

Specification

Proposed replacement of existing glasshouse
and associated works

at

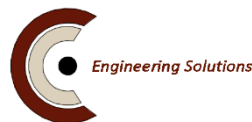
Castle, Glenveagh National Park,
Churchill, Leitir Ceannain,
Co. Dún na nGall

for

Glenveagh National Park



An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage



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Civil o Structural o Materials o Fire Engineering

Document Approval

Project	Proposed replacement of existing glasshouse and associated works	
Client & Job No.	Department of Housing Local Government and Heritage	CC26-5065
Document Title	Civil Engineering Specification	

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1.0 GENERAL CONDITIONS AND PRELIMINARIES

1.0 DESCRIPTION OF WORKS:

Refurbishment of existing glasshouse at Castle, Glenveagh N. P. comprising:

- Demolition and removal of existing glasshouse Including floor slab and drainage.
- Careful removal of stonework battlements to allow for renewal of damp-proof course and lead flashings and reinstatement ready for new gutter.
- Demolitions and excavations for new floor slab and drainage plus demolitions and preparations for outside concrete slab to cold frames
- Install new drainage and construct concrete floor slabs and yard slabs
- Preparation of existing walls and foundations to receive the new glasshouse structure.
- Erection of new glasshouse structure and glazing.
- Install and commission the automatic venting system.
- Install electrical sockets and lighting.

1.1 SEQUENCE OF WORKS, STORAGE OF MATERIALS

The proposed sequence of works is as follows but may vary depending on weather conditions. Works are likely to commence in early September 2026 and continue to end of October 2026.

1.2 EMPLOYER

Department of Housing Local Government and Heritage

1.2 LOCATION OF SITE

Castle surround, Glenveagh National Park, Churchill, Letterkenny, Co. Donegal

1.3 LOWEST TENDER

The employer does not bind himself to accept the lowest or any tender.

1.4 CONDITIONS OF CONTRACT

The Form of Contract and Conditions is the model public contract for Public Works **PW CF6** Minor Building & Civil Engineering Works Contract. The Contractor will be deemed to have examined these Conditions and to have priced the items in accordance therewith, and also to have included for all of the Conditions in the Contract Documents.

Where any statement in this document is inconsistent with a statement in the form of contract referenced above, the contents of the form of contract shall take precedence.

In order to comply with Safety, Health & Welfare at Work (Construction) Acts and Regulations current at the date of tender, contractor should take note of the following:

- (a) Include for complying with the Safety, Health and Welfare at work Acts and Regulations current at the date of tender.
- (b) The contractor shall be appointed by the client under a collateral agreement to the main contract as Project Supervisor for the Construction Stage in respect of the project pursuant to the Safety, Health & Welfare at Work (Construction) Regulations 1995. The contractor shall include all costs for the provision of the services of Project Supervisor for the Construction Stage pursuant to Regulations 6 and 7 of the regulations.
- (c) The contractor shall include for procuring that the insurance cover required to be obtained and maintained by the contractor pursuant to Clause 21 of the main contract shall provide indemnity in respect of any claim for bodily injury or property damage which the contract may incur by reason of the performance of the functions and duties of the Project Supervisor for the Construction Stage of the project.

- (d) The contractor shall include for providing all necessary information as requested by the Project Supervisor for the Construction Stage to enable the preparation and completion of the Safety File excluding drawings and specifications which shall be provided by the appropriate member of the Design Team and relevant nominated duties of the Project Supervisor for the Construction Stage of the Project.
- (e) The contractor shall include for providing assistance to the appropriate member of the Design Team (and to relevant nominated sub-contractors) in preparing "Construction" drawings for inclusion in the Safety File.

1.5 SUMMARY OF MAIN CONDITIONS

Possession of the site:	August/September 2026 (TBC)
Commencement of work:	TBC
Practical Completion:	TBC
Liquidated and ascertained Damages:	€100 per day
Period of Final Measurement:	6 months
Defects Liability Period:	12 months
Retention:	5%

The remaining particulars to be settled by agreement after receipt of tenders.

1.6 INSURANCE

The contractor shall provide public liability and employers Liability and Contractors All risk insurance in accordance with the requirements of the Conditions of Contract and as set-out in the *Invitation to Tender* and *Tender & Schedule* documents. Contractor shall provide evidence of such cover at the tender stage. In addition, the Contractor shall obtain third party all-risk insurance cover for stored materials to recover the full replacement value of these due to losses to the satisfaction of the Employers Representative.

1.7 CONTRACT AND OTHER DRAWINGS

The Contract Documents to be signed by the Contractor and the works are to be executed in strict conformance therewith and also in accordance with such further Drawings and instructions which may be issued by the Employers Representative from time to time. Further Detail Drawings will be supplied for various parts of the works and the Contractor shall obtain these Drawings before putting the works in hand.

1.7 WORK NOT DESCRIBED

Should there appear on the Drawings any work not described in the Specification, or if described therein, is not shown on the Drawings, such work shall be taken as if both shown and described and executed part of the work contracted for. In case of any discrepancy between the Drawings and Specification, the Employers Representative shall determine which shall be followed.

1.8 DESCRIPTIONS BINDING ON THE CONTRACTOR

The description of written particulars on the Drawings are to be actually binding as if contained in the Specification, and everything is to be done that is usual or necessary in completion of same on what may be reasonably implied from the Drawings and Specification. The Employers Representative shall describe those which shall be followed.

1.10 PROGRESS OF WORK

The Contractor whose tender is accepted will be required to commence work within one (1) week of being given possession of the works, to proceed continually and to complete works within the time agreed upon at the beginning of the Contract. The works shall not be deemed to be complete until certified by the Employers Representative to that effect. When the Employers Representative has certified the works to be complete, the Contractor shall hand over possession of the building to the Employer, and shall forthwith remove all tools, plant, scaffolding, surplus materials and rubbish from the site.

1.11 CONTRACTORS VISIT

Contractor's tendering must make and will be deemed to have made a thorough examination of the site, adjoining premises and property and other things affecting the proposed works, to ascertain the nature and

extent of same and the conditions under which the works will have to be executed and shall include for incidental and contingent works which they consider necessary to proceed and complete all work.

1.12 EMPLOYERS REPRESENTATIVE TO HAVE ACCESS TO WORKS

The Employers Representative shall have at all times access to the works, or the materials intended for the works whether they are in progress or in preparation and the Contractor shall provide facilities for inspection.

1.13 COMPETENT WORKMEN

None but fully competent and qualified tradesmen together with their necessary helpers and labourers shall be employed on the works and the whole shall be carried out and completed in the best and most substantial manner.

1.14 WORK NOT TO BE COVERED-UP

No work of any kind to be covered up without first being inspected and passed by the Employers Representative, and any variation therein measured by the Quantity Surveyor or Employers Representative. Work covered in contravention of this Clause must be Un-covered if so required under the Conditions set forth in the Conditions of Contract.

1.15 SUB-LETING

No portion of the works is to be sub-let without the Employers Representative's consent in writing and the parties or party appointed are to be subject to his approval.

1.16 P.C. ITEMS

Where goods are the subject of a P.C. Sum (as defined in the Conditions), such sums shall be taken to include delivery to site unless otherwise stated.

The work 'fixing' where used in connection with such goods shall be taken to include the actual fixing in position and also unloading, getting in, unpacking, storing and returning empties, carriage paid, to the merchant.

The Employers Representative reserves the right to allow the Contractor a maximum of 2.50% discount for cash where such discount is allowed by the merchant to the Contractor. In case of a greater cash discount being allowed, the Employer shall benefit by the difference.

1.17 PROVISIONAL SUMS

All provisional sums or amounts in the Specification or Bill of Quantities, whether in money or in quantity, are to be at the disposal of the Employers Representative, who may alter, add to or deduct from same as he may think fit. Differences to be adjusted at the settlement of accounts. All vouchers received by the Contractor in respect of P.C. Items or provisional sums shall be produced when called for by the Employers Representative. In case of a Contractor's inability to show to the Employers Representative's satisfaction the net amount paid by him in respect of these items, the Employers Representative shall have the power to allow such sums as he shall deem fit and his decision shall be final and binding. The Employers Representative shall retain the right of selecting the firm who shall supply, or select or approve, as he may decide, all or any of the material for which a P.C. price or provisional sum has been included.

1.18 PAYMENTS

Payments will be made from time to time during the progress of the works upon a Certificate of the Employers Representative to an extent not exceeding 95% of the works executed and fixed until the works are complete, when a further 2.5% will be paid when the Employers Representative shall think fit. In all cases at least 2.5% of the Contract amount shall be held as retention money until the maintenance period of 12 month expires and a Certificate has been issued by the Engineer that the amount so retained may be paid in accordance with the contract.

1.19 SCAFFOLDING AND PLANT

The contractor is to provide all and every kind of scaffolding, ladders, tools, hoists, machinery, rods, stakes and measuring boxes and everything else in the nature of plant and to pay all charges and carriage costs incidental or necessary thereto and to the works. The scaffolding used throughout is to be of the safest kind.

1.20 SHEDS AND LATRINES

Provide all sheds required for storage of cement and all perishable goods, provide and maintain latrines for the use of the workmen and so maintain them that they should cause no nuisance. Remove on completion and deodorize the ground affected.

1.21 NOTICES

Provide for giving all notices required to Authorities or any other person. Make all necessary application and pay all fees legally required by them.

1.22 BY-LAWS

The Contractor shall confirm to all acts passed or adopted by the Oireachtas which may in any way affect the works and shall observe all regulations and bye-laws of the Local Authority and shall indemnify the Employer against all claims or liabilities.

1.23 SETTING OUT

Allow for setting out and keeping correct the works, errors in setting out shall be put right at the Contractor's own expense.

1.25 CASING UP AND PROTECTION

Allow where necessary for casing up and protection of work by other tradesmen and make good any work which may suffer for the want of this protection.

1.26 FOREMAN

Allow for keeping on the works during the whole of the programme a competent foreman who shall be approved by the Employers Representative and who shall not be changed without the latter's consent. The foreman shall represent the Contractor and all directions given to him shall be binding as if given to the Contractor. The Contractor shall give personal supervision to the work and shall report to the Employers Representative any error or inconsistency in Drawings and Specifications. The contractor shall keep accurate measurements of excavations, concrete, etc., in accessible places and shall furnish the Quantity Surveyor with all particulars demanded.

1.27 RESPONSIBILITY

Allow for taking charge of the works from the commencement to the completion of same and to be responsible for and make good all injuries, damages and repairs occasioned or rendered necessary by cause over which the Contractor shall have control and hold the Employer harmless and indemnified against all claims on the part of such persons or their representatives. He shall also insure against all Third Party risks arising out of the execution of the works and shall hold the Employer as above against Third Party Claims.

1.29 PROTECTION FROM INCLEMENT WEATHER

Allow for this or as necessary including the covering of from walls, concrete, etc., Provide temporary screens to openings, etc., of walls, and concrete flat surfaces are to be covered with felt or tarpaulin at all times when work is not in progress and every evening after work. The felt, etc., is to be removed as may be necessary from time to time.

1.30 WATCHING AND LIGHTING

Allow for all watching and lighting during the progress of works and allow for any damage occasioned by lack of sufficient watching and lighting. All regulations of the Fire Insurance Co. are to be complied with.

1.31 ATTENDANCE

Allow for each trade attending upon all other trades.

1.32 VARIATIONS

Refer to Conditions of Contract PW CF5. Employers Representative is empowered to authorise variations to a total cumulative value of €3000.00 as noted in the Tender & Schedule.

1.33 WAGE AND PRICE VARIATIONS

Fixed Price Lump Sum Contract-

1.34 DAYWORKS

No work of any kind, except when authorized in writing by the Employers Representative and as specifically agreed with Glenveagh National Park, shall be carried out on a time and material basis. The Contractor shall in such cases be paid as outlined in the contract generally as follows:

(1) At the rates, if any, in the Schedule of Rates.

(2) When no such rates have been inserted, at the rates in the Schedule of Daywork Charges agreed between the Royal Institute of Chartered Surveyors (Republic of Ireland Branch) and the Construction Industry Federation, and approved by the Royal Institute of the Architects of Ireland.

Vouchers specifying the time for each day (and, if required by the Employers Representative, the workmen's names) and materials employed shall be delivered for verification to the Employers Representative or his authorized representative at or before the end of the week following that in which the work has been executed.

1.35 WATER SUPPLY FOR WORKS

The Contractor is to supply at all times a sufficient supply of clean, fresh water and to allow for all temporary plumbing and storage in connection therewith.

1.36 ARTIFICIAL LIGHTING

The contractor is responsible for the supply of artificial lighting for works.

1.37 MAINTENANCE

The work shall be maintained by the Contractor in perfect condition for 6 months after the issue of the Engineer's Certificate that the works are complete and any work exhibiting defects due to faulty workmanship or materials during that period shall be made good at the Contractor's own expense.

2.0 DEMOLITIONS

2.1 GENERAL REQUIREMENTS

Demolition work will include the demolition and removal of existing glasshouse building and cold frames including floor slab and drainage and miscellaneous items as requested by the Employers Representative. These works shall be co-ordinated with the Employers Representative to minimise inconvenience to the existing gardener and her staff.

The contractor shall be prepared to stop **noisy or disruptive** works **immediately** upon request of Employers Representative or Denis Lafferty NPWS where in the opinion of NPWS staff this is negatively impacting visitor experience.

2.1.1 CONDITION SURVEY [PHOTOGRAPHIC SURVEY]

Before starting demolition work, examine all available information available from building. The Contractor shall carry out a record survey of the existing stone work walls and gates, roadway and doors and shall submit a copy of any such condition survey report including a full photographic record to Employers Representative prior to commencing works.

2.1.2 METHOD STATEMENTS

Before starting demolition work, examine all available information and produce Method Statements covering:

- form, condition, and demolition methods for removal of identified elements.
- to mitigate any potentially adverse impacts on visitors and existing staff including for heavy machinery, noise, vibration, dust and removal of structure
- identification and location of services. Arrangements for disconnection and removal of services.
- arrangements for control of construction traffic to and from the site.

2.1.3 VARIATIONS TO METHODS

- Do not vary methods on site from the agreed method statement without prior approval.
- Give 14 days' notice of any proposed variation to the method statement. Minor variations may from time to time be agreed as appropriate.
- Should the work on site expose any item which either requires or makes appropriate a variation from the agreed method, notify the Employers Representative/Glenveagh National Park Representative at once. Accept responsibility for any further work in such an area before approval.
- The submission to, and scrutiny by, the Employers Representative of any programme or details of methods and any checking by the Employers Representative of the stability and safety of the structures in all stages of demolition shall not relieve the Contractor of his obligations under the Contract and his sole responsibility for the temporary works and the safety of the structure in all stages of demolition.

2.1.4 EXTENT OF DEMOLITION

Subject to the retention of features, facades, structures elements of the roof and wall cladding shall be carefully demolished as shown in the drawings.

2.1.5 GROUNDWORKS:

None anticipated

2.2 SERVICES AFFECTED BY DEMOLITION

2.2.1 SERVICES REGULATIONS

Any work carried out to or which affects new or existing services must be in accordance with the byelaws or regulations of the relevant Statutory Authority.

2.2.2 LOCATION OF SERVICES

2.2.3 Locate and mark the positions of all services affected by the work. Arrange with the Glenveagh National Park representatives for the location and marking of the positions of mains services.

2.2.4 DISCONNECTION OF DRAINS

Locate and disconnect all disused drain connections. Seal within the site to approval.

2.2.5 DRAINS IN USE

Protect gullies, vent pipes and fittings still in use and ensure that they are kept free of debris at all times. Make good any damage arising from demolition work. Leave clean and in working order at completion.

2.2.6 BYPASS CONNECTIONS

Provide as necessary to maintain continuity of services to other areas of the same property. Give a minimum 72 hours' notice to occupiers if shutdown is necessary during the changeover.

2.3 DEMOLITION WORK**2.3.1 WORKMANSHIP GENERALLY**

- Demolish structures in accordance with BS 6187:2011, Code of practice for full and partial demolition.
- Operatives must be appropriately skilled and experienced for the type of work and hold or be training to obtain relevant CITB Certificates of Competence.
- Site staff responsible for supervision and control of the work are to be experienced in the assessment of the risks involved and in the methods of demolition to be used.

2.3.2 TEMPORARY WORKS

The contractor shall:

- Design and be responsible for all temporary works at all times and at all stages including subsequent dismantling where relevant. All calculations and details in connection with the temporary works shall be submitted for comment. Allow 14 days from the date of receipt by the Employers Representative for this.
- Design temporary works in accordance with relevant Standards and Codes of Practice, particularly BS EN 12811-1 'Temporary works equipment. Part 1: Scaffolds. Performance requirements and general design' and in accordance with good practice. The design shall include foundations or other appropriate support. Accept responsibility for any inspection or opening-up required to enable the design of the temporary works to be carried out.
- Give the Employers Representative reasonable opportunity to view such inspection or opening-up.

2.3.3 GAS OR VAPOUR RISKS

Take adequate precautions to prevent fire or explosion caused by gas or vapour.

2.3.4 FLAME CUTTING

- Where flame cutting of existing metal is required, take all necessary precautions to prevent the outbreak of fire(s) or causing explosion of noxious gases from any adjacent combustible or ignitable materials such as timber, paper, paint, or adjacent gaseous or flammable liquids in pipes, tanks, contaminated ground etc.
- Remove petrol and oil storage tanks and tanks that have been used for the storage of gaseous, flammable or toxic liquids in conformity with statutory regulations.

2.3.5 DUST

Allow for any measures for the control of dust such as periodically spraying demolition works with water.

2.3.6 HEALTH HAZARDS

Proposed replacement of existing glasshouse at Glenveagh N. P.

Take adequate precautions to protect site operatives and the general public from health hazards associated with dangerous fumes and dust arising during the course of the Works.

2.3.7 ADJOINING BUILDINGS AND STRUCTURES

- When demolishing structures against adjoining property leave adequate temporary support and protection at each stage. Maintain and alter temporary supports and protection as necessary as work progresses.
- Demolish structures causing a minimum of damage to adjoining property
- leave no unnecessary or unstable projections
- make good to ensure safety, stability, weather protection and security
- Report any defects exposed or becoming apparent.
- Promptly repair any damage caused to adjoining property by demolition work.

2.3.8 PARTLY DEMOLISHED STRUCTURES

Leave in a stable condition with adequate temporary support at each stage to prevent risk of uncontrolled collapse. Keep safe outside working hours. Prevent debris from overloading the structure, scaffold platforms or other temporary works. Prevent access of unauthorised persons.

2.3.9 DANGEROUS OPENINGS

- Illuminate and protect as necessary.
- Keep safe outside working hours.

2.3.12 ASBESTOS-BASED MATERIALS

The contractor shall carry out a preliminary inspection of the entire roof and give notice to the Employers Representative immediately of any suspected asbestos-based materials discovered, which has not been previously identified. Avoid disturbing such materials until instructed to do so by the Engineers Representative.

2.3.13 UNFORESEEN HAZARDS

Notify any unrecorded tanks, chemicals etc. discovered during demolition work. Submit details of methods for safe removal, filling etc. Any work to unforeseen hazards shall not be at additional cost to the Contract.

2.3.14 SITE CONDITION AT COMPLETION

Clear away all rubbish, debris and surplus materials and leave the whole site clean and in a tidy condition.

2.4 MATERIALS ARISING

2.4.1 CONTRACTOR'S PROPERTY

Except for assets identified to be retained by Client, or to be removed by Client, components and materials arising from the demolition work are the property of the Contractor. Remove from site as work proceeds.

2.4.2 EMPLOYER'S PROPERTY

Components and materials to remain the property of the Employer:

Assets to be removed by Client.

Assets to be retained by Client

Protect until removed by the Employer, reused in the Works or at the end of the Contract.

2.4.3 RECYCLED MATERIALS

None anticipated

3.0 CONCRETE WORK

3.1 Concrete

Proposed replacement of existing glasshouse at Glenveagh N. P.

Manufactured concrete blocks shall consist of dense concrete of the specified strength made with natural aggregates and complying with the harmonised standard I.S. EN 206-1. The aggregate used in the manufacture of this concrete shall comply with the harmonised standard IS EN 12620 and the guidance for their use in Ireland provided in S.R. 16.

3.1.1 Compressive Strength

The Contractor must satisfy the Engineer that all concrete mixes have the required minimum compressive strength. The strength class of the concrete to be used in the various sections of the work shall be as stated herein and on the drawings.

3.2 Certificates

Prior to commencing any work the contractor shall supply the following documentation from the readymix concrete producer:

- (a) Mix design certificate confirming the constituents of the proposed concrete mix for each concrete strength class. The concrete mix design shall state the relevant properties of fresh and hardened concrete together with the constituents and their proportions. Concrete mixes shall be certified by a third party or shall have a documented track record indicating compliance with the strength class specified.
- (b) Certification that the concrete and **all** of the constituent aggregates used to make this concrete complies with the appropriate harmonised standards.

3.3 Verification & Testing

The contractor shall supply a certificate with each delivery stating the concrete mix type or number. The contractor shall sample and test the concrete for fresh and hardened properties in accordance with the requirements of clause 4.7 below.

3.4 Constituent Materials

3.4.1 Cement

The cement shall be Ordinary Portland Cement certified as complying with IS EN 197-1 (Cement type CEM I, CEM II or CEM III). Manufacturer's certificate of compliance with the standard shall be provided when requested by the engineer.

3.4.2 General

All aggregates shall comply with the requirements of the latest version of Series 800 of the Specification for Roadworks published by Transport Infrastructure Ireland (TII).

3.4.2.1 Fine Aggregates / Sand

Sand and fine aggregate are to be clean and sharp and from an approved pit, and shall comply with the requirements of IS EN 12620.

3.4.2.2 Coarse Aggregates / Gravel

Coarse Aggregates shall consist of natural pit gravel or crushed stone. They shall be hard, strong and durable and shall be clean and free from clay films and other adherent coatings and shall be washed if so directed. The coarse aggregate is to have a nominal maximum size of 20mm unless shown otherwise. Coarse aggregates shall conform to IS EN 12620.

3.4.2.3 Certificates & CE Marking

The contractor shall furnish the CE Mark including the Declaration of Performance for all aggregates to be used in the concrete.

3.4.4 Water

Clean fresh water shall be used and shall be free from deleterious material.

3.4.5 Admixtures

Admixtures may be used in the concrete at the contractors discretion in accordance with the manufacturer's instructions and best practice and shall comply with the requirements of or latest applicable BS EN 934-2

3.5 Concrete Mixes

The concrete mixes in the various sections of the works shall be designed mixes in accordance with BS 8500 and IS EN 206:

Mix Designation	Mix	Mix	Mix
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	"A"	"B"	"C"
Concrete Class (Cube Strength)	17/20 (20N/mm ²) Lean Mix	28/35 (35N/mm ²)	32/40 (40 N/mm ²)
Exposure class	n/a	XC2	XS1/XF4/XC4
Cement Type & Strength Class	CEM I or II 42.5 N/mm ²	CEM I or II 42.5 N/mm ²	CEM I or II 42.5 N/mm ²
Nominal Maximum Aggregate size	20	20	20
Minimum Cement Content (kg/m ³)	180	290	350
Maximum free water /cement ratio (by mass)	0.75	0.55	0.50
Consistence Class (contractor to confirm)	S4	S3	S3
Admixture	Please advise	Please advise	3.5% Air Entrainment
Placement Method (contractor to confirm)	Usually Direct	Pump	As requested

Table 3.2

Mix Classes and proposed uses

- Mix "A" Class 17/20** (Cube strength 20N/mm² at 28 days),
Proposed Use: *In-fill lean mix concrete.*
- Mix "B" Class C28/35** (Cube strength 35 N/mm² at 28 days)
Proposed Use: *finished floor slab.*
- Mix "C" Class C32/40** (Cube strength 40 N/mm² at 28 days)
Proposed Use: *Structural concrete for external yard area.*

Notes:

- If mix uses vary from that stated above the contractor shall request updated mix parameters from the Engineer.
- Depending on the selected method of placement maximum aggregate size and consistency may be varied provided that the concrete strength class is maintained as approved by the Engineer during submission of mixes, refer to clause 3.5.1 below.

3.5.1 Submission of Mixes by Contractor

Contractor shall submit to the Engineer/Architect the name of ready-mix concrete supplier and a certified concrete mix for each strength class/different mix proposed for use on the project together with the CE Mark & DoP's of the constituent aggregates, a minimum of one week prior to commencing work.

3.3 Sampling and Testing of concrete

1. The Sampling, Curing and Testing of concrete fresh or hardened shall be carried out by the contractor in accordance with IS EN 12350-1 to 6 and IS EN 12390-1 to 7.

The rate of sampling for testing shall be as follows:

Recommended minimum rate of sampling of concrete	
One Sample of concrete per	
10 cu.m	Columns and cantilevers
30 cu.m	Walls, Beams and Slabs
50 cu.m	Foundations & large slab areas

Table 3.3

2. From each sample a consistency test shall be carried out initially, air content and density tests shall also be completed as agreed with the Engineer. In addition, at least three test specimens (cubes) shall be prepared in accordance with IS EN 12350 and laboratory cured under water maintained at 20°C until tested. Test one specimen at seven (7) days in compression as a guide to strength gain of concrete. Test two (2) specimens at 28 days in compression and the average of the two tests shall be taken as the test result.

3. Testing to be performed by a qualified independent testing laboratory utilizing up to date calibrated equipment. A copy of the calibration certificate shall be forwarded to the Engineer upon request. Copies of all test reports shall be sent directly to Architect/Engineer.

3.3.1 Compliance with the Characteristic Strength, f_k

Compliance with the Characteristic strength shall be assumed if the strength determined from any test result is not less than the specified $f_k - 4 \text{ N/mm}^2$ with a minimum mean strength of $f_k + 1$ or 2 N/mm^2 of in accordance with the requirements of IS EN 206-1 unless agreed otherwise by Engineer prior to commencing work.

3.3.2 Tests on Fresh Concrete IS EN 12350

Consistence of Concrete

The consistence of concrete shall be as stated in the mix design parameters given above. The contractor shall verify that the consistency of the concrete is verified by testing of the fresh concrete on-site using one or more of the appropriate test methods presented in IS EN 12350.

Air Content of Air Entrained Concrete

The air content of air entrained concrete shall be as specified herein and in accordance with IS EN 206-1. Air entrained fresh concrete shall be tested for compliance with the specification by using one or more of the appropriate test methods presented in IS EN 12350.

Wet Density of Normal Concrete Mixes

The density of the fully compacted normally concrete shall not be less than 2350 kg/cu.m, unless otherwise stated in this specification. Wet density of the concrete shall be verified by the contractor in accordance with IS EN 12350. Wet density for other mixes such as air entrained concrete mixes shall be agreed with the supplier during mix submissions.

3.4 Joints in concrete

3.4.1 Construction Joints

Floor slabs and wall panels shall be laid in continuous pours between extremities and construction joints shall be incorporated as shown in the drawings. The surface of concrete against which new concrete is to be cast shall be free from laitance and shall be roughened to the extent that the large aggregate is exposed but not disturbed. The joint surface shall be cleaned immediately before fresh concrete is placed against it. Where practicable such preparation of horizontal and vertical joint faces shall be carried out when the concrete has set but not hardened. Dowels shall be used as shown in the drawings.

3.4.2 Contraction Joints

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Contraction joints shall be formed or cut in all sections of floor slab or wall greater than 6m in length as approved by the Engineer. Typical contraction joint details are shown in the drawings.

- (i) Partial contraction joints (PCJ) - 50% of the main reinforcing steel shall pass through the joint.
- (ii) Total Contraction Joint (TCJ) – 0% of main reinforcing steel shall pass through the joint. However Sleeved dowels are generally used across the joint for continuity.

3.4.3 Expansion Joints

Expansion joints are provided to allow for expansion movements of continuous members generally in excess of 50m in length. Typical expansion joint details are shown in the drawings.

3.4.4 Isolation Joints

Isolation joints are generally formed between certain members to prevent bonding of concrete to other surfaces and provide for relative movements. Typical isolation joint details are shown in the drawings.

3.5 Formwork

The formwork shall be of sufficient rigidity to support the concrete without deflection and shall be securely wedged and supported. Care must be taken in striking to avoid injury to the surface.

The Contractor shall be responsible for supplying, erecting, maintaining, striking and clearing away all formwork and for forming all moulds for precast work and for ensuring that it is of adequate strength and without deflection or movement when bearing load. All formwork shall receive an application of mould oil before concrete is poured.

3.6 Concrete finish

3.6.1 Formed Finish

Formed surfaces to members shall be finished as follows:

Member	Class Finish
Foundations	F1
Walls and Piers	F2
Soffits to slabs and beams	F3

Table 3.6.1

3.6.2 Unformed Finish

Unformed surfaces in floor slabs shall be finished in accordance with the requirements of EN 13670 as follows:

Ordinary Finish

The concrete shall be levelled, screeded to produce a level plain surface and then shall be floated under light pressure to eliminate surface irregularities to produce a level uniform surface.

Plain Finish

The concrete shall be levelled and screeded to produce a level plain surface and then shall be floated under light pressure to eliminate surface irregularities. When the moisture film has disappeared and the concrete has hardened sufficiently, the surface shall be hard trowelled under firm pressure to produce a dense, smooth surface free from travel marks.

Special Finish - Brush Texture

Finish is achieved by pulling a brush over the surface of the wet concrete after the surfaced has been levelled and screeded.

Unformed concrete surfaces shall be finished as follows:

Member	Class Finish to EN 13670
Finished Floor Slab	Special finish An ordinary finish with a small amount of hard trowelling without a polished finish
Outside Yard Areas	Special Finish Ordinary finish with a brush texture

Table 3.6.2**3.6.3 Edges and sharp arises**

Sharp arises are to be avoided in the exposed surfaces of the exposed columns, beams and walls. A 25mm chamfer shall be constructed on the exposed corners of all columns, beams and walls.

3.7 Placing

Concrete shall be placed from the truck by an approved method and carefully deposited into the formwork, levelled and consolidated by tamping, ramming, or mechanical vibration. The concrete shall be placed in such a way to minimize segregation of the mix and shall not be dropped nor poured from a height nor made flow in the formwork. Concrete shall be placed within 60 minutes of the truck arriving at the site or 90 minutes of water being added to mix.

Concrete shall not be placed in any part of the structure until formwork, reinforcement, inserts and water bars, means of mixing, transporting, placing and compaction have all been inspected and approved by the Employers Representative. Such approval shall be obtained 24 hours prior to concreting and sufficient time shall be allowed for the Employer's Representative to make such an inspection and order any alterations that should be made.

Unless otherwise approved by the Employers Representative, concrete shall be discharged, placed and compacted in its final position, in one operation, under the direct supervision of a competent member of the Contractor's Personnel.

The concrete shall be placed in the positions as indicated on the Drawings, in the Specification or as directed by the Employers Representative. It shall be placed in such a manner as to avoid segregation of concrete, or displacement of formwork, reinforcement, inserts or water bars. Concrete shall not be allowed to fall freely more than 1.5m unless otherwise approved by the Employer's Representative. A suitable tremie pipe shall be used in all concrete pour lifts greater than 1.5m, to deposit the concrete as close as possible to its final location. Concrete placement and compaction shall proceed continuously between approved construction joints. Concrete which has partially hardened, has been adversely affected by delay or by weather, has become contaminated or segregated, or has fallen outside the section of formwork being filled shall not be used.

The depth of lifts and size of sections to be concreted shall be determined by the Contractor and shall be subject to approval by the Employers Representative. In any case, pour sizes will be limited to a maximum of 15 metres in any direction. Pour depths will be limited to a maximum of 900mm in depth.

Concrete shall be thoroughly compacted by vibration, or other means approved by the Employers Representative, or thoroughly worked around reinforcement, inserts, water bars and corners of formwork to ensure a solid mass free of voids throughout and to achieve the required surface finish. Where vibrators are used for compaction, vibration shall be applied continuously during concrete placement and until the expulsion of air has practically ceased and in a manner which avoids segregation. All concrete shall be compacted to its final position within 30 minutes of discharge from the mixer, unless otherwise directed by the Employer's Representative. When in situ concrete has been in place for four hours, no further concrete shall be placed against it for a further twenty hours.

The contractor shall add no water in addition to that provided for in the approved concrete mix design without the agreement of the Employers Representative. In exceptional cases where it is agreed that water may be added to the concrete mix, approval if given, shall in no way remove responsibility for the concrete strength from the Contractor. In such cases the concrete to which water has been added shall be sampled and tested as noted above to verify compliance with concrete strength class requirements.

3.8 General Curing of concrete

After being placed, concrete shall not be jarred, walked on or otherwise disturbed during setting. Curing is the process of preventing loss of moisture from the concrete in its early life while maintaining a satisfactory temperature regime.

As such concrete shall be maintained damp after its initial set for a minimum period of seven days. The concrete can be maintained damp by using any of the following techniques:

- (i) Ponding or spraying water on the surface of the concrete.
- (ii) Prevention of evaporation of water from the surface of the concrete by covering with polythene or leaving formwork in-place.
- (iii) Apply an approved spray-on curing membrane. All concrete slabs and wall surfaces shall be sprayed with an approved curing membrane (90% efficiency) after final set or removal of formwork

Regarding temperature, concrete shall not be placed when its temperature is below 5°C or if its temperature exceeds 30°C. Refer to cold and hot weather concreting below for further information.

Precast concrete shall be protected similarly for a period of seven days and then stacked in the open air to cure for a further period of fourteen days before being built into position.

Cold Weather Concreting

Concrete shall be protected from inclement weather, and no concreting to be proceeded with when the temperature drops below 2°C. If the air temperature is below 2°C, or if less than 5 °C on a falling thermometer, no concrete shall be placed. Where temperature is expected to fall overnight recently placed concrete shall be protected from freezing; insulating blankets and heaters shall be supplied by the contractor. Striking of supporting concrete structures shall be delayed during cold weather to account for slow strength gain of concrete due to low temperatures.

Hot Weather Concreting

In hot weather and during high winds, freshly placed concrete must be kept watered and protected by wet hessian and polythene or other approved method for at least seven days after placing.

All concrete slabs and wall surfaces shall be sprayed with an approved curing membrane (90% efficiency) after final set or removal of formwork.

3.9 Reinforcement

Steel bars used for reinforcement shall comply with BS EN 10138 as applicable to high yield steel designation H and B with $f_y = 500\text{N/mm}^2$. In general bars designated H shall be used in RC structures not subjected to cyclic load from process equipment, while bars designated B shall be used for RC structures subjected to cyclic loading from process equipment.

Condition

Bars shall be free from all loose rust, scale, grease or oil.

Fixing

Reinforcing steel bars shall be securely tied in position as shown in the drawings so as not to deflect due concrete placement. On no account shall bars be welded.

Nominal Cover

Nominal concrete cover to reinforcing steel shall be as follows :

foundations :	60 mm top and bottom and sides
slabs	40 mm top and bottom
walls	50 mm inside face and outside face

Unless noted otherwise on the drawings.

4.0 MASONRY STONEWORK WITH LIME-BASED MORTAR & DPM

4.1 General Requirements

All works to be carried out by operatives **experienced in traditional masonry and lime mortars**. Works to follow principles of **minimum intervention, like-for-like repair**, and **reversibility** where feasible.

Protect adjacent historic fabric at all times; no abrasive cleaning, power-washing, or mechanical cutting unless approved by the Conservation Architect/Engineer.

4.2 Materials

4.2.1 Stone

Stone to match existing in **type, colour, texture, porosity, and bedding**.

Salvaged stone from site to be reused where possible.

New stone to be from an approved quarry with similar geological characteristics.

All stones to be free from defects, laminations, iron nodules, or salts.

4.2.2 Lime Binder

Use **Natural Hydraulic Lime (NHL)** or **Hot-Mixed Lime (HLM)** depending on exposure and substrate. Grades:

- **NHL 2** – sheltered elevations, internal work, soft historic stone
- **NHL 3.5** – general external work
- **NHL 5** – marine or severe exposure only

Hot-mixed lime permitted where appropriate and subject to specialist approval.

4.2.3 Aggregates

Sharp, well-graded sand complying with **IS EN 13139**.

Colour and grading to match existing mortar.

Particle size typically **0–4 mm**; coarser aggregates (up to 6 mm) may be required for rubble cores.

No recycled or contaminated aggregates.

4.2.4 Mortar Mix

Typical mix: **1 part lime : 2.5–3 parts aggregate** by volume.

For hot-mixed lime, mix proportions to follow traditional practice and project-specific testing.

No cement, plasticisers, waterproofer, or chemical additives permitted.

4.2.5 Breathable Geotextile Damp Proof Course (DPC)

Breathable geotextile DPC, e.g. polypropylene or polyester non-woven membrane) to **BS EN 13252**, compatible with lime mortar, suitable for conservation works, in a level lime based mortar bed, width 550mm, minimum lap 200 at joints. Place above and below lead DPM where in contact with lime based mortar.

4.2.6 Lead Damp proof course (DPC) & Flashings (for more detail refer to section 5.0)

Damp Proof Course & Flashings

lead sheet damp-proof course to **BS EN 12588**, code 5 (2.24 mm thick) as detailed. Lay full width of wall (min. 550 mm for 500 mm stone) on **lime-based mortar bed**, continuous across wall thickness, lapped **150 mm** at joints. Separate lead from masonry with **breathable geotextile slip layer** to prevent chemical reaction.

4.3 Preparation of Existing Masonry

Carefully rake out defective mortar **by hand only** to a depth of **2–2.5× joint width**.

Do not use angle grinders or power tools.

Remove vegetation, salts, loose material, and dust using soft brushes and wooden tools.

Pre-dampen masonry to control suction but avoid saturation.

4.4 Mortar Mixing

Use a **forced-action mixer** or drum mixer for NHL mortars.
Add water gradually to achieve a cohesive, workable mix.
Allow mortar to **rest (“fatten”) for 10–20 minutes** before use.
Use within **2–3 hours**; do not retemper.
For hot-mixed lime, follow appropriate safety and mixing procedures.

4.5 Laying and Building Stonework

Lay stones **on their natural bed** unless otherwise required.
Fully bed stones in mortar; no voids or “buttering” of edges only.
Insert **through-stones** or bonding stones at minimum **1 per m²** in rubble walls.
Maintain existing bonding patterns, coursing, and joint widths.
Avoid creating straight vertical “running joints”.

4.6 Pointing and Joint Finishing

Joint width typically **10–15 mm** unless matching existing.
Fill joints in layers, compacting each layer to avoid voids.
Final finish to match approved sample:
Flush, slightly recessed, weather-struck, or bag-rubbed depending on historic precedent.
Final brushing with a churn brush to expose aggregate and achieve breathable texture.

4.7 Curing and Protection

Protect fresh mortar from **rain, frost, wind, and direct sun** for minimum **7–10 days**.
Use breathable coverings: damp hessian, geotextile, or timber shelters.
Maintain gentle moisture to prevent rapid drying and shrinkage cracking.
Do not use polythene directly against mortar.

4.8 Cleaning

Clean stonework using **soft natural bristle brushes** and clean water only.
No acid cleaners, power-washing, or abrasive pads.
Remove mortar smears before final set.

4.9 Quality Control

Construct a **sample panel (min. 1 m²)** for approval showing:
Stone selection and dressing
Mortar colour and texture
Joint profile and finish
All work to match the approved panel.
Mortar samples may be subject to **laboratory analysis** where matching historic mortars is required.

4.10 Placement of DPC's

4.10.1 Geotextile DPC

Lay on **lime-based mortar bed**, below and above lead DPC and continuous across wall thickness, lapped **200 mm** at joints. Ensure **capillary break** between stone and backing; protect from puncture during placement. DPC to be **compatible with lime masonry**, suitable for **conservation works**.

4.10.2 Lead DPC (for more detail refer to section 5.0)

Lay full width of wall (min. 550 mm for 500 mm stone) on **lime-based mortar bed**, continuous across wall thickness, lapped **150 mm** at joints. Separate lead from masonry with **breathable geotextile slip layer** to prevent chemical reaction. DPC to be **compatible with lime masonry**, suitable for **conservation works**.

4.11 Lead Flashings (for more detail refer to section 5.0)

Installation: Dress lead flashing to external wall face on **each side to depth of 200mm**, continuous over junctions and laps. Provide **underlay (geotextile or bituminous)** beneath lead to prevent underside corrosion. Maximum flashing length **1.5 m**, laps **100 mm**, allow for thermal movement per Lead Sheet Association (LSA) guidance.

Detailing: Drip edge to project **45–55 mm** beyond wall face; stiffen by turning down **25 mm**. Ensure clear drip gap **≥ 10 mm** between underside of lead and wall face.

Final detail to be agreed with the employers representative prior to commencing the works.

4.12 Documentation

Record all interventions, including:

- Areas repointed
- Stones replaced or repaired
- Mortar mix used
- CE Marks & DoP of DPC and Lead

5.0 DAMP-PROOF COURSE & LEAD FLASHINGS

5.1 GENERAL REQUIREMENTS

All works to follow DAHG Advice Series, BS 6915, BS EN 12588, BS 8221-1, and Lead Sheet Association (LSA) guidance. Interventions must follow conservation principles: minimum intervention, breathability, compatibility, and reversibility where feasible.

All cutting into historic stone must be hand-cut only; no angle grinders or power tools.
Protect adjacent masonry from staining, vibration, and mechanical damage.

Remove battlements intact by wrapping with wrapping plastic and cable ties. Carefully lift off and store at ground level on a pallets.

Remove the existing lead flashing and damp proof course DPC.

Prepare a level lime mortar bed and place the following build-up:

1000 gauge DPC over entire battlement area

Layer of double face sticky EPDM

Dress a lead flashing over EPDM and down face of the stone wall to form a drip on each side

Ensure that DPC & EPDM products are overlapped by a minimum of 200mm and fully sealed to prevent moisture ingress into wall as inspected and approved by the Employers Representative.

5.2 MATERIALS

5.2.1 Lead Sheet

Rolled lead sheet to BS EN 12588.

Minimum grade:

Code 5 for parapet flashings, drips, and weatherings

Code 4 only for soakers or vertical upstands

Lead to be free from ripples, buckling, or surface defects.

5.2.2 Breathable DPM / Underlay

Use a vapour-permeable, waterproof, breathable membrane to avoid trapping moisture in historic masonry.
Acceptable types:

- Proctor Roofshield
- Klover Permo Air
- Tyvek Supro (or equivalent approved)

Breathable geotextile DPC, e.g. polypropylene or polyester non-woven membrane) to **BS EN 13252**, compatible with lime mortar, suitable for conservation works, in a level lime based mortar bed, width 550mm, minimum lap 200 at joints. Place above and below lead DPM where in contact with lime based mortar.

Polyethylene DPMs are not permitted as they trap moisture within stonework.

5.2.3 Ancillary Materials

Underlay beneath lead: bituminous felt, geotextile, or lead-compatible separation layer.

Fixings: stainless steel or copper only.

Sealant: LSA-approved low-modulus neutral-cure sealant.

Mortar for chase sealing: lime mortar (NHL 2 or NHL 3.5).

5.3 PREPARATION OF PARAPET

Inspect parapet for defects; repoint open joints with lime mortar before flashing installation.

Ensure parapet top is even; level using lime-based bedding mortar where required.
Form chase 20–25 mm deep, hand-cut, following existing joint lines where possible to minimise visual impact.
Remove dust and debris; lightly dampen chase before inserting lead.

5.4 INSTALLATION OF BREATHABLE DPM

Lay membrane over full parapet width (500 mm), lapping down minimum 150 mm on weather face.
Ensure continuity with any existing roof underlay or internal cavity tray.
Dress membrane into chase where required, ensuring no punctures or folds.
Protect membrane from UV exposure and mechanical damage during works.

5.5 Lead Flashing Installation

5.5.1 General Requirements

Provide continuous underlay beneath all lead to prevent underside corrosion and allow movement.
Maximum length of any lead piece: 1.5 m.
Minimum lap between pieces: 100 mm.
Form expansion joints in accordance with LSA guidance for long runs.

5.5.2 Drip Detail

Form drip projecting 45–55 mm beyond stone face.
Turn down drip edge 25 mm and dress to a straight, stiffened arris.
Maintain a clear drip gap of 10–12 mm between underside of lead and masonry to prevent capillary return.

5.5.3 Upstand and Chase Fixing

Upstand height: 75–100 mm above finished roof level.
Insert lead into chase 20–25 mm, wedge with lead wedges at 450 mm centres.
Seal chase with lime mortar (preferred) or LSA-approved sealant.
Do not over-tighten wedges; allow for thermal movement.

5.5.4 Fixings

Fix only at top edge of lead; never through horizontal surfaces.
Use stainless steel clips or copper nails fixed into mortar joints where possible.

5.6 WEATHERING AND PROTECTION

Ensure minimum fall of 1:80 to shed water.
Avoid direct contact between lead and cementitious materials; maintain separation layer.
Protect finished leadwork from lime staining, foot traffic, and site debris.
Ensure no ponding occurs behind the flashing.

5.7 INTERFACE WITH COPINGS OR ROOF COVERINGS

Where parapet is capped with stone:

- Ensure DPM and lead integrate beneath coping stones.
- Provide lime-mortar bedding that remains vapour-permeable.

Where parapet forms part of a roof edge:

- Ensure continuity with slate underlay or roof membrane.
- Provide weep holes at 900 mm centres if moisture could accumulate behind flashing.

5.8 QUALITY CONTROL

Inspect for:

- Correct lap lengths and sealing
- Proper drip formation and projection
- Adequate laps and expansion joints
- Smooth, even dressing without oil-canning

Any defects to be corrected before handover.

6.0 MASONRY BLOCKWORK

6.1 Concrete Blocks

Manufactured concrete blocks shall be dense concrete blocks of the specified strength made with natural aggregates and complying with the harmonised standard I.S. EN 771-3 and the relevant guidance in S.R. 325. The aggregate used in the manufacture of these concrete blocks shall comply with the harmonised standard IS EN 12620 and the guidance for their use in Ireland provided in S.R. 16.

6.1.1 Compressive Strength

The Contractor must satisfy the Engineer that all blocks have the required minimum crushing strength. The strengths of the blocks to be used in the various sections of the work shall be as stated on the drawings. But in any case should not be less than 13N/mm².

6.1.2 Drying Shrinkage

The drying shrinkage of the blocks shall be determined as described in I.S. EN 771-3, and shall not exceed the maximum value of 0.06%

6.3 Certificates

Prior to commencing any work the contractor shall supply the following documentation from the manufacturer of the blocks:

- (a) Certificate confirming a CE Marking in accordance with the provisions of the Construction Products Regulations for the blocks to be supplied for this project. The delivered blocks shall bear this CE Marking also.
- (b) Certification that the blocks comply with the appropriate harmonised standards or European Technical assessment in accordance with the Construction Products Regulations as noted in 6.1 and 6.1.1 above for blocks and **all** of the constituent aggregates used to make these blocks.
or
- (c) Comply with an appropriate Irish standard or Irish Agreement Certificate or with an alternative national technical specification of any state which is a contracting party to the agreement on the European Economic Area, which provides in use an equivalent level of safety and suitability.

6.4 Verification & Testing

The contractor shall supply a certificate with each delivery stating the date of manufacture and also that the blocks comply with all the requirements of I.S. EN 771-3. At intervals during the construction, samples of blocks delivered to site shall be taken when required by the Engineer and delivered to an approved testing laboratory. Testing shall be carried out by the methods described in I.S. EN 771-3. Where the sample from any delivery fails to meet the Specification requirements, the whole of this delivery shall be rejected and the blocks must not be used in the works and shall be removed from the site.

6.5 Materials

6.5.1 Cement

The cement shall be Ordinary Portland Cement certified as complying with IS EN 197-1 (Cement type CEM I, CEM II or CEM III). Manufacturer's certificate of compliance with the standard shall be provided when requested by the Engineer. Cement is to be delivered to site in sealed drums or bags and is to be stored in an area where the cement is maintained dry and free from contamination.

6.5.2 Aggregates

All aggregate including sand and filler used in the manufacture of blocks shall consist of naturally occurring sand, gravel or stone or a combination thereof. They shall comply with IS EN 12620 determined as hard, strong, durable, clean and free from adherent coatings. All aggregates shall be CE marked and conform with the requirements of SR 16 and 21 Annex E and shall not contain excessive quantities of deleterious materials such as free mica or pyrite. Coarse aggregate shall all pass a 20mm test sieve.

6.5.3 Lime for Mortar

Lime for mortar shall be in the form of lime putty, complying with the relevant provisions of IS EN 459-1. Hydrated Lime shall comply with I.S. 8.

6.5.4 Water

Clean fresh water shall be used and shall be free from deleterious material.

6.5.5 Admixtures

Admixtures may be used in the concrete at the contractors discretion in accordance with the manufacturer's instructions and best practice and shall comply with the requirements of or latest applicable BS EN 934-2. Air entraining agents may only be used with the approval of the Engineer. If used, the mortar shall be mixed in a powered mixer. No antifreezes' or accelerators shall be used without the prior approval of the Engineer.

6.6 Ancillary products for blockwork**6.6.1 Damp Proof Course**

The damp proof course for all blockwork shall be of durable heavy grade plastic with a CE mark as approved by the Engineer.

6.6.2 Metal Ties

All cavity wall ties shall be galvanised mild steel or stainless steel ties conforming to IS.1243 and IS.268. They shall be built into the correct position initially and not inserted in the joints afterwards. The ties shall have a minimum embedment of 50mm either end. The spacing of wall ties shall be in accordance with Table 6 Spacing of Ties in I.S. 325 Part 1 unless noted otherwise. The spacing of wall ties around openings shall be in accordance with the requirements of the Building Regulations and B.S. 5628 Part 3. Plastic wall ties will not be permitted.

6.6.3 Lintels

Concrete, lintels shall comply with the relevant provisions of I.S. 240 and I.S. 255. Steel or timber prefabricated lintels shall comply with the relevant provisions of BS 5977. The contractor shall provide CE mark for all lintels together with certified confirmation of load capacity for review and approval by the Engineer one week prior to use.

6.6.4 Metal Lathing

Steel metal lathing for plastering walls and ceilings shall comply with the relevant provisions of BS 1369 and be plain expanded and ribbed expanded types respectively.

6.7 Mortar

Mortar shall be mixed only as and when required in the relevant proportions indicated in the following table, until its colour and consistency are uniform. The constituent materials shall be accurately gauged, allowance being made for bulking of sand.

MIX BY VOLUME			
Class	Cement: Lime Putty: Sand	Cement: Sand with plasticizer	Masonry Cement Sand
M1	0 to ¼ : 3	1 : 1 : 2½ to 3	M5 – 1 : 2 to 2½
M2	1 : ½ : 4 to 4½	1 : 3 to 4	M6 – 1 : 2½ to 3½
M3	1 : 1 : 5 to 6	1 : 5 to 6	M7 – 1 : 4 to 5
M4	1 : 2 : 8 to 9	1 : 7 to 8	M8 – 1 : 5½ to 6½

Table 6.1. Nominal mix by volume

Ready mixed lime: sand mortar and ready to use retarded mortar shall comply with the relevant provisions of BS 4721.

All mortar shall be conveyed fresh to the Works as required for use. Mortar that has begun to set or which has been site-mixed for a period of more than one hour in the case of Classes M1, M2, M5 and M6 and two hours in the case of Classes M3, M4, M7 and M8 shall not be used. Mortar plasticizers shall comply with BS 4887 and shall be supplied with instructions for use. Rapid curing approved polyester mortar or equivalent shall generally be used for bedding to Manhole Covers and Frames in heavily trafficked locations.

6.8 BLOCKWORK AND BRICKWORK

6.8.1 Generally

Blockwork and Brickwork shall comply with the relevant provisions of BS 5628 "Code of Practice for the Use of Masonry" except as noted otherwise in this Section. The moisture content of the bricks and blocks shall be adjusted so that excessive suction is not exerted on the mortar. Bricks and Blocks in each course shall break joints correctly with the bricks underneath. The courses shall be laid parallel with joints of uniform thickness and shall be kept straight or regularly curved as required. Brickwork and Blockwork shall rise uniformly; corners and other advanced work shall be raked back and not raised above the general level more than 1 metre. No work shall be carried up higher than 1.5 metres in one day. No bats or broken bricks or blocks shall be incorporated in the work unless essential for bond. Blockwork used in fair-faced blockwork shall be smooth undamaged face and be neatly pointed with flush joints. Sand shall be used in such proportions as specified by the Permanent Works Structural Designer. All sand shall pass a 5mm test sieve and shall comply with B.S. 1200. Blocks may not be incorporated in the structure until at least 28 days have elapsed calculated from the date of manufacture, and satisfactory compliance with the requirements of IS No. 20 in relation to dimensional tolerances, drying shrinkage and strength is a condition precedent to their incorporation. Except where noted otherwise in the Contract Documents, the minimum strength requirement for blocks when tested in accordance with IS EN 771-3 shall be **13N/mm²** for solid blocks and **7N/mm²** for hollow blocks, unless stated otherwise in the drawings.

6.8.2 Testing of Blocks to IS EN 771-3.

The number of blocks in the sample for each test shall be as shown in the following Table:

Testing of Blocks to I.S. EN 771-3		
Test	Sample Size	Maximum lot size
Dimensional tolerances	10	
Determination of strength	10	
Drying shrinkage	4	1500
Determination of density (if required)*	3	
Spares	3	

Table 6.2: Testing of Blocks to IS EN 771

Note: Determination of density will not be required except where the Specification sets out limits for the density of blocks.

The above noted tests, to be carried out by an approved Engineering Laboratory, shall be arranged by the Contractor, including carriage and delivery, free of charge to the Employers. Copies of test results are to be forwarded directly by the Testing Laboratory to the Employer's Representative and to the Employer's Representative Site Staff.

6.8.3 Workmanship

Only experienced masons, skilled in their trade, shall be allowed to carry out block laying, and the work shall be set out and built to the respective dimensions, thicknesses and heights shown on the Drawings. Blocks shall be buttered with mortar before being laid and all joints shall be thoroughly flushed up as the work proceeds. Blockwork shall be brought up in a uniform manner, no one portion being raised more than 1m above another at any one time. All walls shall be kept strictly in horizontal and vertical alignment, and the whole shall be properly bonded together and levelled around the top at the completion of blockwork. Where cavity walling is specified the outer and inner leaves shall be separated by a 100mm cavity. Cavity Wall insulation, as specified, shall be incorporated by fixing the insulation

panels, which are to be 60mm in thickness, on the external faces of the inner leaves of the cavity walls during the course of construction. The two leaves of the cavity shall be tied together with wall ties of wire or strip construction composed of stainless steel and complying with I.S. 268. The ties shall be spaced not more than 750mm apart horizontally and not more than 450mm apart vertically. Inside and outside leaves of all blockwork walling shall be reinforced in the manner specified or in any other approved manner. All walls shall incorporate bed joint reinforcement in accordance with the following requirements unless noted otherwise on the Drawings or in the Specification. The bed joint reinforcement shall be continuous between control joints and shall be incorporated generally at 450mm centres vertically from the first joint above the D.P.C. at the base of the wall to the top of the wall. Additional bed joint reinforcement shall be provided above and below windows and above doors so that there are two layers incorporated within 600mm vertically of the opening. This additional bed joint reinforcement shall be continued for a minimum of 750mm beyond the opening. The bed joint reinforcement shall be staggered vertically with the wall ties in alternate rows. Laps in bed joint reinforcement shall be kept to a minimum and where these occur, a minimum lap of 150mm or the Manufacturer's minimum lap recommendation (whichever is the greater) shall be used. In no case shall any reinforcement be provided with less than 3mm mortar all round. A minimum cover of 25mm of mortar shall be provided between the faces of the blockwork/brickwork and the reinforcement shall be specially cut and bent to achieve the minimum lap. At wall corners the bed joint reinforcement shall also be specially cut and bent to achieve the minimum lap. At intersecting walls clashing of bed joint reinforcement shall be prevented, by staggering the reinforcement.

All bed joint reinforcement in internal walls, in internal leaves of external walls and in plastered external blockwork shall be of stainless steel. In the external leaf of un-rendered blockwork or brickwork, stainless steel bed joint reinforcement shall be incorporated. The steel shall comply with BS 970 to Grade 304 S15 or better. The bed joint reinforcement shall comprise two longitudinal wires connected by orthogonal cross wires at maximum 400mm centres, or zigzag lattice wires at maximum 450mm centres, the cross wires being welded to the longitudinal wires. The wires shall be 3mm minimum and 6mm maximum in diameter. If more than two (2) longitudinal wires are incorporated, smaller diameter wires can be used to achieve the equivalent area. All bed joint reinforcement shall be used strictly in accordance with BS 5628: Part 3 and with the Manufacturer's recommendation. Near the sides of door and window openings toes shall be placed at each 225mm of height to increase stability. Wall ties shall be set to a minimum depth of 50mm in each leaf. All ties shall be kept free of mortar and debris. The cavity shall be closed at the jambs of doors and windows by a vertical damp proof course. The cavity shall be sealed at wall plate level with blockwork. Finished surfaces of fair-faced blockwork shall be protected at all times from scaffold, splash, mortar droppings, grout leakage from suspended slabs and the harmful effects of weather. Blockwork shall be allowed to set thoroughly hard before cutting or chasing out is performed.

6.9 Block Laying

Blocks shall generally be laid in stretcher bond and where 215mm solid block walls are specified these will be built with blocks laid on flat extending through the full thickness of the wall. The blocks shall be laid in true and regular courses and the tops of the walls shall be finished so as to provide an even bearing for floors and roofs. Making up heights with brick or other material will not be permitted unless approved by the Engineer. All joints shall be fully bedded. Vertical control joints shall be formed in the block work where shown on the Engineer's drawing. Care is to be taken that the joint is free from debris.

6.9.1 Jointing And Pointing

Bricks and blocks shall be laid in mortar properly bedded and jointed and all joints filled with mortar at every course. Mortar shall be in accordance with I.S. 406 Masonry Mortars. Where the surface of walling does not provide an adequate key, the joints on faces of walls to be plastered shall be raked out 12mm deep.

6.9.2 Chases and Holes

Vertical chases in loadbearing block work shall only be prepared with a rotary cutter or abrasive disc. Reciprocating hammers of any description shall not be used for this purpose. No horizontal or diagonal chases are permitted. Holes through wall shall be formed during block laying only. No chases or holes shall be formed without the prior approval of the Engineer.

6.9.3 Cutting of Blocks

Cutting of blocks should be kept to a minimum. Where it is necessary to cut blocks this must be squarely and accurately done and the cut blocks used in a panel so as to maintain a regular bond.

6.9.4 Working Tolerances

Unless otherwise indicated on the drawings the setting out dimensions levels and plumb of the finished works shall not exceed the tolerances given below:

All dimensions of 3 m and over ± 6 mm

All dimensions less than 3 m ± 3 mm

All walls shall not be more than 6mm out of plumb in one storey height and not more than 12mm out of plumb in the total height.

6.9.5 Propping of Block work

Block work shall be propped during construction as follows:

1. To ensure stability at all stages of construction.
2. Until completion of construction of, all returns and intersecting walls connected to the wall, pier or panels, all band beams connected to the wall, pier or panel all structural members connected to the wall, pier or panel and all associated supporting structure other specific members identified on the drawings.
3. When internal block work walls, piers or panels are constructed prior to the completion of the external envelope of the building (including the closure of all openings exceeding 3.5 sq.m. for a single opening and 10% of the area of any elevation for multiple openings.)
4. In other cases noted on the drawings. The propping of walls in this manner is obligatory and shall be omitted or removed only where instructed in writing by the engineer. The type and extent of propping shall be determined by the Contractor and designed as part of his temporary works. The Contractor shall take account of his sequence of construction in determining the prop positions and loads.

The criteria for design of props shall be as follows:

1. Propping of walls of heights lower than that given below shall not be required.

Thickness	215	300 Cavity Wall	415 Cavity Wall
Height	1.0	1.0	1.5

2. Above this height props shall be designed to resist wind loads imposed based on BS6299 Part 2.
3. The requirement for props shall be deemed satisfied by props arranged to support a characteristic wind load of 3.6kN/sq.m. on the entire wall provided such walls are at a height not exceeding 10 m above ground level.

6.9.6 Bonding To Concrete

Where brickwork is required to be bonded to concrete, dovetail slot ties shall be evenly placed at three per square metre and brickwork shall be brought up subsequent to the concrete.

6.9.7 Lintels and padstones

Lintels and padstones shall be as specified on the drawings. Unless stated otherwise lintels are to bear a minimum of 150 mm onto a full length block, where due to coursing a full block below the bearing is not possible, the bearing is to be increased to 225 mm. Padstones are to be constructed in grade C20/25 concrete to the sizes specified and reinforced with a minimum of one number 10mm diameter high yield steel bar or as agreed with the Engineer. CE Mark and DoP shall be provided by the contractor for all load bearing P. C. Concrete lintels and shall be approved by the Engineer/Employers representative

6.9.8 Brick and blocklaying In Cold Weather

Materials used in bricklaying and block laying shall be frost-free and no bricks or blocks shall be laid when the ambient temperature is below 5 Deg. C unless special precautions are taken. The Contractor shall ensure that any additive used in the mortar does not cause a variation in the colour of the joints. Completed work shall be protected adequately during cold weather.

7.0 PLASTERWORK/RENDER

7.1 GENERALLY

The Contractor shall provide all labour, materials, plant, tools, scaffolding and temporary rules necessary for the completion of the works. The plastering shall be carried out to the satisfaction of the Engineer and any work or materials rejected by them shall be removed and replaced at the Contractors expense.

7.2 CEMENT

The cement shall be Ordinary Portland Cement certified as complying with IS EN 197-1 (Cement type CEM I, CEM II or CEM III). Manufacturer's certificate of compliance with the standard shall be provided when requested by the Engineer. Cement is to be delivered to site in sealed drums or bags and is to be stored in an area where the cement is maintained dry and free from contamination.

7.3 LIME

Lime for mortar shall be in the form of lime putty, complying with the relevant provisions of IS EN 459-1. Hydrated Lime shall comply with I.S. 8.

7.4 SAND

Sand for render should be well-graded category 2, in accordance with BS EN 13139. Sand with excessive fine material, clay or silt can shrink and crack so should be avoided. The sand shall be clean sharp evenly graded river or pit sand and shall comply with the harmonised standard IS EN 12620 and the guidance for their use in Ireland provided in S.R. 16.

7.5 WATER

Water to be fresh and clean.

7.6 PLASTICISERS

Plasticisers and air entrainers should comply with BS EN 934 and not be used in mortars containing masonry cement.

7.7 PREMIXED RENDERS (INSULATING RENDER)

Pre-mixed insulating renders shall be used to render masonry fascia and soffit as shown in the drawings. Minimum thermal conductivity of 0.045W/mK shall be provided. Use Diathonite Evolution thermal plaster or equal can be used for render and insulation of Historic/Listed buildings or any building with solid stone or masonry walls. Preparation of substrate shall be strictly in accordance with Manufacturers recommendations. Render shall be mixed and applied strictly in accordance with Manufacturers instructions.

7.8 PREPARATION

All walls and ceilings shall be thoroughly brushed down and well wetted before plastering or rendering. All plastering undercoats shall be well scored to provide a proper key for the following coat. Concrete surfaces shall be free from contamination including mould and soil.

7.9 MIX DESIGN

Designation ii, iii and iv (strength class M6, M4 and M2) mixes are generally used for rendering. Stronger mixes are generally more moisture resistant; however, they are also more prone to shrinkage, which increases the likelihood of the render cracking.

	Mix designation	Mortar compressive strength class equivalent	Mix proportions by volume based on damp sand				
			Cement:lime:sand	Cement:ready-mixed lime:sand ⁽¹⁾ Ready-mixed lime:sand	Cement:ready-mixed material	Cement:sand ⁽¹⁾ (using plasticiser)	Masonry cement:sand ⁽¹⁾
Weaker – stronger	i	M12	1:¼:3	1:12	1:3	-	-
	ii	M6	1:½:4 - 4½	1:9	1:4 - 4½	1:3 - 4	1:2½ - 3½
	iii	M4	1:1:5 - 6	1:6	1:5 - 6	1:5 - 6	1:4 - 5
	iv	M2	1:2:8 - 9	1:4½	1:8 - 9	1:7 - 8	1:5½ - 6½
	v	-	1:3:10 - 12	1:4	1:10 - 12	-	-

Proposed replacement of existing glasshouse at Glenveagh N. P.

7.9 MIXING

The materials shall be accurately measured and proportioned by volume by means of gauge boxes. Mixing shall continue until the mass is uniform in colour and consistency. Plasters shall be used up before they begin to set and shall not be re-tempered. All mixing shall be done on a clean platform on a clean mixing box or in a mechanical mixer. Only water shall be added and not other admixture is permissible.

7.10 TEMPORARY RULES

Timber laths spiked onto walls shall be used throughout as temporary rules to ensure proper thickness.

7.11 WORKMANSHIP

The plastering shall be executed in workmanlike manner to the satisfaction of the Engineer. It shall be finished absolutely smooth and free from cracks, holes, and blemishes. Adequate time shall be allowed for each undercoat to dry out before subsequent coats are applied.

7.12 SCUDDING

The wall surface shall be well wetted before applying the scud coat. Blockwork shall be scudded to a depth of 3-5mm using a thick slurry of 1 part sand to 2 parts cement to give a rough surface. After application the scudding coat shall be allowed to dry for 48 hours before applying any new layer.

7.13 THICKNESS OF PLASTERING

The total thickness of plastering stated in this Specification is exclusive of any scudding coat or keys (i.e. grooves or open joints in blockwork or spaces between lathing). The number of coats should be designed to take account of the background and exposure conditions of the site.

7.14 SAND-CEMENT PLASTER

A scratch coat may be applied in one or two coats to a total depth of 20mm (severe exposure). The undercoat shall be applied to a depth of 10-12mm followed by a final scratch coat 6mm to 8mm depth using a 1:1:6 mix (cement:lime:sand) or a 1:6 mix cement: sand) with plasticiser added in accordance with the manufacturers instructions. The rendered surface shall be scratched throughly to form a key. Apply a finish in sand and cement (1:3) as described, with nap finish, 20mm total thickness on blockwork walls at plinth below dpc. Level.

	Typical two-coat application
Normal density aircrete	
Undercoat	8-12mm designation iii (M4)
Final coat	6-8mm designation iv (M2) ⁽¹⁾
Ultra lightweight and lightweight aggregate blockwork	
Undercoat	8-12mm designation iii (M4)
Final coat	6-8mm designation iv (M2) ⁽¹⁾
Dense aggregate blockwork	
Undercoat	8-12mm designation ii (M6)
Final coat	6-8mm designation iii (M4)
Clay brick	
Undercoat	8-12mm designation ii (M6)
Final coat	6-8mm designation iii (M4)
Ribbed metal lath	
First coat	8-12mm designation i (M12)
Undercoat	10-12mm designation ii (M6)
Final coat	6-8mm designation ii (M4)

7.15 EXTERNAL PLASTER

Sand/cement plaster to be a minimum 16mm thick (sheltered exposure) and **20mm (severe exposure as typical for Donegal)** with a smooth float finish applied to exposed masonry walls. External angle reinforced with plastic nosed, stainless or epoxy coated Galvanized steel corner beads in accordance with BS 5262:1991.

8.0 DRAINAGE AND SERVICE DUCTS

8.1 GENERAL REQUIREMENTS

All drainage work is to conform with the requirements of Document H of the Building Regulations 1997 and all relevant Irish and British standards and in particular B.S. 8301.

8.2 PIPES FOR EFFLUENT AND SURFACE WATER SEWERS

Storm and Effluent Pipework below Ground

Wavin PVC

Storm Drainage above ground

Wavin PVC with stainless steel support brackets & fixings.

Satinless steel Channels Gullies & Slot Drains

By kent distributed in Ireland by Richmond Trading tel 0504 56000 or another approved supplier.

Pipe Gradients

Storm water Pipes

Minimum gradient for storm water drainage pipes to be 1:100 unless otherwise noted on the drawings.

Effluent Pipes

Minimum gradient for sewerage drainage pipes to be 1:100 unless otherwise noted on the drawings.

8.3 BACKFILL AND PIPE SURROUNDS

Trench Backfill Material (Type A)

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

Type B Material

To be used for pipes laid in gardens, public open spaces and as approved by the Supervising Officer. Shall be fine material which may be selected from excavated material or imported, as required, from which all clay lumps in excess of 75 mm, stones in excess of 25 mm and vegetable matter have been removed. This material must be readily compactable. Wet or plastic clay may not be used. The material must meet with the approval of the Supervising Officer. Pipes laid under roads, driveways, paths, shall be backfilled with approved compacted hardcore.

Granular Bedding & 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

110 and 150 water main 150 depth

100 and 150 sewers 100 depth

225, 300 and 375 sewers 150 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 1200 mm in roads and 750 mm elsewhere, it shall be in Grade 20 concrete of following dimensions:

Diameter	Depth	Width
mm	mm	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 150 mm concrete of similar mix as directed by the Engineer.

8.4 PIPELAYING**HDPE Pipework.**

Generally all pipework below ground will be completed in HDPE.

Laying Sewer Pipes

All sewer pipework to comply with Code of Practice B.S. 5572. 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.

Branch Junctions and Specials

The Contractor shall provide all necessary branch junctions and specials in the correct locations.

8.5 TESTS**Testing Pipes**

Sewers shall be tested in convenient sections by one or other of the following methods, as directed by the Engineer.

Water Test

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

Air Test

Air shall be pumped into the section of sewer under test until a pressure of 100 is indicated on a U-Tube connected to the system. The air pressure shall not fall to less than 75 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.

8.6 MANHOLES, FRAMES AND GULLIES

Manholes and Inspection Chambers

Manholes

Manholes less than 1500mm deep of 800 x 800 on a 150mm concrete Class A thick base. The walls to be 225mm thick built of concrete blocks or alternatively pre-cast concrete. Block work to be a minimum of 10 N/mm² in 1:3 mortars. The hoods of the manholes to be 100mm precast concrete.

Manholes in the public domain shall be constructed in Grade 20 concrete. Manholes shall be of the following internal dimensions:

Less than 2700 mm in height: 1200 x 750 mm

Over 2700 mm in height: 1200 x 840 mm

Bases shall be 150 mm thick Grade 20 concrete

Walls shall be 225 mm thick Grade 20 concrete

Roofs shall be 225 mm thick Grade 30 concrete reinforced as indicated on drawings.

Alternatively, circular manholes of approved dimension and construction may be used, subject to approval by the Architect/Engineer. Inspection chambers to be a minimum of 600 mm 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 20 in situ concrete finished with 19 mm 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 35 concrete finished with 19 mm 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.

Double seal Internal Manhole Covers & frames

Refer to appendix B

Manhole Covers and Frames

Shall be cast iron to comply with IS/EN 124 as follows:

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. Minimum clear opening 600 diameter.

All Class D400 manholes are to have an anti-rocking device and to be sealed. In areas which are not paved, surround manhole frames with a cement and sand (1:3) collar 150 mm wide x 100 mm thick.

Manhole Step Irons

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

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

Interceptor Traps

Interceptor traps to be vitrified clay complying with the requirements of IS/EN 295-1/2/3:1992 or equivalent standard. Crushing strengths shall be in accordance with class number 160 and 200 of IS/EN 295-1:1992. Size to match outlet pipe diameter and set into chamber wall and surrounded in concrete on exit.

Road Gullies

Road gullies shall be cast iron in accordance with local authorities' specifications with grate, trap, cleaning eye, (overall weight approximately 114 kgs) and shall be lockable, and close with traffic.

Armstrong Junctions

Armstrong junctions shall be uP.V.C. With required number of inlets to suit pipe runs. They shall be set on Grade 20 concrete 150 mm thick and surrounded in similar concrete. Provide all necessary raising pieces. Provide galvanised cast iron cover set into concrete.

Infiltration Test for Manholes

If so required by the Architect, manholes shall be tested for infiltration of ground water.

8.7**CLEANING****Cleaning Sewer System**

On completion of the works, the Contractor shall ensure, to the satisfaction of the Architect/Engineer, that all sewers and manholes are clean and free from obstruction. P.V.C. house drains and fittings should always be laid and properly bedded i.e. Contractor to ensure that pipes and fittings are never freely suspended and unsupported while being placed and fitted on site. 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.

9.0 Glasshouse System

9.1 GENERAL

Provide a **mono-pitched glasshouse structure** abutting an existing stone wall and supported on an existing masonry perimeter wall. The approximate overall plan dimensions **17 000 mm (L) × 4 300 mm (W)**.

Eaves height **1 750 mm**, ridge height **4 000 mm**. All dimensions to be confirmed on-site by the glasshouse supplier prior to fabrication. Provide glazed cold frames and complete with supports, fixings and hinges as shown in the drawings.

Structure to be designed, manufactured, delivered and installed as a complete system by a specialist glasshouse supplier.

9.2 DESIGN STANDARDS & PERFORMANCE REQUIREMENTS

Structural design to **Eurocodes** and Irish National Annexes:

EN 1990 Basis of design

EN 1991-1-4 Wind actions (Donegal coastal exposure; terrain category II/III as applicable)

EN 1991-1-3 Snow loads

EN 1999 Aluminium structures

EN 12150 Toughened safety glass

Minimum design life: **25 years**.

Glasshouse to resist **ultimate wind pressures appropriate to County Donegal**, including suction on roof glazing and positive pressure on wall glazing.

All fixings, brackets and interfaces to be designed to prevent galvanic corrosion and accommodate thermal movement.

9.3 STRUCTURE

Primary frame:

Aluminium alloy grade: 6063 T6

powder-coated aluminium alloy sections, proprietary extrusions suitable for external structural use.

Minimum coating system:

Qualicoat-approved polyester powder coating, 60–80 µm DFT, colour to be confirmed.

All aluminium members to be sized to limit deflection under serviceability loads to:

L/200 for rafters and purlins

L/150 for wall mullions

Provide all necessary rafters, purlins, wall plates, ridge beams, glazing bars, gutters and downpipes.

9.4 Glazing

Roof and wall glazing: **4 mm toughened safety glass** to EN 12150.

Thermo-plastic rubber (TPR) glazing seals

Glass to be bedded in proprietary glazing gaskets compatible with aluminium.

Glazing bars to provide continuous support and restraint.

All edges to be polished or arised.

Safety:

- All glazing to be **toughened**.
- Provide anti-slip safety film or laminated glass where required by supplier's system design.

9.5 VENTILATION

Automatic opening roof vents

Provide **automatic opening roof vents**, minimum **1 vent per 3 m** length (i.e., approx. 5 vents total), or as required by manufacturer to achieve adequate natural ventilation.

Automatic openers to be **thermally actuated**, (typically wax filled cylinder system) no electrical supply required unless otherwise agreed with employers representative.

Provide manual override where available.

Manual opening windows

Provide manual push bar hinged windows to front wall as shown in the drawings

9.6 DOORS

Provide **2 no. single hinged or sliding door** (location to be confirmed).

Door to match glazing system and powder-coated finish.

Minimum clear opening: **800 mm**.

9.7 RAINWATER MANAGEMENT

Integrated **aluminium gutters** along eaves.

Downpipes to discharge to ground level or to existing drainage as instructed.

All components powder-coated to match frame.

9.8 FIXINGS & INTERFACES

All fixings to be **stainless steel A4** (marine grade) due to Donegal coastal exposure.

Wall fixing brackets to be designed to suit substrate (masonry/concrete).

Provide EPDM or neoprene isolation pads between aluminium and dissimilar metals.

Seal all junctions with UV-stable silicone or proprietary weathering seals.

9.9 FOUNDATIONS / BASE

Glasshouse to be fixed to the top of a perimeter wall and to abut to an existing stone wall. All fixings to be included by specialist greenhouse supplier. Hardwood timber plate fixed to stone wall as specified by glass house supplier, to be provided by civils contractor for support of main rafters. Glass house supplier shall specify the support substrate and fixing down details for glass house frame to walls and timber plate.

Tolerance of base: ± 5 mm over 3 m.

9.10 WORKMANSHIP

Installation by trained operatives of the manufacturer.

All works to be carried out in dry conditions with protection of materials on site.

All glass to be cleaned and inspected on completion.

9.11 SUBMITTALS

Provide:

- Detailed **shop drawings**
- Structural calculations to Eurocodes
- Powder-coating certification
- Glass certification
- O&M manual including maintenance requirements

9.12 Warranty

- Minimum **25-year warranty** on aluminium frame and powder coating.
- Minimum **15-year warranty** on powder coating.
- Minimum **5-year warranty** on automatic vent mechanisms.

Proposed replacement of existing glasshouse at Glenveagh N. P.

10.0 ELECTRICAL & MECHANICAL

10.1 GENERALLY

Electrical works do not form part of this contract and will be organised separately by the client.

The Mechanical works shall be carried out by a Sub-Contractor provided by the main contractor.

Each Sub-Contractor shall enter into a Sub-Contract with the Building Contractor for the due performance of the work and the terms of the Sub-Contract shall be a design and build contract.

The Contractor shall provide adequate lock-up storage (including where necessary heated stores) for all materials required or supplied by the foregoing Sub-Contractors. He shall be responsible for taking delivery of all such goods, including unloading, handling into store and during storage until the key of such store is handed over to the Sub-Contractor.

10.2 SUB- CONTRACTORS REQUIREMENTS

The Contractor must at an early stage obtain from the specialist sub-contractors full particulars of the general contractors works which is required to be done in connection with the sub-contracts. Should the contractor fail in this respect he will be required to carry out any subsequent alteration work at his own expense.

10.3 DESIGN & INSTALL CONTRACT

The mechanical works will be carried out by specialist firms of nominated sub-contractors in accordance with a design and install basis. The design proposals shall be submitted to the Architect/Engineer for approval prior to appointment.

10.4 DEFECTIVE WORK

Where in the opinion of the Engineer any part of the finished work or the materials or workmanship in any part of the works do not comply with all the requirements of the Specifications as prepared by the Architect, then that part of the work shall be classed as defective.

All work classed as defective work shall be taken out and removed from the works and replaced to the satisfaction of the Engineer/Architect.

10.5 PROFIT AND ATTENDANCE

Allow for profit on specialists carrying out the foregoing installations. Allow for general and special attendances on specialists as outlined in schedules.

10.6 BUILDERS WORK

Builders work in connection with the mechanical and electrical Installations. The Contractor will be required to cut all holes and chases etc., as required by the Mechanical and Electrical Contractors and to provide all necessary attendances.

10.7 CERTIFICATION

The contractor shall provide Certificates of completion together with RECI, test and commissioning certificates to the Employers Representative at the conclusion of the works.