Guidance Notes; Facade retention.
Waste Management Act (1996)	Waste Management Act (1996) as amended and subsequent Regulations
THE COUNCIL OF THE EUROPEAN UNION	Council Decision 2003/33/EC and Directive 1999/31/EC
EPA	European Waste Catalogue (EWC) And Hazardous Waste List 2002

DEMOLITION

Ensure the safety of the Works and of the public during site clearance and demolition work. Carry out demolition work in such a manner as to cause no inconvenience to the

ongoing activities of Teagasc Solohead Farm. Do not burn on site materials arising from demolition.

GENERAL

A hierarchy exists pertaining to the management of materials containing asbestos cement whereby Irish legislation published by the Health and Safety Authority shall be consulted initially at all stages of the works. In instances where such legislation is not available, the relevant Guidance Notes published by the Health and Safety Executive of the United Kingdom shall be consulted.

TYPE AND EXTENT OF CONTRACT

The Contract provides for the localised demolition of the existing building and clearance of all rubbish. All works shall be carried out to the requirements of this Specification and the Specification Appendices.

The Contract shall include the provision of all labour, materials, construction plant, temporary works, transport to, from, on or about the site, and everything required in the execution, completion and maintenance of the works insofar as the need for them is specified in or may reasonably be inferred from the Contract documents.

INSPECTION OF SITE

The Contractor shall be deemed to have visited and examined all sites and their surroundings and to have satisfied himself as to the nature of the buildings so far as is practicable from visual inspection and the form and nature of the sites and their relationship to existing buildings both within and outside the site boundaries. He shall also have assessed the accommodation which he may require, and generally to have considered all necessary information as to risks, contingencies and all other circumstances influencing or affecting his works. The extent of rubbish to be removed from the site has been inspected by the Contractor.

An asbestos survey (at minimum, a walkabout survey) should be carried out and the locations of materials containing asbestos cement should be confirmed and recorded. Discoveries of such materials not previously recorded are to be reported to the Health and Safety Authority.

DEMOLITION

The Contractor shall carry out all demolition work in accordance with BS 6187:2011, Code of Practice for Full and Partial Demolition, and in accordance with The Safety, Health and Welfare at Work (Construction) Regulations, 2013 (S.I. No. 291 of 2013).

Health and Safety Executive Guidance Notes GS29/1, 3 and 4 are also of relevance. The contractor is to refer to the enclosed drawings for the extent of works and Appendices. The use of explosives for demolition shall not be permitted.

Do not burn on site material arising from demolition.

The Asbestos Register and subsequent Asbestos Surveys shall be consulted prior to all demolitions. Asbestos management remains the sole responsibility of the Contractor and such materials shall be removed by a contractor licensed by the Health and Safety Authority and prior to any other works starting in the locations where such materials are known to be and/or are discovered during the works.

SUPERVISION

The Contractor shall carry out all demolition work under the supervision of a responsible person experienced in demolition work who shall ensure that adequate safety precautions are taken.

Operatives must be appropriately skilled and experienced for the type of work and hold or be training to obtain relevant CITB Certificates of Compliance.

NUISANCE

The Contractor shall take all necessary precautions to minimise nuisance arising from demolition work. In addition, he shall not burn on site materials arising from demolition.

SAFETY

The Contractor shall ensure the safety of the works, the workmen and the public during all demolition work and he shall submit a Safety Statement prepared in accordance with the Safety, Health and Welfare at Work Act, 2005 and the Safety, Health and Welfare at Work (Construction Regulations), 2013. He shall carry out all demolition work in such a manner as to cause the minimum inconvenience to the public and to adjoining owners.

The Contractor shall ensure that Safety, Health and Welfare at Work (Exposure to Asbestos) (Amendment) Regulation 2010 S.I. no. 589/2010 aiming to protect the health and safety of all employees who may be exposed to dust from asbestos containing materials, is adhered to during the course of his work activities. The regulations apply to all work activities and workplaces where there is a risk of people inhaling asbestos dust.

CONTRACTOR'S SAFETY STATEMENT

The Contractor shall be required to provide a Safety Statement setting out his policies as to site safety practices and related matters, all as required by the Safety, Health and Welfare at Work Act, 2005 and the Safety, Health and Welfare Construction Regulations, 2013. A satisfactory statement must be submitted before signature of the Contract Documents.

PROTECTION OF ADJOINING WORK AND STRUCTURES

The Contractor shall take all reasonable precautions to protect adjoining work from damage during all demolition work and provide temporary screens and coverings as required. He shall protect adjoining structures from damage and provide adequate support at each stage of demolition. He shall not disturb adjoining structures or their foundations unless otherwise instructed. He shall report any defects exposed or becoming apparent in adjoining property as the demolition progresses. In addition, he shall repair any damage caused to adjoining property by demolition work and bear all costs arising.

The Contractor shall notify the Client's Representative of Ordnance Survey marks found on structures scheduled for demolition. He shall not remove or destroy such marks unless instructed to do so.

PARTLY DEMOLISHED STRUCTURES

The Contractor shall leave partly demolished structures in a stable condition, with adequately temporary support at each stage to prevent risk of uncontrolled collapse. Debris is to be prevented from overloading scaffolding and access for unauthorised persons shall be prevented.

The design of temporary support systems shall be carried out in accordance with BS 5975:2008+A1 2011; Code of Practice for Temporary Works Procedures and the Permissible Stress Design of Falsework.

Workmanship shall be in accordance with the design brief and in accordance with The Safety, Health and Welfare at Work (Construction) Regulations, 2013 (S.I. No. 291 of 2013) and The Health and Safety Executive Guidance Note GS51.

The Contractor shall ensure that partly demolished structures are left safe outside working hours.

SERVICES

The Contractor shall make adequate provision for the protection of any services in or adjacent to the demolition works; any work carried out to or which affects new or existing services must be in accordance with the bylaws or regulations of the relevant statutory authority. The Contractor is to carry out his own tests to ensure all existing services are removed prior to commencement of demolition.

The Contractor shall provide as necessary to maintain continuity of services to occupied areas of the same and adjoining properties. A minimum period of notice of 72 hours shall be given to occupiers if shutdown is necessary during changeover.

MATERIALS, PROPERTY OF CONTRACTOR

Materials and debris arising from site clearance and demolition work shall become the property of the Contractor unless specified otherwise. He shall remove from the site all materials and debris.

Brick, stone and concrete rubble or other hand materials arising from demolition work may be reused as hardcore subject to compliance with this Specification.

MATERIALS, PROPERTY OF EMPLOYER

During demolition work, the Contractor shall take down and remove to store the materials as listed in the attached schedule. He shall load and remove from the site materials which shall remain the Employer's property. All materials shall be removed to a licensed tip in accordance with Local Authority disposal requirements.

WATCHING AND LIGHTING

The Contractor shall provide for all necessary watching and artificial lighting and everything necessary by day and night for the due protection and security of the works and the public. At least one competent watchman must be on duty during all non-working hours from the commencement to the completion of the Contract.

REMOVAL OF WASTE FROM SITE

Requirement for the removal of waste material from site

Waste removal from site must be carried out in strict accordance with all of the requirements of the Waste Management Act (1996) as amended and subsequent Regulations.

In accordance with Council Decision 2003/33/EC and Directive 1999/31/EC, all waste materials designated for offsite disposal should be classified according to the following criteria; C&D material, inert, non-hazardous or hazardous. Waste classification is a

multi-stage process involving the assessment of hazardous properties, assignment of list of waste codes, and identifying whether a waste is hazardous or not (EA, 2014).

Once the material designated for offsite disposal has been classified, the waste material should be transported by a suitably permitted / licenced haulier. Hauliers engaged for the removal of waste material from site must comply adhering to the conditions imposed on their permits and licences. The waste material should be disposed of to a suitably permitted / licenced waste disposal facility. The waste disposal facility used must possess the requisite authorisations and be compliant with the conditions imposed on their certificate / licences.

Details of the approved waste haulage contractors and their waste collection permits and a copy of the waste collection and facility permits should be included in a site-specific Waste Management Plan.

All necessary waste management documentation should be completed in advance of each load of waste materials leaving the site including chain of custody documentation and the completion of the Waste Transfer Form (WTF) where required.

Records pertaining to waste management should be maintained and include the following information:

- The types (including EWC codes) and quantities of all wastes to be removed from the site.
- The names and waste collection permit reference numbers of the agent and transporters of waste leaving the site.
- The quantity of each waste load removed from the site and its classification and disposal facility including permit/licence reference numbers.
- Records of waste disposal e.g. gate dockets.

SECTION 3.0 EARTHWORKS

3.1 Excavation Work

3.1.1 Standards

The primary standards applying are as set out below:

BS 1377 (all parts)	Methods of test for soils for civil engineering purposes (All parts)
BS 3969:1998+A1:2013	Recommendations for Turf for General Purposes
IS EN 206-1:2002 & NA to IS EN 206-1:2002+A2:2010	Concrete - Part 1: Specification, Performance, Production and Conformity (Including Irish National Annex)
IS EN 1997-1:2005/COR:2009	Eurocode 7: Geotechnical Design - Part 1: General Rules (Including Irish National Annex)
IS EN 1997-2:2007/COR:2010	Eurocode 7 - Geotechnical Design - Part 2: Ground Investigation and Testing
IS EN 10223-2:2012	Steel Wire and Wire Products for Fencing and Netting - Part 2: Hexagonal Steel Wire Netting for Agricultural, Insulation and Fencing Purposes
IS EN 13242:2013	Aggregates for Unbound and Hydraulically Bound Materials for Use in Civil Specialist Designer Work and Road Construction
SR 21:2014	Guidance on the Use of IS EN 13242:2013 - Aggregates for Unbound and Hydraulically Bound Materials for Use in Civil Specialist Designer Work and Road Construction

3.1.2 Definitions

The definition of soils and rocks shall be as described in BS 5930.

“Solid Rock” shall mean rock in natural ledges or masses, which can be moved only by blasting, by pneumatic or hydraulic tools or similar equipment, or by wedges and sledge hammers. All solid boulders or detached pieces of rock exceeding 0.3 cu.m. in size in trenches or 0.6 cu.m. in general excavation shall be regarded as solid rock.

“Topsoil” shall mean soil capable of supporting plant growth.

3.1.3 General

The Building Works Contract will include topsoil stripping, disposal and partial stockpiling for reuse, excavation and filling works and placing of imported rockfill in floors and paved areas.

All excavation work to be carried out in accordance with the Health and Safety Authority Guidance on Safe Excavation. Any excavations on site are to be regularly inspected and AF3 forms completed and maintained on file by the contractor for inspection.

3.1.4 Site Conditions

The results of the Site Investigations are available to the Contractor.

3.1.5 Topsoil Excavation

Excavate all topsoil from the area indicated to be developed.

Stockpile in temporary spoil heaps where directed by the Engineer. Keep separate from other materials. Remove surplus material from site.

3.1.6 General Excavation

Excavate to the dimensions, levels, lines and profiles shown on the drawings.

Level and consolidate the bottoms of excavations in earth.

Trim bottoms of excavations in rock.

Excavate the last 75 mm of earth above formation level immediately before overlying construction is commenced.

Reinstate to formation level with approved filling, surfaces of excavation, which have been rendered unsuitable during the programme of works.

Any additional excavation required for working space, or to accommodate the temporary support of sides of excavations shall be provided and backfilled at the Contractor's expense.

Backfill unauthorised or excess excavations or excess excavations with approved filling at no expense to the Employer.

Explosives

The use of explosives shall not be permitted.

Planking and Strutting

Support sides of excavations as necessary and in accordance with statutory requirements, at no additional expense to the Employer.

3.1.7 Management and Disposal of Surface Water

Keep excavations as free from water as possible.

Prevent silt from entering the permanent drainage system when disposing of water from excavation.

3.1.8 Disposal of Materials

Remove surplus excavated materials from the site, and dispose of in an approved and licenced tip.

Materials being removed from the site to licenced disposal sites shall be transported by licenced hauliers.

The Contractor shall prepare a Waste Management Plan for the construction stage in accordance with this Specification and the conditions attached to the Planning Permissions.

3.1.9 Underground Services and Structures

Notify the Engineer and Teagasc Solohead Farm and obtain instructions when underground services other than those shown on the drawings are encountered. Excavate by hand until services shown on drawings are located.

Remove disused drains encountered during excavation work.

Remove disused underground structures encountered during excavation works to 250 mm below formation level.

Remove foundations encountered during excavation work.

3.1.10 Notice

Notify the Engineer when the excavations are ready for inspection and obtain his approval before proceeding with construction. No claims for delay arising from this requirement will be entertained provided that approval is given within five days of receipt of notice.

3.2 Filling Work

3.2.1 Plate Bearing Tests

On all compacted fill material, the Contractor must carry out plate bearing tests every 300m² and the results will be issued to the Engineer in a report.

3.2.2 Definitions

“Hardcore” shall mean hard stone, concrete, coarse gravel or hard broken brick, free from unsuitable filling material and capable of passing through a 100 mm diameter ring. Hardcore shall not contain pyrite. The Contractor shall provide certification that the hardcore has been independently tested in accordance with SR21;2004 and TRL447;2005 (including amendments)

“Rock Fill” shall mean granular sub base material, complying with 6F2 or Clause 804 (UGMA) of the Specification for Road Works

Should the Contractor wish to use locally sourced rockfill material, or material arising from excavations on the site he shall first of all obtain approval from the Engineer, and arrange for the carrying out of any tests as instructed by the Engineer.

“Suitable Earth Filling” shall mean material either arising from excavation or imported which is capable of being compacted as specified.

“Unsuitable Earth Filling” shall mean the following:

- Perishable material
- Material from marshes or bogs
- Logs, stumps, slurry and mud
- Material susceptible to spontaneous combustion

- Material in a frozen condition
- Clay of liquid limit exceeding 80% and/or plasticity index exceeding 55 as determined in accordance with BS 1377
- Material with a water-soluble sulphate content (as SO) in excess of 0.1%
- Materials having moisture content greater than the maximum permitted.

For cohesive soils, the permitted moisture content shall be not greater than the soils plastic limit multiplied by 1.1.

The Contractor shall include in his rates and prices for breaking up existing excavated rock or concrete, selecting suitable material, safeguarding it from deterioration due to water ingress and the effects of the weather so that the material can be used as filling in the Works. The Contractor shall also include in his rates for sampling and testing materials in order to demonstrate compliance with the Specifications.

3.2.3 Filling Work

Spread and level filling in 200 mm loose layers.

Place fill so that water may drain freely from exposed surfaces.

Reinstate compacted fill where damaged during the progress of the Works.
Spread and level rock fill and hard-core in layers of not more than 200 mm loose depth.

Backfill foundation trenches and isolated footings with Clause 6F2 or Clause 804 (UGMA) rockfill and compact in 200 mm layers, unless otherwise specified on drawings.

Backfill excavations wider than required with Clause 804 (UGMA) rock filling or other backfill specified on the drawings without expense to the Employer.

Backfill excavations deeper than required to be filled with Grade C12/15 concrete without expense to the Employer.

Under Floors

Aggregates for use under and adjacent to concrete floor and footpaths are to comply with S.R.21: Guidance on the use of I.S. EN 12620:2002 +A1 :2016 – Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.

1. Application of T.0 Struct 0/125mm

T.0 Struc Unbound Granular Fill material is recommended for use where; a) the fill material will be subject to substantial loading and /or dynamic loading, or b) the depth of fill is greater than 900 mm to the top of the subsoil.

2. Application of T.1 Struct 0/31.5 Unbound Granular Fill (Crushed Rock) or 0/40mm Gravel

T.1 Struc Unbound Granular Fill material is recommended for use where; a) the overall depth of fill to subsoil is less than 900mm. (Most rising walls are 3 blocks high in the domestic/office scenario) and b) the loading would be normal domestic/office loading.

2.1 Advantages of the use of T.1 Struc material exclusively include a) Most dwelling sites would only need one type of material, b) Less confusion in ordering and placing of material, c) Current construction methods are maintained, d) Designer/ assigned certifier makes the decision on the material to be specified based on the site/loading conditions.

3. Application of T.2 Perm 4/40mm Gas Permeable Layer

T.2 Perm 4/40mm Gas Permeable Layer: Any building where a Radon Sump is to be operational in the sub-floor including all occupied new build projects, i.e. anywhere a person might be for work, leisure or residence.

4. Application of T.3 Blind 0/4mm Blinding Layer

T.3 Blind 0/4mm Blinding Layer: For blinding the top surface of the T.2 Permeable material to ensure the radon barrier is not punctured and there is a level surface upon which to place the insulation and pour the concrete.

5. Combination of T0/1 and T2&3 materials

T 0/1 and T 2&3 materials where the site /loading conditions requires T.0 or T.1 Struc materials but also requires a gas permeable layer, (Type T.2 &T.3 material), the installation should incorporate a hybrid of the materials. This would involve the placing of a layer of the T.2 Perm material above the compacted T.0 or T.1 layer and below the blinding, where the radon extraction method can be placed. The layer should be in the order of 200mm depth.

3.2.4 Compaction Work

Compact each layer of fill until the bulk density of the material is not less than 97% of the density obtained by compacting a sample of the soil, at its in-situ moisture content, by the method specified in BS 1377 Test 12 when placed on a hard base.

Adjust the moisture content of the fill as instructed. Provide all necessary water sprinkling equipment.

Provide for the testing in accordance with Test 12, BS 1377 of compacted earth fill at the rate of one test per 100 sq.m. for each layer of fill.

Lay hard-core in 200 mm thick layers. Where noted on drawings, provide 50 mm thick blinding layer of sand or gravel. Consolidate to an even surface to the required levels and contours with a 3 tonne roller or with a mechanical punner capable of equivalent compaction. Compact hard-core with a 10 tonne roller.

Compact rock fill by not less than twelve passes of towed vibratory roller with a static load of at least 50 kg. per 25 mm of roll or an equivalent suitable roller.

When compacted, filling shall have a moisture content level within the range of 5 - 8% for gravel and not exceeding 5% for crushed stone or concrete.

3.2.5 Tolerances

All earthworks including excavation and filling works shall be carried out to a tolerance of +20mm and – 30mm from the true levels.

SECTION 4.0 CONCRETE WORKS

4.1 General

This section should be read in conjunction with DEPARTMENT OF AGRICULTURE FOOD AND THE MARINE S. 101 July 2016 MINIMUM SPECIFICATIONS FOR THE STRUCTURE OF AGRICULTURAL BUILDINGS and S.100 MINIMUM SPECIFICATION FOR CONCRETE COMPOSITION USED IN AGRICULTURAL STRUCTURES. Grades on concrete for the various elements must meet these minimum requirements.

Unless otherwise described in the Contract, concrete shall be a designed mix for either ordinary structural concrete or special structural concrete. The mixes for the Contract are given in Table 5/1. Ordinary structural concrete shall contain only cement, GGBS aggregates, water and an approved admixture.

The Contractor shall select the mix proportions and, unless otherwise specified, the workability in order to satisfy the strength and other requirements of the Contract. The concrete works to be carried out include:-

- Building Foundations
- Ground floors
- Dungstead walls and floor
- Concrete hardstanding
- Miscellaneous access chambers, footings and concrete surrounds and protection

4.2 Standards

IS EN 206-1	Concrete. Specification, performance, production & conformity
IS EN 15167	Ground granulated blast furnace slag for use in concrete
IS EN 12620	Aggregates for concrete
BS 812	Testing Aggregates
BS EN 12878	Pigments for the colouring of building materials..
BS 1305	Batch type concrete mixers
BS 1370	Low heat Portland cement
BS 1881	Methods of testing concrete
BS EN 1008	Mixing water for concrete
BS EN 13055	Lightweight aggregates for concrete
BS 4027	Specification for sulphate-resisting Portland cement
BS 4248	Supersulphated cement
BS EN 480	Admixtures for concrete, mortar and grout
BS EN 934	Admixtures for concrete, mortar and grout
BS 8500	Concrete. Method of specifying and guidance to specifier
BS EN 1992-1-1:2004	Structural use of concrete
BS EN 1997-1:2004	Code of practice for foundations

4.3 Concrete – Constituent Materials

Cement

Cement shall comply with the relevant British Standards.

The cement shall be obtained from manufacturers approved in writing by the Engineer.

Ordinary Portland Cement (OPC) shall comply with the requirements of BS EN 197.

GGBS shall comply with IS EN 15167 and be suitable for use with OPC and shall not exceed 50% by weight of the total cement.

A cement combination comprising between 25 and 50 % GGBS shall be used in all concrete, unless otherwise stated on the Drawings.

Admixtures

The quantity and method of using admixtures shall be in accordance with the manufacturers' recommendations and in all cases shall be subject to the approval of the Engineer.

The concrete shall include Sika Visocrete 10 or equivalent in order to reduce the water cement ratio to 0.45.

If required by the Engineer, the Contractor shall demonstrate the action of an admixture by means of trial mixes.

Calcium Chloride

The use of calcium chloride in any form is prohibited.

Aggregates

Aggregates shall consist of naturally occurring materials.

Concrete Grade and Class

For each grade of concrete the specified characteristic strength in N/mm² shall be as given in Table 4/1.

Minimum Cement Content and Maximum Water/Cement Ratio

The cement content shall be not less than, and the water content ratio shall be not greater than, that stated in Table 4/2.

Maximum Cement Content

The cement content shall not exceed 550 kg/m³ unless otherwise described in the Contract or agreed by the Engineer.

Table 4/1			Grades of Concrete	
Grade	Characteristic Strength (N/mm ²)			
	Cylinder		Cube	
20	16.0		20.0	
35	28.0		35.0	
37	30.0		37.0	

Table 4/2	Concrete Mixes		
Reinforced Concrete	Mix Reference		
Concrete Grade	15	35	37
Class of Concrete	C16/20	C30/35	C30/37
Minimum Cement Content (kg/m ³)	220	325	325
Maximum Aggregate Size (mm)	20	20	10
Maximum Water/Cement Ratio	0.5	0.5	0.5
Maximum Cement Content (kg/m ³)	350	550	550
Workability – Slump Class	S2	S2	S2
Rate of Sampling and Testing m ³ /sample	50	50	50

Table 43	Outline Information
Grade	Location
15	Surround to Ducts Filling Soft Spots Blinding layers
35	Structural concrete generally
35A	Structural Screeds Filling to "U" Blocks

Flakiness Index

The flakiness index (when determined by the sieve method described in BS 812) of the coarse aggregate shall not exceed 35% except when natural, uncrushed aggregates are used for concrete or grades lower than 40, when the flakiness index shall not exceed 50%. No limit is relevant to Grade 20 concrete or below.

Chloride Levels

Chloride levels shall be determined daily in accordance with BS 812 or as otherwise agreed by the Engineer.

Alkali - Silica Reaction

The Contractor shall satisfy the Engineer that the aggregate or aggregates he proposes to use for concrete do not possess potential alkali reactivity properties when used in conjunction with cement from any source of supply he proposes to use. Reference shall be made to the recommendations published in 'Alkali-Silica Reaction in Concrete' by the Institution of Engineers of Ireland and Irish Concrete Society.

Water

If water for the Works is not available from a Public supply the Engineer's approval shall be obtained regarding the source of supply and manner of its use. When required by the Engineer the Contractor shall arrange for tests of the water to be carried out in accordance with BS EN 1008.

Suitability of Proposed Mix Properties

The Contractor shall submit for the Engineer's approval, prior to the supply of any designed mix, the following information:

- (i) the nature and source of each material
- (ii) either:
 - (a) appropriate existing data as evidence of satisfactory previous performance for target mean strength, current margin, workability and water/cement ratio, or:
 - (a) full details of tests on trial mixes carried out in accordance with the foregoing.
- (iii) the quantities of each material per cubic metre of fully compacted concrete.

Any change in the source of material or in mix proportions (except changes in cement content of not more than 20 kg/cu.m) shall be subject to the Engineer's prior approval.

4.4 Delivery and Storage of Materials

Storage of Cement

Cement shall be stored in an approved dry weatherproof shed with a raised wooden floor or in a silo and shall be delivered in quantities sufficient to ensure that there is no suspension or interruption of the work of concreting at any time. If stored in sheds, each consignment shall be kept identifiable, separate and distinct.

Delivery of Aggregates

Coarse aggregate, unless otherwise agreed by the Engineer, shall be delivered to the site in separate sizes (2 sizes when the maximum size of 20 mm and 3 sizes when the maximum size is 40 mm or more).

Storage of Aggregates

All aggregates brought upon the site shall be kept free from contact with deleterious matter and shall be deposited on the site of mixing for not less than 24 hours before use to ensure adequate drainage.

Aggregates of different sizes shall be stored in different hoppers, or different stockpiles which shall be separated from each other. The type and size of all hoppers or containers for storage of different types and sizes of aggregate shall be to the approval of the Engineer. The floor of such containers shall be of concrete or other approved material having sufficient slope to ensure adequate drainage of surplus water.

The combined capacity of mixer hopper and storage containers for each type and size of aggregate shall be sufficient to hold the respective quantities required for the maximum amount of concrete which the Contractor is obliged to pour or contemplates pouring, in one continuous operation.

Supply

The Contractor shall at all times maintain on the site such quantities of aggregates as are, and are considered by the Engineer to be, sufficient to ensure continuity of the work.

4.5 Batching and Mixing Concrete

Batching

The fine aggregates, the different fractions of coarse aggregates and the cement shall be measured separately by weight and mixed in the proportions specified or permitted for the various qualities of concrete. The individual and combined gradings shall be to the satisfaction of the Engineer. The weighing and water dispensing mechanisms shall be maintained in good order. Their accuracy shall be maintained within 3% of the quantities to be weighed.

The weights of cement and each size of aggregate as indicated by the mechanisms employed shall be within a tolerance of + 2% of the respective weights per batch agreed by the Engineer. The weights of the fine and coarse aggregates shall be adjusted to allow for the free water contained in them. The water to be added to the mix shall be reduced by the quantity of free water contained in the fine and coarse aggregates, which shall be determined by the Contractor by a method approved by the Engineer immediately before mixing begins, and whenever so directed by the Engineer.

4.6 Transport and Placing

As soon as possible after mixing, the concrete shall, subject to the conditions specified, be deposited directly in the work and compacted to the satisfaction of the Engineer.

Transporting

The method of transporting and placing concrete shall be to the approval of the Engineer. Concrete shall be so transported and placed that contamination, segregation or loss of the constituent materials does not occur. All concrete shall be transported in bottom opening skips of a type and size approved by the Engineer, unless the use of chutes or pumping is permitted by the Engineer.

Placing

The Contractor shall make such modifications to the mix proportions as may be required by the Engineer in connection with pumping of concrete.

Fixing Restrictions, Metal Parts

No metal part of any device for fixing reinforcement shall remain within the concrete provided for cover to the reinforcement, unless otherwise shown on the drawings.

All formwork and reinforcement contained therein shall be clean and free from standing water, snow or ice immediately before the placing of the concrete.

Concrete shall not be placed in any part of the structure until the Engineer's approval has been received.

Lapse of Approval

If concreting is not started within 24 hours of approval being given the approval shall lapse and a fresh approval shall again be obtained from the Engineer. Concreting shall then proceed continuously over the area between construction joints.

Continuity of Concreting

Fresh concrete shall not be placed against in-situ concrete which has been in position for more than 30 minutes unless a construction joint is formed in accordance with this Specification. When in-situ concrete has been in place for 4 hours, or less, as directed by the Engineer depending upon the mix, type of cement and weather conditions, no further concrete shall be placed against it for a further 20 hours.

In order to achieve continuity of work in accordance with the requirements of this Clause, pauses for meals, changes of shift, etc. and the distributing of the concrete among the positions where work may be proceeding simultaneously shall therefore be carefully organised to ensure compliance with those requirements.

Temperature of Concrete

Concrete when deposited shall have a temperature of not less than 5° C and not more than 32° C.

Maximum Time Span between Batching and Compaction

It shall be compacted in its final position within 30 minutes of discharge from the mixer unless carried in purpose made agitators, operating continuously, when the time shall be within 2 hours of the introduction of cement to the mix and within 30 minutes of discharge from the agitator.

Deposition of Concrete

Except where otherwise agreed by the Engineer in advance, concrete shall be deposited in horizontal layers to a compacted depth not exceeding 450 mm where internal vibrators are used or 300 mm in all other cases. The spreading of concrete in the forms shall be carried out by approved means and shall in no case be assisted by the use of vibrators. However, concreting of decks shall be completed in one pass and care must be taken to avoid layering.

Unless otherwise specified, no peripheral slopes will be allowed in connection with a deposition of concrete. Where it is necessary for any reason to terminate a bed, such termination shall be against timber forms, stepped as directed by the Engineer.

Segregation

Unless otherwise agreed by the Engineer, concrete shall not be dropped into place from a height exceeding 2 metres. When trunking or chutes are used, they shall be kept clean and used in such a way as to avoid segregation. Concrete shall not be pumped or discharged through aluminium or aluminium alloy conduits.

Concreting Under Water

No concrete shall be placed in flowing water. Underwater concrete shall be placed in position by tremies, or by pipeline from the mixer. Full details of the method proposed shall be submitted in advance to the Engineer, and his approval obtained before placing shall begin.

4.7 Ready-Mixed Concrete

Ready mixed concrete shall comply with this Specification and the following special requirements.

The concrete shall be carried in purpose-made agitators, operating continuously, or truck mixers. The concrete shall be compacted and in its final position within 2 hours of the introduction of cement to the aggregate, unless a longer time is agreed by the Engineer. The time of such introduction shall be recorded on the Delivery Note, together with the weight of the constituents of each mix.

When truck-mixed concrete is used, water shall be added under supervision either at the site or at the central batching plant as agreed by the Engineer, but in no circumstances shall water be added in transit.

4.8 Compaction of Concrete

Vibrators

All concrete shall be compacted to produce a dense homogeneous mass. Unless otherwise agreed by the Engineer, it shall be compacted with the assistance of vibrators. Sufficient vibrators in serviceable condition shall be on site so that spare equipment is always available in the event of breakdowns. When required by the Engineer, concrete shall also be compacted by other means additional to those specified above, such as tamping.

Vibration

Vibration shall not be applied by way of the reinforcement. Where vibrators of the immersion type are used, contact with reinforcement and all inserts shall be avoided as far as is practicable.

A minimum of one serviceable internal vibrator shall be provided for each 3.75 cu.m. of concrete placed per hour.

Concrete shall not be subjected to vibration between 4 and 24 hours after compaction.

4.9 Compliance Testing

General

All sampling and testing of constituent materials shall be carried out in accordance with the appropriate British Standard. In particular, sampling and testing of fresh and of hardened concrete shall comply with BS 1881 unless this is at variance with this Specification.

Strength

- (i) General: Compliance with the specified characteristic strength shall be based on tests made on cubes at an age of 28 days unless there is evidence, satisfactory to the Engineer, that a particular testing regime is capable of predicting the strength of 28 days of concrete tested at an earlier age.

Unless otherwise directed by the Engineer, the rate of sampling shall be one every 50 cu.m. but not less than one sample shall be taken on each day that concrete of that grade is used.

- (ii) Testing: Two cubes shall be made from a sample taken from a randomly selected batch of concrete. Samples shall be taken at the point of discharge from the delivery vehicle.

For compliance purposes:

- (a) The average strength determined from any group of four consecutive test cubes shall exceed the specified characteristic strength by not less than 0.5 times the "current margin".

- (b) Each individual test result shall be greater than 85% of the specified characteristic strength.

The "current margin" shall be taken as two thirds of the specified characteristic strength for concrete up to Grade 15 and 15 N/mm² for concrete to Grade 20 or above, unless a smaller margin is agreed by the Engineer.

If only one cube result fails to meet the second requirement (b), then that result shall be considered to represent only the particular batch of concrete from which that cube was taken.

If the average strength of any group of four consecutive test cubes fails to meet the first requirement (a), then all the concrete in all the batches represented by all such cubes shall be deemed not to comply with the strength requirements. For the purpose of this clause the batches of concrete represented by a group of four consecutive test cubes shall include the batches from which samples were taken to make the first and the last cubes in the group of four, together with all the intervening batches.

- (iii) Special Testing: Special testing shall be used if required in the Contract.

One test cube shall be made from each of two independent representative samples taken from every batch of concrete selected for testing.

The average strength of two test cubes taken from the same batch of concrete shall exceed the specified characteristic strength, whichever is the smaller.

If the average strength of the test specimens taken to represent a given batch of concrete fails to meet the appropriate requirement, the whole of that batch of concrete represented by those specimens shall be deemed not to comply with the strength requirement of the Specification. Compliance with this requirement in respect of a given batch of concrete shall not be adduced as evidence of compliance in respect of any other batch.

Workability

The workability of the fresh concrete shall be such that the concrete is suitable for the conditions of handling and placing and that after compaction it surrounds all reinforcement and completely fills the formwork.

4.10 Concreting in Adverse Weather

No concreting shall take place in the open during storms, strong winds or heavy rains. Where such conditions occur, the Contractor is to arrange for adequate protection of the materials, plant and formwork so that the work may proceed under proper cover. The protection specified above shall be provided to the approval of the Engineer prior to commencement of placing.

Precautions during Inclement Weather

Windy Weather

During windy weather, effective protection shall be provided to prevent the cement from being blown away during the process of proportioning and mixing.

Wet Weather

During wet weather the cement shall be adequately housed.

No concreting shall be carried out during periods of continuous heavy rain.

Cold Weather

The methods used to protect concrete against rapid temperature changes and frost shall, inter alia, comprise de-frosting of the aggregates and heating of the mixing water (to a maximum of 82° C) to bring the temperature of the concrete at the mixer to between 13° C and 21° C (the smaller the quantity of the work the higher the temperature). Newly placed concrete shall be adequately housed and the housing blanketed as required by the Engineer to keep the concrete at a temperature of not less than 7° C for 7 days, with the aid, if necessary, of artificial heating. The use of accelerators or anti-freeze compounds will not be permitted.

The precautions indicated herein shall be brought into play when the air temperature in the shade falls to 3° C and, if in the opinion of the Engineer, the temperature will continue to fall. They may be dispensed with when the air temperature in the shade rises to 2° C and if in the opinion of the Engineer the temperature will continue to rise. Notwithstanding the day temperature, newly placed concrete shall be adequately protected against night frosts to the satisfaction of the Engineer.

In no case shall concreting be carried out when the air temperature is below minus 1° C except that work at a lower temperature may be permitted by the Engineer on specific massive members.

No concrete shall be placed against frozen ground or against hardened concrete or steel forms or reinforcement which the Engineer may consider to be too cold. In cases where concreting is otherwise permissible, steam jets or other approved means may be employed to overcome such difficulties.

4.11 Curing and Protection

Concrete shall be protected during the first stage of hardening from the harmful effects of sunshine, driving winds, cold, rain or running water. Very strict attention to curing shall be applied to all concrete. Curing is to be maintained uniformly. Constant moist curing shall be maintained as advised in BS EN 1992-1-1. The use of curing membranes alone, as opposed to use as a supplementary measure to moist curing, will not be permitted.

Curing in Adverse Weather Conditions

In cold or frosty weather, curing shall be achieved by covering the concrete with canvas or other suitable covers, which shall provide an air space between the concrete and the cover. The cover shall be kept moist for the period specified above and the moisture on the inside of the covers shall be prevented from freezing. The temperature of the air within 75 mm of the surface of the concrete shall not be allowed to fall below 1° C.

Curing Compounds

Aluminised curing compound shall, when applied at the appropriate rate by a mechanical sprayer, become stable and impervious to evaporation of water from the surface within 60 minutes after application.

4.12 Construction Joints

No horizontal or vertical joints shown on the drawings shall be omitted without the prior approval of the Engineer. The position and detail of any additional construction joints shall be subject to the approval of the Engineer, and shall be so arranged as to minimise the possibility of the occurrence of shrinkage cracks. Any additional reinforcement required in consequence of such additional construction joints shall be provided by the Contractor at his own expense unless payment therefor is specially sanctioned.

The upper surface of lifts of concrete shall be horizontal unless otherwise described in the Contract and if the formwork extends above the joint on the exposed face, it shall be cleaned of adhering concrete before the next lift is placed.

All construction joints shall be either horizontal or vertical; moulded bonding chases or shear keys shall be provided where shown on the drawings or instructed by the Engineer. Mass concrete under foundations may be cast in section to the full depth of the concrete, with vertical construction joints.

All costs in connection with the forming of construction joints, grout checks and vee joints shall be included in the Contractor's rates.

Where a construction joint contains a formed surface, that surface shall be roughened to expose the aggregates, care being taken to avoid damaging the aggregate and the arises of the joint. The roughened surface shall then be washed with clean water to remove loose particles.

Where sections of the work are carried out in lifts, the reinforcement projecting above the lift being cast shall be adequately supported so as to prevent movement of the bars during the casting and setting of the concrete.

Removal of Laitence and Loose Material

Whenever possible, laitence and all loose material shall be removed whilst the concrete is still green, great care being taken not to damage the underlying mass, and no further roughening shall then be required. Where this is not possible, it shall be removed by mechanical means provided the concrete has been in position for more than 12 hours, great care being taken to avoid breaking the arises of the joint face.

Preparation for Concrete

Immediately before fresh concrete is deposited against a construction joint, the exposed surface shall be cleaned of foreign matter by wire brushing if necessary and shall then be thoroughly washed with clean fresh water, the surplus being blown off.

Compaction

In order to ensure that the fresh concrete is thoroughly compacted and worked against the existing concrete, the compacting tools, and vibrators where appropriate, shall be worked right up to the old faces and into angles and corners formed between them and the forms and the damping effect of vibration in such positions shall be allowed for.

Chamfers and Nosings

All exposed arises shall be chamfered or given a radius to the extent shown on the drawings or specified by the Engineer, all internal and external sharp edges and corners shall be chamfered to not less than 25 mm x 25 mm. The cost of this work shall be included in the rates for concrete.

Sequence of Pours and Construction

The size and sequence of pours shall be arranged in such a manner as to minimise internal and external restraint and associated thermal and shrinkage cracking.

The limit of individual pours, location of joints and height of lifts shall be subject to the approval of the Engineer.

4.13 Power Floated Floor Slab

Place the floor slab concrete directly where it is needed, in accordance with drawings. Concrete shall be well compacted with a poker vibrator and tamped. Compact and bring the concrete to its final level with a double beam vibrator or other approved means.

Before power floating, any excess water from the concrete surface shall be removed. The concrete surface shall be brought to a smooth finish by power floating and trowelling and the workability of the concrete shall be such as to avoid excessive surface laitence. Initial sample trial of the finish shall be made until the required finish is obtained and approved by the Engineer.

4.14 Method Statement

Detailed methods shall be set out by the Contractor in his method statements and shall be to the approval of the Engineer. Unless otherwise specified, joints shall be located at pre-determined places, either where shown on the drawings or appropriate to size of pour, continuity or otherwise of reinforcement, etc. Construction shall generally proceed progressively from one end to the other of a structure.

4.15 Formwork and Surface Finish for Structures

Design and Construction Generally

Formwork

The design, erection and removal of formwork shall be the responsibility of the Contractor. All forms shall be aligned to a tolerance of 6 mm. The same type of plywood shall be used to form similar exposed areas.

Formwork Design

The formwork shall produce hardened concrete to the tolerances, levels and finishes specified and withstand the worst combination of loads during construction.

Formwork Details

Provide the following formwork details prior to fabrication.

1. All details including drawings, design calculations and relevant brochures of the proposed formwork and falsework systems. These details to be submitted for approval 28 days prior to commencement of formwork.
2. Any other details requested by the Engineer.

Metal Parts

No metal part of any device for locating formwork shall remain within concrete provided as cover to the reinforcement.

Removable Through Fixings

Removable through fixings shall be extracted without damage to the concrete and the holes rounded with concrete Grade 35A to match the surrounding concrete finishes flush with it.

Formwork Support

The Contractor must satisfy the Engineer that his method of supporting the formwork is adequate to prevent excessive stress or movement.

Formwork Striking

Design and construct the formwork so that striking will not subject the structure to shock, overloading or damage.

4.16 Formed Surfaces – Classes of Finish

The requirements extra to those given in the foregoing Clauses of this Specification to provide the class of finish described in the Contract shall be:

- (i) Class F1 No extra requirement.
- (ii) Class F2 The irregularities in the finish shall be no greater than those obtained from the use of wrought thicknesses square edged boards arranged in a uniform pattern. The finish is intended to be left as struck but imperfections such as fins and surface discolouration shall be made good by methods approved by the Engineer.
- (iii) Class F3 The formwork shall be lined with a material approved by the Engineer to provide a smooth uniform texture and appearance. This material shall leave no strain on the concrete and shall be so joined and fixed to its backing that it imparts no blemishes. It shall be of the same type and obtained from only one source throughout any one structure. The Contractor shall make good any imperfections in the finish as required by the Engineer. Internal ties and embedded metal parts will not be allowed.
- (iv) Class F4 The requirements for Class F4 are as for Class F3 except that internal ties and embedded metal formwork support will be permitted. The ties shall be positioned only in rebates or in other position as agreed by the Engineer.

Unless otherwise described in the Contract, all formwork joints for exposed surfaces of concrete shall form a regular pattern with horizontal and vertical lines continuous throughout each structure and all construction joints shall coincide with these horizontal or vertical lines.

4.17 Preparation of Formwork Before Concreting

Release Agents

The inside surfaces of forms shall, except for permanent formwork, or unless otherwise agreed by the Engineer, be coated with a release agent approved by the Engineer. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not come into contact with the reinforcement. Different release agents shall not be used in formwork to concrete which will be visible in the finished Works. If concrete is to receive an applied finish the release agent shall be compatible.

Cleaning

Before concrete is placed, the formwork shall be thoroughly cleaned and free from sawdust, shavings, dust or other debris. Temporary openings shall be provided to assist in removal of the rubbish.

Notice

The Contractor shall give 24 hours notice to the Engineer of the intention to place concrete in the forms, and concreting shall not commence until the Engineer's approval is given.

Removal of Formwork

The Engineer shall be informed in advance when the Contractor intends to strike any formwork.

Removal of formwork shall not occur until the concrete has attained a compressive strength of 10 N/mm² or twice the compressive stress to which it will be subjected whichever is the greater. In the absence of data on the compressive strength the Contractor shall in advance of the removal of any formwork provide the Engineer in writing with his proposals for minimum periods between completion of concreting and removal of formwork. These proposals shall be in accordance with Table 5.4, unless otherwise directed by the Engineer. Provided always that the minimum periods before striking are as in the table below the actual times of striking shall remain the responsibility of the Contractor.

Formwork shall be constructed so that the side forms of members can be removed without disturbing the soffit forms and, if props are to be left in place when the soffit forms are removed, these props shall not be disturbed during the striking.

All formwork shall be removed without damage to the concrete.

Where it is intended to re-use formwork it shall be thoroughly cleaned and made good to the satisfaction of the Engineer.

Periods during which the air shade temperature remains below 3° C shall not be taken into account.

Table 4/4	Minimum Period Before Striking Formwork		
	Minimum period before striking		
	16° C	7° C	t° C (any temperature between 0° C and 25° C)
Vertical formwork	12 hours	18 hours	300 hours t + 10
Soffit formwork to slabs	4 days	6 days	100 days t + 10
Props to slabs	10 days	15 days	250 days t + 10
Soffit to formwork to beams	9 days	14 days	230 days t + 10
Props to beams	14 days	21 days	360 days t + 10

4.18 Unformed Surfaces – Classes of Finish

Class U1 - The concrete shall be uniformly levelled and screeded in an approved manner by means of a steel-shod screed to produce a plain, textured or rigid surface as described in the Contract, and having a dense finish. Care shall be taken to ensure that

the surface of the concrete is properly "closed". No further work shall be applied to the surface, unless it is used as the first stage for a Class U2, Class U3 or Class U4 finish.

Class U2 - After the concrete has hardened sufficiently, the concrete Class U1 surface shall be floated by hand or machine sufficiently only to produce a uniform surface free from screed marks.

Class U3 - When the moisture film has disappeared and the concrete has hardened sufficiently, a Class U1 surface shall be steel-trowelled under firm pressure to produce a dense smooth uniform surface free from trowel marks.

Class U4 - The Class U2 surface shall be brush finished in accordance with Clause 1021 of the Specification for Road Works. The surface shall not be brushed within 150 mm of a perimeter edge.

Class U5 – After the concrete has hardened sufficiently, the concrete U1 surface shall be power floated by machine to achieve a smooth uniform "closed" surface free from screed marks. Thereafter the floor shall be shot blasted to achieve a uniform non slip textured surface. On completion of the shot blasting 2 coats of Sikafloor Proseal Pro Floor or equivalent sealer to all floors.

Remedial Treatment of Surfaces

Any remedial treatment to surfaces shall be agreed with the Engineer following inspection immediately after removing the formwork and shall be carried out without delay.

Any concrete, the surface of which has been treated before being inspected by the Engineer, shall be liable to rejection.

Samples

If the Engineer so requires, samples of formwork shall be constructed and concrete placed so that the proposed methods and finish can be demonstrated.

4.19 Steel Reinforcement for Structures

Standards

- BS 4449: Carbon steel bars for the reinforcement of concrete.
- BS 8666: Specification for scheduling, dimensioning, bending and cutting of steel reinforcement for concrete.
- BS 4482: Steel wire for the reinforcement of concrete.
- BS 4483: Steel fabric for the reinforcement of concrete.
- BS EN 1011 Recommendations for the welding of metallic materials.

4.20 Materials

Mild Steel Bars

Hot rolled mild steel plain or deformed bars shall comply with BS 4449.

High Yield Hot Rolled Deformed Bars

Hot rolled high yield steel bars shall be deformed and shall comply with BS 4449 Type 1.

Steel Fabric

Steel fabric shall comply with BS 4483.

Hard Drawn Mild Steel Wire

Hard drawn mild steel wire for concrete reinforcement shall comply with BS 4482.

Iron Tying Wire

Use annealed iron tying wire of not less than 1.6 mm diameter.

Certificates

Provide manufacturer's test certificates for all bars as requested by the Engineer.

Spacers Generally

Use ordinary spacers as necessary to support reinforcement in position. Use special spacers to support reinforcement where such are shown on the drawings and schedules.

Cover Blocks

Concrete cover blocks required for ensuring that the reinforcement is correctly positioned shall be as small as possible consistent with their purpose, of a shape acceptable to the Engineer, and designed so that they will not overturn when the concrete is placed.

Plastic Cover Spacers

Use approved plastic or mortar cover spacers for sides of beams.

Proprietary Fixings

Obtain approval for the use of proprietary fixings for reinforcement.

Proprietary Couplers

Obtain approval for the use of proprietary couplers for reinforcement.

Tolerances

The permissible deviation for cover to reinforcement shall be + 5 mm from that specified. The permissible deviation for the location of reinforcement shall be 25 mm provided the permissible deviation for cover is not exceeded.

Handling and Storing

Handle reinforcement so as not to impair its qualities or cause permanent deformation. Reinforcement to be stored clear of the ground on a clean site and with adequate protection to prevent deterioration.

Identified Storage

Store reinforcement which has been cut and bent for each portion of the Works in clearly identified and separate bundles.

Cleanliness

All reinforcement shall be free of loose mill scale, retarder, release agent, loose rust, oil, grease, release agents, mortar spillage, snow, ice and other deleterious materials at the time of placing concrete.

Rust Staining

Prevent projecting reinforcement from causing rust staining of exposed concrete surfaces.

Alternative Reinforcement

Do not use alternative reinforcement in members without approval.

4.21 Cutting and Bending

Generally

Cut and bend reinforcement in accordance with BS 8666 and the schedules provided.

Mild steel bars of large diameter may be bent at cherry red heat if so, approved by the Engineer. The bars must not be quenched but allow to cool slowly.

Cold Weather

Do not cold bend high yield reinforcement when the air shade temperature is below 5° C. Do not cold bend mild steel reinforcement when the air shade temperature is below 0° C.

Cold Worked Steel

Do not heat cold worked steel reinforcement.

Rebending

Do not rebend or remove bends from bars without approval.

4.22 Fixing

Place and fix securely all reinforcement in the position indicated on the drawings. Support top reinforcement in slabs at not more than 1.2 m centres. Fix covers spacers to maintain the specified concrete cover except where other methods are required. The supply and fixing of cover spacers and supports to maintain reinforcement in the required position are deemed to be included in the rates for reinforcement, whether specified or otherwise.

Laps

Do not, without approval, form laps in reinforcement other than those shown on the drawing.

Fixing

Fix reinforcement adequately with tying wire or proprietary fixings.

4.23 Recesses, Pockets, Inserts and Cast In Elements

The Contractor shall note and include in his rates and prices for all recesses, pockets, inserts and cast in elements shown on the Drawings.

All items to be cast in shall be assumed to be supplied by the Main Contractor unless specifically stated otherwise on the Drawings.

The Contractor shall also note the very light tolerances required for all concrete works including recesses, pockets, inserts and cast in elements particularly for the Press Pit.

4.24 Grouting

All structural steel columns and posts, all equipment support steelwork and all equipment base plates shall be grouted with non shrink cementitious grout.

The grout shall be five-star grout or similar. It shall meet the requirements of ASTM-C 1107-02 Grades A, B and C, ASTM-C 1107-7 and CRD – C 621-93 specifications for non shrink grout.

The grout shall be stored, mixed, laid and cured strictly in accordance with the manufacturer's instructions. The Contractor shall ensure that the complete space to be grouted is filled thereby avoiding any voids. The grouting method to be adopted shall be agreed with the Project Manager in advance of any grouting works.

5.0 CONCRETE BLOCKWORK

5.1 STANDARDS:

BS 12	Portland Cement
BS 1243	Metal ties for Cavity Wall Construction
BS 1199	Building Sands from Natural Sources
BS 1120	Building Sands from Natural Sources
BS 1449	Steel Plate, Sheet and Strip
BS 5628	The Structural Use of Masonry
BS 6073	Precast Concrete Masonry Units
BS 6717	Precast Concrete Paving Blocks
BS 1449	Steel Plate, Sheet and Strip Part 2 Specification for Stainless and Heat Resisting Steel.
BS 6398	Bitumen Damp Proof Courses

5.2 MATERIALS:

Concrete Blocks

Concrete blocks shall be supplied by an approved manufacturer and shall comply with BS 6073. The blocks shall be of type and size unless otherwise stated, blocks shall be solid Type A and have a density of not less than 1500 kg/cubic metre.

All blocks shall be sound and free from cracks and shall have uniform texture and clean sharp arises.

Blocks shall be blended by taking from a number of different pallets at the same time. Concrete blocks for facing work shall be similar to approved sample.

Metal Reinforcement

Metal reinforcement shall be "Exmet" or other approved strip coated in asphaltum paint.

Expanded Metal Lathing

Metal lathing shall be 22 s.w.g. bitumen coated steel.

Metal Ties

Dovetail anchors consisting of stainless steel to BS 1449, Part 2 shall be cast into dovetail cramps in the reinforced concrete columns, or shall be welded to the structural steel columns as shown on drawings. The anchors shall be provided at 450 mm vertically.

Damp Proof Courses

Damp Proof Courses shall comply with BS 743 or equal approved.

Cement

Cement shall comply with BS 12.

Wall Ties

Wall ties shall be Catnic Ref BB 3 or similar approved made with Austentic stainless steel to BS 1449, Part 2, type 304 515.

Plasticisers

Plasticisers may be permitted but are subject to the approval of the Engineer.

Sand

Sand for mortar shall comply with BS 1200. Store sand on a hard self-drained area.

Mortar

Mortar for underground block work shall be cement sand 1:3.
Elsewhere for block work mortar shall be cement, lime, sand 1:1:6 proportioned by volume.

Mortars containing cement shall be used within two hours of the addition of cement. Store premixed mortar under weatherproof conditions on a raised floor.

Mortar shall be accurately gauged and thoroughly mixed, using the minimum amount of water required for workability. It shall be made in small quantities only. All mortar shall be used within half an hour of the addition of water.

Storage of Blocks

Blocks shall be carefully unloaded and stacked on a strong reasonably level surface, cleared of all broken stone, etc., and any material which might tend to stain or damage them. Blocks shall be stacked in such a manner that air can circulate between them freely.

Any blocks that are damaged, broken, chipped, or cracked during handling or storage or do not conform to the Specification or are not equal to sample shall be removed from the works and replaced at the Contractor's expense.

5.3 LAYING BLOCKS AND BRICKS GENERALLY:

Ensure the stability of blockwork and brickwork during erection. Do not lay blocks or bricks while the air temperature is below 2 degrees C. on a rising thermometer or below 5 degrees C. on a falling thermometer. Build walling in level lifts. Where waling is racked back, no part shall rise more than 1.2 m above the general level. In facing work, complete the lift in one operation and leave no work racked back at the end of each day. Cut and fit blockwork and brickwork neatly to the line and profile of parts of the structure, which the walling abuts or surrounds.

Lay solid blocks and bricks on a full bed of mortar and with bed and vertical joints fully filled to a consistent thickness.

Lay blocks and bricks for fair-faced work with the fair face in line.

Lay blocks and bricks with cross-joints in any course not less than one quarter of the length of the unit from those in the course below. Bats shall be used only where required to obtain bond.

Leave toothing to provide for the bonding of future work. Weather tops of projections with mortar.

Form toothing in existing work to provide adequate bond for new work.

Build a honeycomb sleeper wall with 25% of the area of such walls open.

Form ducts, channels and openings in walling as the work proceeds.

Keep dry each lift of facing blockwork and facing brickwork including the top surfaces until the commencement of the next lift or other superimposed work.

5.4 CAVITY WALLS:

Keep cavities and ties free from mortar and debris.

Close tops of cavities with two courses of asbestos cement slates breaking joint where the cavity is spanned by in-situ concrete or where the construction over required grouting, unless otherwise shown on arch drawings.

Where rising walls are not of solid construction, fill the cavity to the level of the adjacent finished ground or paving level with concrete, Grade 15.

Form weep holes at intervals not exceeding 450c/c in vertical joints at the base of the cavity.

Set wall ties in mortar joints to a depth not less than 50 mm in each leaf.

Space wall ties in cavity walls at 750 mm centres horizontally, and 450 mm centres vertically.

Provide wall ties at openings at centres not exceeding 225 mm vertically.

Form solid jambs to openings using cavity closer blocks built in as the opening is formed with case on nibs equal to the width of the cavity.

Blockwork joint at jamb on openings will be closed by window or door frames only.

Build in cavity insulation as the wall is formed in accordance with the manufacturers' written instructions.

5.5 REINFORCEMENT AND BUILT-IN COMPONENTS:

Reinforcement shall have a minimum of 30 mm cover of mortar from any exposed external face.

Built in sills, lintels, copings, padstones and other components in mortar similar to that in the adjacent walls.

Where one-piece windowsills are used, bed ends only and point horizontal joint for the full length of the sill with mortar to a depth of 20 mm.

5.6 FINISHING OF BLOCKWORK AND BRICKWORK JOINTS:

Strike off surplus mortar and leave neat joints. Joints shall be 10 mm thick.

Provide a weathered finish to joints in external walling, and a concrete finish to joints in internal walling, and a concave finish in joints in internal walling, still green unless otherwise specified.

Rake out joints, which are to be pointed to a depth of 20 mm before the mortar has hardened.

Mortarboards shall have two adjacent vertical sides about 150 mm high, one which should face the wall being built to minimise splashing. Scaffolding planks should be kept at least 25 mm from the face of the work, and should be turned back at night and in rain, to prevent splashing. The top of all work should be protected with felt or polythene on the completion of the day's work and during inclement weather. Where cast in-situ concrete or plaster has to be executed to facework or where fair face blockwork is specified, it is imperative that the works are protected to prevent splashing.

5.7 WORKMANSHIP:

Slated D.P.C.

Lay two courses of slates breaking joint, as a damp proof course for the full width of the wall or for the full width of each leaf of a cavity wall. Lay each course on a full bed of mortar.

Flexible D.P.C.

Lay flexible damp proof course in a continuous strip on a full bed of mortar for the full width of the wall or for the full width of each leaf in a cavity wall. Lay 150 mm at joining and the full width of angles and junctions.

D.P.C. to Base of Walls

Provide a damp proof course at the base of external walls not less than 150 mm above the adjacent finished level of external ground or paving.

5. MOVEMENT JOINTS:

Materials

Two-part polysulphide sealing compounds shall comply with B.S. 4254.

Workmanship

Build in joint fillers as the work proceeds.

Fill movement joints with mortar.

Rake out mortar to the required depth and seal with sealing compound in accordance manufacturers' written instructions.

SECTION 6.0 STRUCTURAL STEELWORK

6.1 Standards

This section should be read in conjunction with DEPARTMENT OF AGRICULTURE FOOD AND THE MARINE S. 101 July 2016 MINIMUM SPECIFICATIONS FOR THE STRUCTURE OF AGRICULTURAL BUILDINGS.

This Specification is based on the harmonised European Technical Standards. (i.e. Eurocodes). Where British Standards have been called up in this Specification, they will apply as long as the Basic Eurocode and respective National Annex Document has not yet been published.

As soon as a National Annex Document has been published or a formal acceptance of the Basic Eurocode without the need for a National Annex Document has been made, it shall take precedence over the document referenced in this specification, which it replaces. It shall therefore, even if not called up, be deemed to be part of this specification.

BS 4:2005	Hot-rolled Structural Steel Sections
BS EN ISO 2560:2005	Welding consumables. Covered electrodes for manual arc welding of non-alloy and fine grain steels. Classification.
BS EN ISO 9015-1:2011	Destructive tests on welds in metallic materials. Hardness testing. Hardness test on arc welded joints.
BS EN ISO 9015-1:2011	Destructive tests on welds in metallic materials. Hardness testing. Micro hardness testing of welded joints.
BS EN ISO 9017	Destructive tests on welds in metallic materials. Fracture Tests
BS EN ISO 1461:2009	Hot Dip Galvanised Coatings on fabricated Iron and Steel Articles. Specification and test methods.
BS EN ISO 17636	Radiographic examination of fusion welded butt joints in steel
BS EN ISO 636:2008	Welding consumables. Rods, wires and deposits for tungsten inert gas welding of non-alloy fine-grain steels
BS EN ISO 14343:2009	Welding consumables. Wire electrodes, wires and rods for fusion welding of stainless and heat resisting steels. Classification.
BS EN ISO 14341:2011	Welding consumables. Wire electrodes, wires and deposits for gas shielded metal arc welding of non-alloy and fine grain steels. Classification.
BS EN 10162:2003	Cold Rolled steel sections
BS 3692: 2001	ISO metric precision hexagon bolts, screws and nuts
BS EN ISO 17640:2010	Non-destructive testing of welds. Ultrasonic testing. Techniques, testing levels and assessment
BS 4190:2001	ISO metric black hexagon bolts, screws and nuts.
BS 4320 :1968	Metal washers for general engineering purposes
BS EN 7668:2010	Weldable structural steels: Anodizing of aluminium and its alloys
BS EN 10029 :2010	Hot-rolled steel plates 3mm thick or above. Tolerances on dimensions and shape.
BS EN 10025-1:2004	Hot-rolled products of structural steels. General technical

	delivery conditions.
BS EN 10025-3:2004	Hot-rolled products of structural steels. Technical delivery conditions for normalized/normalized weldable fine grain structural steels.
BS EN 10025-4:2004	Hot-rolled products of structural steels. Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels.
BS EN 14399-1:2005 BS EN 14399-2:2005.	High strength friction grip bolts and associated nuts and washers for structural engineering.
BS EN 10210-2 :2006	Hot rolled structural hollow sections of non-alloy and fine grain steels. Tolerances, dimensions and sectional properties.
BS EN 10056-1:1999	Specification for structural steel equal and unequal angles. Dimensions.
BS EN 10056-2:1993	Specification for structural steel equal and unequal angles. Tolerances on shape and dimensions.
BS EN 10210-1 :2006	Hot-finished structural hollow sections of non-alloy and fine grain steels. Technical Delivery requirements.
BS EN ISO 15614-1:2004+A2:2012	Specification and qualification of welding procedures for metallic materials. Steel and Nickel alloys.
BS EN ISO 15614-2:2005	Specification and qualification of welding procedures for metallic materials. Arc welding of aluminium and its alloys.
BS EN ISO 15614-8:2002	Specification and qualification of welding procedures for metallic materials. Welding of tube-to-tube plate joints.
BS EN ISO 14732	Welding personnel. Approval testing of welding operators.
BS EN ISO 9606-2:2004	Approved testing of welders when welding procedures approval is not required.
BS 4872-1: 1982 BS 4872-2: 1976	Approved testing of welders when welding procedure approval is not required.
BS EN 1011-1:2009	Metal arc welding of carbon and carbon manganese steels
BS ISO 12944-1:1998 BS ISO 12944-2:1998	Protective coating of iron and steel structures against corrosion.
BS EN 1993-1-3	Structural Use of Steelwork in Buildings
SIS 05 5900: 1967	Pictorial Surface Preparations Standard for painting steel surfaces
BCSA	National Structural Steelwork Specification for Building Construction.
HSA-IRL	Code of Practice for the Design and Installation of Anchors
BS EN 10131:2006	Cold-rolled uncoated and zinc or zinc-nickel electrically coated low carbon and high yield strength steel flat products for cold-forming
BS EN 10143:2006	Continuously hot-drip coated steel sheet and strip.
BS EN 10067:1997	Hot-rolled bulb flats.
BS EN ISO 14171:2010	Welding consumables. Solid wire electrodes, tubular cored electrodes and electrode-flux combinations for submerged arc welding of non-alloy and fine grain steels.
BS EN ISO 14174:2012	Welding consumables. Fluxes for submerged arc welding and electroslag welding.
BS 7668: 2004	Weldable structural steels. Hot-finished structural hollow sections in weather resistant steels.

6.2 Materials

Sections and Plates

The dimensions and tolerances of structural steel sections shall comply with BS 4: Part 1 for universal beams, columns, joists, channels and tees. The dimensions and tolerances of angles and hollow sections should comply with BS EN 10210-2:2006 and BS EN 10056-1: 1999.

Grades of Steel

Hot rolled steel plates and sections, including hollow sections shall comply with BS 7668:2004, BS EN 10029:2010 and BS EN 10025:2004, Grade S275, unless otherwise stated on drawings.

Steelwork products for use in fabrication shall be procured from a certified source. The rolling of the steelwork shall comply with the EU Construction Products Directive 89/106/EEC and other harmonised technical regulations. Hollow profiles shall be fully kilned, have the correct aluminium content, mechanical resistance, stability and be fully suitable for welding applications. Where the steelwork contractor cannot provide sufficient documentation in case of suspect steel or otherwise when requested by the Engineer, he shall be obliged to send samples for testing to an approved metallurgical laboratory at his own expense. The testing schedule shall be agreed with the Engineer and all steelwork not satisfying the testing regime shall be replaced. The costs of this and other related costs, project delays, etc. shall be borne by the Contractor.

Bolts

Bolts for structural connections general shall be high tensile bolts complying with BS 3692- 2001 Grade 8.8.

Where shown on drawings, H.S.F. G. bolts shall comply with BS EN 14399-1:2005 and BS EN 14399-2: 2005 - General Grade.

Black bolts where shown on drawings shall comply with BS 4190 - Grade 8.8.

Cold Formed Sections

The dimensions and tolerances of cold-formed steel sections shall comply with BS EN 10162:2003.

The material for cold-formed steel sections shall comply with BS EN 10131:2006 having a minimum yield strength of 200 N/sq.mm. The steel shall be hot dip zinc coated pergalvanised complying with BS EN 10143:2006 and BS EN 10346:2009. Where alternative sections to those shown on the drawings are proposed, they shall be designed in accordance with BS EN 10067:1997 and satisfy the same loading conditions.

The necessary ancillary struts, sleeves and ties recommended by the manufacturer shall be deemed to be included in the rates for the sections. Installation of these shall comply with the manufacturers' requirements.

Non-Standard Sections

Non-standard steel sections shall comply with Eurocode 3.

Open Metal Flooring and Stair Treads

Open type metals flooring and stair treads shall be supplied by an approved manufacturer. Alternative products to those called up on the drawings shall be designed and manufactured in accordance with Eurocode 3. Floor panes shall be capable of carrying a uniform loading of 4 kN/m² or a concentrated load at mid span of the span shown on the drawings of 5 kN, whichever is the more critical. Stair treads shall be manufactured to the dimensions shown on the drawings and shall be capable of carrying a concentrated load at mid span of 2.5 kN.

Handrailing

Handrailing shall be as detailed on the drawings.

Welding Electrodes

Welding electrodes for manual metal arc welding shall comply with BS ISO 2560:2005

Electrodes, wires and fluxes for the submerged arc welding of carbon steel and medium-tensile steel shall comply with BS EN 14171:2010 and BS EN ISO 14174:2012.

Filler rods and wires for gas-shielded arc welding shall comply with BS EN ISO 636:2008 and BS EN 14343:2009

6.3 Fabrication Drawings

Prior to fabrication, the Steelwork Contractor shall issue a full set of fabrication drawings for review by the Engineer. The submission which shall include a 3-Dimensional navigable visual computer model, shall be made at least two weeks in advance of the proposed fabrication date. Review by the Engineer shall not relieve the Steelwork Contractor of His contractual responsibility of ensuring that the fabrication drawings accurately convey the designers intend as detailed on the Engineer's drawings. The contractor shall confirm all dimensions of site prior to fabrication.

On completion of the Contract the Steelwork Contractor shall provide the Employer with;

- (1) One set of Paper Prints of "As Erected" drawings comprising:
 - General Arrangement Drawings
 - Fabrication Drawings (Final Construction version incorporating all revisions/amendments).
 - Fabrication Drawing Register
- (2) An electronic set in Autocad format of all documents listed in note (1) above.

6.4 Fabrication

General

The work of fabrication shall be carried out as much as possible in the shop, and shall be in accordance with the relevant requirements of this BS EN 1993-1-5:2006.

The Engineer or his representative shall have access at all reasonable times to all places where work is being carried out and shall be provided by the Contractor with the necessary facilities for inspection during fabrication.

Detailing

The Contractor shall take account of the necessity for clearance between components and requirements for pre-set on cambers.

6.5 Connections

General

Connections carried out in the fabrication shop shall, as far as possible be welded. Field connections shall be in accordance with approved detailed drawings. Connections shall be detailed to minimise the formation of pockets that would hold condensation, water or dirt. Where this is unavoidable, drainage holes shall be provided and taken into account in the design.

All post-fixed anchor bolts post-fixed into concrete shall be approved by ETA and the design and installation shall comply with ETAG (European Technical Approval Guidelines). Splicing of structural members is not permitted without the approval of the Engineer.

Flame Cutting

Flame cut by machine. Flame cut edges which will be subjected to substantial stress or which are to have weld metal deposited on them shall be reasonably free from gouges. Occasional notches or gouges not more than 3 mm deep shall be permitted. Gouge marks greater than 3 mm that remain after cutting shall be repaired by welding or grinding. Shape all re-entrant corners to a radius of at least 15 mm.

6.6 Welding

All welding shall be carried out by qualified welders, under proper supervision in accordance with BS EN 1011-1:2009 and BS EN 1011-2:2001. Automatic welding shall be used wherever possible. The work shall be properly prepared and the correct welding sequence adhered to. Working procedures shall be approved prior to commencement of fabrication.

Welds are to be continuous, except where noted, and are to be returned round any meeting face to ensure that the joint is sealed against corrosion.

The length of rack welds which shall be incorporated in the finished work shall not be less than four times the thickness of the thicker plate or 50 mm, whichever is the smaller.

Qualification of Welders

All welders shall hold an approved proficiency certificate, or approved qualification, appropriate to the class of work on which they are to be engaged. Submit a copy of proficiency certificates on request.

Where welders do not hold approved proficiency certificates, submit for approved evidence in accordance with BS EN ISO 9606 and BS 4872 of the proficiency of welders for the class of work to be carried out.

Visual Examination of Welds

All welds and adjacent surfaces shall be examined visually for absence of the following defects:

1. Cracks in the weld or adjacent surfaces.
2. Slag intrusions.
3. Porosity.
4. Lack of fusion at the edge of weld.
5. Undercut.
6. Concave weld profile.
7. Excessively convex weld bead.
8. Poor transition between weld and members welded.
9. Lack of alignment between components of joint.
10. Lack of penetration at the root of the weld.
11. Excessive penetration bead.

The Engineer reserves the right to call for the non-destructive testing of any weld by an approved specialist. The cost of such examinations shall be borne by the Contractor in any case where the examination reveals unsatisfactory workmanship.

6.7 Fabrication Tolerance

Fabrication tolerances shall be in accordance with Section 7 of the National Structural Steelwork Specification for Building Construction.

6.8 Delivery of Materials to Site

1. Each member shall be clearly identified with the identification mark and shop drawings.
2. Holding down bolts shall be delivered to site clearly identified, and made up completely
3. The Contractor shall use nylon or other approved slings to off-load the steel.
4. Bolts, nuts and washers shall be packed in separate containers according to type and size.
5. Any material damaged during transit or off-loading shall be removed immediately from site and replaced by the Contractor to the Engineer's satisfaction.

6.9 Erection

General

The work of erection shall be deemed to include:

1. The lifting, transporting and off-loading of all steel from the designated storage area on the site to the place of erection.
2. The erection of all steelwork.
3. The provision of all plant and equipment necessary for erection including in particular cranes, slings, welding equipment and electrodes, compressors, torching equipment and wrenches.

The recommendations of Section 8 of the National Structural Steelwork Specification for Building Construction shall be adhered to in the planning and erection of all structural steelwork.

Erection Procedures

At least one month before erection of any building commences, the Contractor shall submit for approval, details of his proposals for erecting the steelwork. Details shall include:

1. Names and qualifications of key personnel to be engaged.
2. The manner and sequence in which steelwork is to be erected.

The approval of such proposals by the Engineer shall not relieve the Contractor of his responsibility of ensuring that all steel is properly erected, and is stable during the various stages of erection.

The position and levelling of all steelwork and the placing of every part of the structure shall be in accordance with the approved drawings and to the satisfaction of the Engineer. No permanent bolting shall be done until proper alignment has been obtained, and no straining into position shall be allowed after the final connections are made.

Welding or flame cutting of structural members on site shall not be permitted, unless directed specifically by the Engineer.

Temporary Supports

Temporary supports such as temporary guys, braces, falsework and other elements required for the erection operation shall be determined, furnished and installed by the Steelwork Contractor. These temporary supports shall secure the steel framing, or partly assembled steel framing against dead and wind loading. The cost of such supports shall be deemed to be included in the rates.

The Contractor shall be responsible for preparing calculations and details of the aforesaid temporary works. These together with a signed Temporary Works Certificate shall be submitted to the Engineer for comments and to the PSDP for filing.

6.10 Holding Down Bolts

The Contractor shall be responsible for setting the bolts in accordance with the drawings and within the tolerance set out in Clause 9.4 of the National Structural Steelwork Specification for Building Construction.

1. +/- 5 mm centre to centre of any two bolts.
2. +/- 5 m when measured horizontally to the nearest reference line.
3. +/- 5 mm for specified projections.

The Contractor shall check the setting out of the holding down bolts immediately before erection commences.

6.11 Frame Tolerances

Frame tolerances on plan shall be as set out in Section 9 of the National Structural Steelwork Specification.

6.12 Surface Preparation and Priming

Surface Preparation`

Shot-blast to remove all traces of loose rust, grit etc. Inspect for laminations and remove by careful grinding leaving a smooth surface.

All steelwork shall be galvanised to BS EN ISO 3834.

6.13 General Corrosion Prevention

Where different metallic elements or alloys come into contact, the Contractor shall, unless specified otherwise on the Engineers' drawing, use separator pads such as neoprene pads and teflon washers.

7.0 PRECAST CONCRETE

7.1 GENERAL:

The production of the precast concrete units shall generally be in accordance with the section for Reinforcement Concrete, together with the additional items contained in this section.

The design, fabrication and erection of the precast concrete units shown on the Engineer's drawings shall comply with the requirements of BS 8110.

7.2 DESIGN:

Units shall be designed for the construction depth, live loads, finish and partition loads shown on the Engineer's drawing.

Precise length and widths of the units shall be checked on site by the Contractor. Full design calculations and detail drawings shall be submitted to the Engineer for approval prior to manufacture.

7.3 CURING:

The methods of curing and their duration shall be such that the precast unit shall remain undistorted, be free of cracks and will not cause by its shrinkage, undue racking in the structure into which it is to be built; and be such that the concrete will have satisfactory durability and strength.

7.4 MATURING:

No units shall normally be supplied until they have matured, under suitable conditions, for a period of not less than 14 days. Shorter periods may be allowed where special methods of curing or special types of cement are used. No unit shall be built into the work until it has matured for 28 days, unless otherwise agreed by the Engineer.

7.5 MARKING OF UNITS:

Each unit shall be clearly marked by indentations cast in during manufacture with:

- (i) the type of location letters and numerals as shown on the drawings.
- (ii) the date of casting
- (iii) where necessary, the way up for building in

7.6 STORAGE AND HANDLING:

Units shall be so handled, stacked, and stored, transported and fixed that no undue stress comes on any part and that they are not damaged in any way,

7.7 DIMENSIONAL TOLERANCES:

The units shall be manufactured within the tolerance set out below. Greater dimensional variations will only be tolerated if they do not:-

- (i) affect the correct assembly, performance and appearance of the building, or
- (ii) cause unacceptable variations to finishes or other work.

Concrete Units

LENGTH:	Up to 3m	+	3 mm
	3 to 4.5 m	+	5 mm
	4.5 to 6 m	+	6 mm

Additional for every subsequent 6 m + 3 mm.

CROSS SECTION: Cross sectional dimensions in each direction shall not vary by more than the following:

Up to 250 mm	+	3 mm
250 to 500 mm	+	6 mm
500 to 750 mm	+	9 mm

Additional for every subsequent 250 mm + 3 mm

STRAIGHTNESS: Units shall not deviate from the intended line by more than the following:-

Up to 3 m	+	3 mm
3 to 6 m	+	5 mm
6 to 12 m	+	6 mm

Additional for every subsequent 6 m : 3 m.

TWIST: Any corner shall not be more than the tolerance stated from the plane containing the other three corners.

Up to 0.6 wide and up to 3 m in length	3 mm
Up to 1.2 m wide and up to 6 m in length	6 mm
Over 1.2 m wide and for any length	12 mm

FLATNESS: The maximum deviation from a 1.5 m straight edge placed in any position on a nominally plane surface shall not exceed 6 mm.

Prestressed Concrete Units

The tolerances stated in (i) above for length, cross section, twist and flatness will apply until the application of the stressing force. The actual cover to all steel at any point shall not be less than the required nominal cover by more than 3 mm. After stressing, the actual camber should not exceed the predicted camber by more than 50%. The variation in chamber between closely associated units (for example, floor units laid side by side and practically

touching and receiving finish and/or topping) shall not be greater than 6 mm for units up to 4.5 in length, or 890 mm for longer units.

Rejection

Units will be rejected by the Engineer when having any of the following defects:

- (i) Broken edges, whether the reinforcement is exposed or not
- (ii) Cracks other than hair cracks
- (iii) Repairs
- (iv) Misplaced reinforcement or reinforcement showing through the surface
- (v) Honeycombing or air holes in the surface
- (vi) Winding or bowing
- (vii) Failing, in any other way, to comply with the Clauses contained herein.

Rejected units shall be replaced by Contractor at his own expense and any delay caused by the rejection shall not in any way relieve the Contractor from his responsibility with regard to completion with the period specified.

Inspection

Facilities shall be provided by the Contractor to enable the Engineer to inspect materials, manufacture and stacked units at the factory at all reasonable times.

Cutting

No units shall be cut, drilled, chased, etc. without the permission of the Engineer. All opes required for services shall be cast into the units at manufacturing stage.

Erection

Every precaution shall be taken during erection to maintain the units in their final position by adequate strutting, staying, bracing, etc., and to ensure that they are plumb, true to line and correctly positioned. Such strutting, staying, bracing, etc. shall not be removed until any grouting or in-situ concrete, to be used in bedding and jointing has fully matured. The composite plank and hollow block floor shall be temporarily propped at the third points until the joint concrete has set.

Test Cubes

Concrete used in the manufacture of the structural precast units shall be sampled and tested as specified in the reinforcement concrete section.
At least one sample per ten cubic metres shall be taken and tested.

Bedding

Units shall be bedded on in-situ beams or corbels. Care shall be taken in the construction of the bearing surfaces that the units have a true bearing over the whole of the contact surfaces.

Grouting

The prestressed concrete hollow core units shall be accurately fixed in their correct position and true to line. They shall be thoroughly cleaned and wetted immediately prior to grouting with cement and sand (1: 3).

Finish

Units to receive concrete topping or cementitious finishing screed shall have a roughened top surface

8.0 DRAINAGE AND SERVICES

GENERAL

This section should be read in conjunction with DEPARTMENT OF AGRICULTURE FOOD AND THE MARINE S. 101 July 2016 MINIMUM SPECIFICATIONS FOR THE STRUCTURE OF AGRICULTURAL BUILDINGS, S.100 MINIMUM SPECIFICATION FOR CONCRETE COMPOSITION USED IN AGRICULTURAL STRUCTURES and S.129 MINIMUM SPECIFICATION FOR FARMYARD DRAINAGE, CONCRETE YARDS AND ROADS.

This Specification shall be read in conjunction with all relevant drawings and contract documents.

'Local Authority' shall mean the representative body or department of the representative body in accordance with the Contract.

DESIGN

Standards

The primary standards applying are as set out below:

BD 31/14 (DMRB 3.5.8)	The Design of Buried Concrete Box and Portal Frame Structures NRA Design Manual for Roads and Bridges, Volume 3 Section 5 Part 8
BS 3251:1976	Specification. Indicator Plates for Fire Hydrants and Emergency Water Supplies
BS 9295:2010	Guide to the structural design of buried pipelines
BRE Digest 365:2007	Soakaway Design. 2007 Edition
CIRIA R 156:1996	Infiltration Drainage – Manual of Good Practice
IS EN 752:2008	Drain and Sewer Systems Outside Buildings
IS EN 858-1:2002 AMD 2005	Separator Systems for Light Liquids (e.g. Oil and Petrol) - Part 1: Principles of Product Design, Performance and Testing, Marking and Quality Control
IS EN 858-2:2003	Separator Systems for Light Liquids (e.g. Oil and Petrol) - Part 2: Selection of Nominal Size, Installation, Operation and Maintenance
IS EN 1295-1:1998	Structural Design of Buried Pipelines Under Various Conditions of Loading - General Requirements
IS EN 1610:1998	Construction and Testing of Drains and Sewers

Greater Dublin Regional Code of Practice for Drainage Works v6.0

Greater Dublin Strategic Drainage Study 2005

Technical Guidance Document H - Drainage and Wastewater Disposal Department of the Environment, Communities and Local Government: Building Regulations 2010

Treatment Systems for Small Communities, Business, Leisure Centres and Hotels EPA manual 1999

Recommendations for Site Development Works for Housing Areas Department of the Environment and Local Government, 1998

Minimum Performance

All drainage work is to conform to the requirements of Document H of the Building Regulations 2010 and all relevant Irish/European standards and in particular IS EN 752.

Pipes for Foul and Surface Water Sewers

Pipe material shall be in accordance with this Specification.

Backfill

Pipelines laid under roads and other paved areas where traffic may occur shall be designed in accordance with IS EN 1295-1 and BS 9295.

Pipes laid under roads, driveways, paths, shall be backfilled with approved compacted hardcore.

Manholes and Inspection Chambers

Manholes in the public domain shall be to the Local Authority specification.

Underground Tanks and Box Culverts**Flotation**

Installation of underground tanks shall be in accordance with the manufacturer's specification and the Specification for Earthworks.

Underground tanks shall be designed against flotation to the worst uplift case as outlined below:

Water level	FOS against flotation
Groundwater (higher of site investigation level or upon opening up for tank installation)	1.1
Water level at the higher of existing or finished ground level	1.0
Flood level above ground where previously recorded or indicated as a future possibility	1.0

Live and surcharge loading on tanks and culverts

All underground structures must be designed for loading from vehicles.

Tanks which are under public roads shall be designed in accordance with the NRA addendum to BD 31 and constructed in accordance with the NRA Specification for Roadworks.

Tanks which are not located in paved or trafficked areas may still occasionally be subject to surcharge from construction traffic, maintenance vehicles, agricultural vehicles or fire tenders. In addition, the tanks may be temporarily surcharged by Earthworks or Roadworks materials during future construction works or may be paved over.

Rainwater Harvesting Systems

Connections to rainwater harvesting system tanks shall be in accordance with the supplier's specification.

Pressure pipes from rainwater harvesting tanks shall be constructed in accordance with the Specification for Watermains.

Underground Static Water Storage Tanks for Fire Fighting Purposes

Where required, underground tanks for the purposes of providing water to be sized to the requirements of the Fire Officer and shall be pre-cast concrete.

Watermains or potable water supply pipes shall not be connected to underground tanks.

Access shall be provided by means of a manhole cover in accordance with this section, and by a hydrant cover in accordance with the Specification for Watermains, painted Canary Yellow.

All tanks shall be signed in accordance with BS 3251.

Access Covers

Access covers to tanks to be in accordance with this specification and in addition shall be lockable.

Attenuation Systems

Attenuation systems shall consist of parabolic arch chambers with cantilever foot. Chamber rows shall provide continuous, unobstructed internal space with no internal support systems.

Attenuation systems with a closed cell construction or other which would prevent access for inspection by CCTV camera and prevent cleaning by high pressure jetting shall not be used.

Attenuation system should be capable of treating 14l/s flow per linear metre and be designed to capture 80% TSS.

Chambers to be certified with independent verification on:

1. Long duration dead loads and:
2. Short duration live loads based on the BD31-01/BS EN 9295 design truck with consideration for impact and multiple vehicle presences.

Creep modulus data (including 10,000hr test data) for product to be submitted as part of technical submission to verify long term performance as per BS 8006-1.

Chambers shall be produced at an ISO 9001 certified manufacturing facility.

All design specifications for chambers shall be in accordance with the manufacturer's latest design manual.

The installation of chambers shall be in accordance with the manufacturer's latest installation instructions and a volume calculation must be prepared.

MATERIALS

Standards and Definitions

The primary standards applying are as set out below:

IS 6:2004	Concrete Sewer Pipes
IS 166:1972	Concrete Surface Water Pipes
IS 420:2004	Pre-Cast Concrete Manholes
IS EN 124:1994	Gully Tops and Manhole Tops for Vehicular and Pedestrian Areas - Design Requirements, Type Testing, Marking, Quality Control
IS EN 295 (all parts)	Vitrified Clay Pipes and Fittings and Pipe Joints for Drains and Sewers (All Parts)
IS EN 476:2011	General Requirements for Components Used in Drains and Sewers
IS EN 681-1:1996 Amd 2005	Elastomeric Seals - Materials Requirements for Pipe Joint Seals used in Water and Drainage Applications - Part 1: Vulcanized Rubber
IS EN 998-2:2010	Specification for Mortar for Masonry - Part 2: Masonry Mortar
NA to IS EN 998-2:2010	
IS EN 1401-1:2009	Plastics Piping Systems for Non-Pressure Underground Drainage and Sewerage - Unplasticized Poly(Vinyl Chloride) (Pvc-U) - Part 1: Specifications for Pipes, Fittings and the System
IS EN 1916:2002 Corr 2008	Concrete Pipes and Fittings, Unreinforced, Steel Fibre and Reinforced
IS EN 1917:2002 Corr 2008	Concrete Manholes and Inspection Chambers, Unreinforced, Steel Fibre and Reinforced

When any material or article is required to comply with an Irish, British or European Standard, such material or article or its container shall bear the stamp of the registered certification trade mark of the relevant Standard Authority. Alternatively, the Contractor shall obtain test certificates furnished by the supplier or manufacturer of the material or article indicating compliance with the relevant Irish, British or European Standard.

Any Irish, British or European Standard or Code of Practice referred to in the Documents relating to the Contract or any other Irish, British or European Standard or Code of Practice that may be substituted therefor shall be held to be the latest edition published 3 months prior to the last date for submission of Tender. All relevant particulars and conditions in Irish, British or European Standards or Code of Practice relating to a standard of material, quality and workmanship, shall be complied with and except as otherwise noted, all tests specified shall be conformed to. In cases where no particular specification is given for any article or material to be used under the Contract, the relevant Irish, British or European Standard or Code of Practice, where one exists, shall apply.

Minimum Performance

Sewers for Adoption

Sewers for adoption are to be in accordance with the requirements of the adopting Authority.

Pipes for Foul and Surface Water Sewers***Pipes for Foul and Surface Water Sewers (less than 150 mm diameter)***

Unless otherwise stated pipe sizes specified on the drawings to be less than 150 mm diameter may be laid in uPVC flexible pipes all in accordance with IS EN 1401-1.

Pipes for Foul Sewers (over 150 mm diameter)

Unless otherwise stated all pipes over 150 mm are to be in concrete. Concrete pipes for sewers shall be flexible spigot and socket type conforming with IS EN 1916 and incorporating rubber rings to the requirements of IS EN 681-1.

Pipes for Surface Water Sewers (over 150 mm diameter)

Unless otherwise stated all pipes over 150 mm are to be in concrete. Concrete surface water pipes to IS 166, IS EN 1916 and IS 6.

Concrete Ogee Pipes

Concrete ogee pipes shall be in accordance with IS EN 1916 and IS 6.

Typical Backfill Material***Type A***

Shall be free draining 13 mm single size washed gravel chippings (Min. size 10 mm, Max. size 20 mm).

Type B

Shall be fine material which may be selected from excavated material or imported, as required, from which all clay lumps in excess of 75mm, stones in excess of 25mm and vegetable matter have been removed.

This material must be readily compactable.

Wet or plastic clay may not be used.

Hardcore

Shall be as defined in the Specification for Earthworks

Manholes, Chambers, Frames and Gullies***Manholes***

Precast manholes shall comply with the requirements of IS 420 and IS EN 1917.

Blockwork Manholes and Chambers

Mortar to be strength class M12 in accordance with IS EN 998-2.

Manhole Covers and Frames

Shall be cast iron to comply with IS EN 124. Minimum clear opening 600mm diameter.

Class D400 manhole covers and frames to be used in all areas to which vehicles have access. In all other areas Class C250 covers and frames to be used.

All Class D400 manholes are to have an anti-rocking device and to be sealed.

Manhole covers in paved areas shall be recessed type covers with infill to match the surrounding paving, in accordance with the Architects specifications.

Road Gullies

Road gullies shall be pre-cast in accordance with Local Authorities specifications with grate, trap, cleaning eye, (overall weight approximately 114 kg) and shall be lockable, and close with-traffic.

Interceptor Traps

Interceptor traps to be vitrified clay complying with the requirements of IS EN 295 or equivalent standard. Crushing strengths shall be in accordance with class number 160 and 200 of IS EN 295.

Armstrong Junctions

Armstrong junctions shall be uPVC with required number of inlets to suit pipe runs

Covers in paved areas shall be recessed type covers with infill to match the surrounding paving, in accordance with the Architects specifications.

Special fittings and equipment

Flow Control Devices

Vortex Flow controls must be fully stainless steel and be accompanied by the manufacturer's flow curves. The units must have a drain down feature for instances when the unit becomes blocked.

Leaf Filters

Leaf filters to Rain Water Harvesting Tanks shall be in accordance with the Mechanical and Electrical Specification.

Designed or Ready Mixed Concrete

Where required in this specification, concrete mixes with a specified strength shall be in accordance with the Specification for Concrete.

Concrete Standardised Prescribed Mixes

Where required in this specification, concrete standardised prescribed mixes ST1 to ST4 shall comply with the requirements of Annex NB of the National Annex to IS EN 206-1.

TESTING

Testing of Materials

At the commencement of the Contract, the Contractor shall establish the nature and extent of preliminary tests required on materials before bulk orders are placed. A schedule of these tests shall be provided to the Employer's Representative.

The Contractor shall submit such samples as are necessary for testing purposes to a laboratory. A copy of the test results shall be provided to the Employer's Representative.

Notwithstanding the results of any preliminary tests, the Employer's Representative reserves the right to instruct the Contractor at any time to have tests carried out during the progress of the works either at site or in a nominated laboratory.

The costs of all unsatisfactory tests and all tests of materials in respect of alternative sources of supply shall be the responsibility of the Contractor.

All sampling and testing of constituent materials shall be carried out in accordance with the procedures laid down in relevant Irish/British/European Standards.

Testing of Pipelines

Water Test

Pipes shall be tested for a minimum of 30 minutes under a head not less than 900mm over crown at high point and not more than 2400mm over crown at low point. Any defective work shall be made good or replaced and test repeated until pipe line is proved watertight and the test recorded.

Air Test

Air shall be pumped into the section of sewer under test until a pressure of 100mm is indicated on a U-Tube connected to the system. The air pressure shall not fall to less than 75mm head of water during a period of 5 minutes, without pumping, after a period of requisite stabilisation. Failure to pass the Air Test is not conclusive and, when failure does occur, a water test shall be carried out.

Infiltration Test for Manholes

Manholes shall be tested for infiltration of ground water.

Unsatisfactory Test Results

In the event of unsatisfactory test results being obtained the Employer's Representative reserves the right to reject the works represented thereby and/or to instruct the Contractor to:-

1. Cut or remove from the finished work samples of materials for testing.
2. Apply tests to the suspected defective elements, to a test specification prepared by the Employer's Representative.
3. Make such other tests as may be determined by and acceptable to the Employer's Representative.

The Contractor shall carry out such tests expeditiously and shall be responsible for the costs thereof and for any delays incurred.

Remedial works are to be approved by Employee's Representative

WORKMANSHIP

Standards and Definitions

The primary standards applying are as set out below:

IS EN 1610:1998

Construction and Testing of Drains and Sewers

Technical Guidance Document H -
Drainage and Wastewater
Disposal

Department of the Environment,
Communities and Local Government
Building Regulations 2010

Sewers for Adoption

Sewers for adoption are to be constructed in accordance with the requirements of the adopting Authority.

Trenches for Drainage Pipes***Excavating Trenches***

Trenches shall be excavated in straight and even lines to the widths specified.

Trench width at the position of the pipe joints may be widened to enable the pipe jointer to complete the jointing operations.

The minimum depth of the trench shall be not less than 1m.

The trench shall be excavated to the specified depth below the bottom of the barrel of the pipe. All hard objects such as stones, rock projections or roots shall be removed from the trench formation before placing the pipe under bed.

Dewatering of Trenches

Contractor shall provide and perform all dewatering, pumping, poling, well-pointing, etc. as is necessary to keep the trenches dry and free from water at all times and as will enable him to lay the pipelines in dry ground.

All water removed from the trenches shall be confined to proper channels and not permitted to flow across roads, pavements or footpaths and every precaution shall be taken to ensure that such water does not interfere with traffic or the public or cause any damage or injury to public or private property.

Levelling and Grading

On completion of the bulk excavation of the pipe trench, to the required line, the bottom of the trench shall be levelled by hand operation to ensure that the pipe will be properly supported.

Excess excavation under pipelines shall be filled as directed by the Specialist Designer.

Bedding and Surround to Pipes***Bedding for Flexible Pipes***

Unless noted otherwise bedding for flexible pipes is to be in accordance with Diagram 8, Document H of the Building Regulations provided the cover is a minimum of 0.9m in roads and car parks or 0.6 m in fields and gardens and is not greater than 10.0m. Where the cover falls outside these limits the pipes are to be concrete encased to a minimum of 150mm cover all round with a flexible joint at all couplers.

Granular Bedding and Side Filling to Pipes

A granular bed of approved material, Type A, shall be provided under all pipes to the following thickness:

Pipe Diameter	Minimum Thickness
100 and 150 sewers	200 depth
225, 300 and 375 sewers	200 depth

Side filling shall be placed to a level of the top of pipes in similar material to that used in beds and shall be thoroughly compacted in three layers to completely fill the space between the sides of the trench and the piping.

Concrete Bed Benching and Surround

Where a concrete bed is required under sewers, i.e. where cover to the crown of the pipe is less than 1200mm in roads and 750mm elsewhere, it shall be in Grade 20 concrete of following dimensions:

Pipe Diameter (mm)	Depth (mm)	Width (mm)
100	100	400
150	100	450
225	100	525
300	100	600
375	100	675

Bench half way up pipe and surround pipe in 150mm concrete of similar mix.

Laying Sewer Pipes

All sewer pipework to comply with Code of Practice IS EN 1610.

Sewer pipes shall be laid and jointed in accordance with manufacturer's instructions to correct line and gradient, each pipe being true to the general gradient of the section in which it is laid.

Testing Pipes

Sewers shall be tested in convenient sections by one or other of the methods described in this specification

Manholes, Frames and Gullies

Sewers for Adoption

Manholes in the public domain shall be to the Local Authority specification.

Manholes and Inspection Chambers

Manholes inside the curtilage of the development to be precast concrete manholes.

Internal dimensions to be as per the Drawings and to be approved by the Specialist Designer.

Block work manholes shall be of the following internal dimensions:

Element	Dimensions
Less than 2700mm in height	1200 x 750mm
Over 2700mm in height	1200 x 840mm
Bases	150mm thick Grade C25/30 concrete
Walls	225mm thick Grade C25/30 concrete

Roofs shall be 225mm thick Grade C25/30 concrete reinforced as indicated on the Drawings. Mortar to be in accordance with this Specification.

Inspection chambers to be a minimum of 600mm square.

Channels and Benching for Manholes

Channels shall consist of preformed channels or pipes cut to form channels. At manholes where there is a change in pipe size between the main pipe entering and that leaving the manhole, the connecting channel may be formed in Grade ST4 in situ concrete finished with 19mm cement sand (1:2) mortar with steel trowel finish. This may also apply where curved channel sections are not available.

Benching shall be in Grade C30/37 concrete finished with 19mm thick 1:2 cement sand mortar with steel trowel finish. Benching shall rise vertically from the top edge of the channel to a height not less than that of the soffit of the outlet and shall be sloped upwards to the walls at a gradient of 1 in 6.

In the case of branch drains, the benching shall be so shaped as to guide the flow of sewage in the desired direction.

Manhole Covers and Frames

In areas which are not paved, surround manhole frames with a cement:sand (1:3) collar 150mm wide x 100mm thick.

Manhole covers and frames must be adequately supported. When finalising the position and level of manhole cover in road, high density engineering bricks must be used to support the frame as necessary, particularly where manholes are likely to be subjected to heavy traffic loads.

Manhole Step Irons

Manhole step irons shall be provided in manholes deeper than 975mm. Step irons shall be provided in two vertical runs, 300mm apart centre to centre. Irons shall be 300mm apart in each run and shall be staggered vertically by 150mm.

The top rung shall be at a maximum depth of 450mm from ground level and the bottom rung shall be a maximum of 300mm above benching.

Interceptor Traps

Interceptor traps to comply with above spec. Size to match outlet pipe diameter and set into chamber wall and surrounded in concrete on exit.

Road Gullies

Road gullies shall comply with be heavy duty D400 and shall close with-traffic.

Armstrong Junctions

Armstrong junctions shall comply with the above spec and shall be set on Grade ST4 concrete 150 mm thick and surrounded in similar concrete. Provide all necessary raising pieces. Provide galvanised cast iron cover set into concrete except where noted.

uPVC Adapters

Provide all necessary uPVC adapters for jointing uPVC pipes to Armstrong junction and gulley outlets.

Cleaning Sewer System

On completion of the works, the Contractor shall carry out a CCTV survey of the drainage works to ensure that all sewers and manholes are clean and free from obstruction and damage.

9.0 TAMS - FARM BUILDING AND STRUCTURES SPECIFICATIONS

All elements to be built in accordance with the DEPARTMENT OF AGRICULTURE FOOD AND THE MARINE Specifications which are available at the link below.

<https://www.gov.ie/en/collection/65f5b-tams-farm-building-and-structures-specifications/>