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TECHNICAL SPECIFICATIONS MANUAL

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CONTROLLED DOCUMENTATION

GROUND FLOOR SLAB SPECIFICATION

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GROUND FLOOR SLAB SPECIFICATION

1. General

1.1. Contents

1.1.1. THIS DOCUMENT

This specification includes

1) General
2) Materials & Equipment
3) Construction
4) Tolerances

1.1.2. REFERENCES

This specification incorporates by dated or undated reference provisions from other documents and standards. These normative references are cited at the appropriate places in the text. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this specification only when incorporated in it by amendment or revision. For undated references the latest edition of the document referred to applies (including amendments).

1.1.3. DEFINITIONS

The term 'Engineers' in this specification shall mean O'Connor Sutton Cronin & Associates.

The term 'Contractor' in this specification shall mean the main contractor appointed for the project.

Within the terms of this standard general definitions are given for "hardcore" and "unbound granular fill", however, work contracts may define these differently. Other definitions and responsibilities may exist under Building Regulations, Eurocodes, Irish Safety, Health and Welfare (Construction) Regulations and may take precedence.

CE Mark - The CE Mark provides proof of this "fitness for purpose" and the manufacturer affixing the CE mark shows that the construction product will enable the finished construction works such as a home or school to comply with the Construction Products Regulation requirements.

Declaration of Performance (DOP) - This applies when a construction product is covered by a harmonised standard or conforms to a European Technical Assessment. The DoP details the product and the standard and contains information about its performance in relation to the essential characteristics defined within the applicable harmonised technical specification.

1.1.4. RESPONSIBILITY

Approval by the Engineer shall not relieve the Contractor of his responsibility for fitness for purpose, the quality of the materials used and for the strength, durability and appearances of the finished concrete.

1.2. Scope

1.2.1. CONTENTS

This specification covers a method of laying a ground bearing concrete floor slab. Unless another method has been agreed with the Engineer its clauses shall be binding.

Any ground floor supported on fill in excess of 900mm must be designed and constructed as a suspended floor slab, unless otherwise agreed with the Engineer.

1.2.2. CONTRACTOR REQUIREMENTS

It is intended that the Contractor shall achieve a standard which shall allow some or a combination of the following uses:

1. As a finished floor
2. Allowing clay, stone, terrazzo or concrete tiles to be laid directly without a concrete levelling screed being used.
3. Allowing flexible finishes e.g. rubber, linoleum, cork, vinyl asbestos to be laid with the use of no more than a latex underlayment.

1.2.3. CONTRACTOR RESPONSIBLITIES

The Contractor is responsible for fully coordinating and providing any additional curing/protection requirements necessary (e.g. liquid applied damp proof membranes or similar) to allow completion of floor finishes within the contract programme.

1.2.4. LIMITATIONS APPLIED TO SLABS

It is not intended that this Specification shall cover a concrete slab with a monolithically applied finish.

1.2.5.	SCREED FINISH	Where it is intended to use a finishing screed this specification shall generally apply except that a tamped or other suitable finish should be achieved.

1.3. Floor Composition

1.3.1.	NATURE OF FLOOR	The floor shall consist of an insitu reinforced concrete slab laid on a sub-base.
1.3.2.	SUB-BASE	The sub-base consists of a layer of fine sand on a layer of hardcore.
1.3.3.	REINFORCEMENT	The reinforcement in the slab, the thickness of the slab of the hardcore shall be as shown in the Engineer's drawing.
1.3.4.	UNDERFLOOR LAYERS	The DPM/Radon Barrier (+ associated components, fixtures/fittings etc), insulation and finishing + underfloor heating screeds shall be as shown on the Architects/M&E Drawings.

2. Materials and Equipment

2.1. General

2.1.1.	GENERAL	Materials used in the manufacture and supply of the concrete shall conform to the Engineer's Concrete Specification.

2.2. Fill Materials

2.2.1.	HARDCORE	"Hardcore" and "Unbound Granular Fill" under concrete floor slabs, footpaths and external concrete paved areas shall mean material in accordance with I.S. EN 13242 and SR21:2014 with particular reference to Clause 3.4 and Annex E, available from National Standards Authority of Ireland.
2.2.2.	SOURCE	The Contractor shall obtain material for hardcore only from a supplier who has tested and certified that the hardcore is in accordance with SR21:2014 (as well as complying with the other relevant particular requirements of the specification). In addition to complying with Table E.1 (Annex E, SR21:2014 only natural crushed rock aggregate shall be used under floor slabs of buildings, footpaths and external concrete paved areas.

All materials supplied to site must be accompanied with a CE mark and DOP in accordance with the Construction Products Directive.

2.2.3. TESTING OF FILL MATERIAL

All tests to conform to SR21:2014. Where material from a quarry source is to be used as hardcore fill material under concrete floor slabs, footpaths and external concrete paved areas, it is a requirement of this specification that a suitably experienced petrographer carry out a detailed mineralogical examination specifically covering the proposed area of extraction in order to:

a) ascertain the material's suitability for its end use, and
b) establish an appropriate test frequency for total sulphur from an assessment of the variability of the quarry deposit. This assessment may need to be repeated where there is a significant change in quarry characteristics.

In addition up-to-date test certificates (chemical, pyrite, sulphate, gradings, Optimum Moisture Content etc) totally representative of the actual material to be used shall be submitted to the Engineer at least 21 days in advance of the use of this material.

2.2.4. ADDITIONAL MEASURES IN RESPECT OF SULFATE ATTACK ON BURIED CONCRETE AND STEEL

In addition to the requirements for hardcore and unbound granular fill material above, the following requirements shall be complied with in respect of fill material that may be placed close to (i.e within 500mm of) unprotected buried concrete and/or steel elements.

a) Close to concrete but not to steel: the chemical requirements in Clause 801, Paragraph 2 (UK Highway Works Specification, Nov 2009) shall be complied with;
b) Close to steel but not to concrete: the chemical requirements of Clause 809 (NRA Specification) shall be complied with;
c) Close to steel and to concrete: the chemical requirements of Clause 809 (NRA Specification) shall be complied with and, further, the 2:1 water soil extract prepared for the determination of water-soluble

sulphate content shall have a pH value of not less than 7.2.

2.2.5. SAND BLINDING

Sand for blinding hardcore fill shall comply with the requirements of BS 882, Table 5, Type C or M.
Sand blinding shall comply with the specification given in Annex E of S.R.21:2004 & A1:2007

Sand blinding supplied to site must have a CE mark and DOP in accordance with the Construction Products Directive.

Where required, fines material for blinding the top surface of the Annex E granular fill should have a grading of 0/6,3 GF80 (see Table 4), with an acid soluble sulphate content of AS0,2 and a total sulphur of S1 (taking into account the recommendations of E.2.4.4).

2.2.6. FROST SUSCEPTIBILITY

All fill materials shall be non-frost susceptible as defined in Road Research Laboratory Report No. SR829.

2.2.7. SUBMISSION OF FILL MATERIAL SAMPLES

At least 21 days before any filling is started the Contractor shall submit full details of the source and types of the proposed filling materials together with 25kg representative samples of each type from each source. In addition, up-to-date test certificates (chemical, pyrite, sulphate, gradings, Optimum Moisture Content etc) totally representative of the actual material to be used shall be submitted to the Engineer at least 21 days in advance of the use of this material.

At the same time, the Contractor shall deliver to the agreed laboratory, sufficient representative samples of each material for any of the specified tests in this specification.

2.2.8. PLACING OF FILL

No fill shall be placed in water.

2.2.9. COMPACTION PLANT APPROVAL

At least 14 days before starting any filling, the Contractor shall submit full details of his proposed compaction plant. The types of plant listed below will normally be acceptable.

Earthmoving machines or similar will not be accepted as compaction plant.

2.2.10. METHOD OF COMPACTION PLANT

Each layer of fill shall be spread and compacted by approved plant as specified below:

Each layer shall be a maximum of 225mm, levelled and fully compacted prior to laying of the next layer. Compaction shall be in accordance with NRA Manual of Contract Documents for Roadworks (MCDRW) Series 600. Fill shall be graded in accordance with Table 6/1 of that document and compacted by a corresponding method from Table 6/4.

When compacting each side of a rising wall the contractor shall ensure that each side of the wall is backfilled to the same level at the same time to ensure that no overloading of the wall occurs due to the compaction.

2.2.11. MCV FOR COHESIVE FILL

Where cohesive fill material to be compacted in accordance with the references given in 2.2.10 the Moisture Condition Value (MCV) value shall be between 8 and 14 for the fill.

2.2.12. MOISTURE CONTENT

For Type 2 granular materials the moisture content during spreading and compaction shall be maintained within a range between two per cent below to one per cent above the optimum moisture content for compaction determined from BS 1377, Test 14.

2.2.13. COMPACTION EQUIPMENT

Notwithstanding the provisions of 2.2.10, the maximum depth of compaction layer and number of passes required for compaction shall not be less than that given in the table below

Type of Plant	Category		Max Depth of Compacted Layer	Minimum Number of Passes
	Variable	Value		
Smooth wheeled roller	Tonnes per m. width of roll	2-5 more than 5	125	10
Vibratory Roller	Static load in tonnes per m. width of vibratory roller	0.3 - 0.6 0.7 - 1.1 1.2 - 1.8 more than 1.8	75 125 150 150	16 12 8
Vibrating plate compactor	Static pressure under base plate in Kgf/cm.sq	0.1 - 0.12 0.13 - 0.14 more than 0.14	75 75 125	10 6 6
Vibro Tamper	Weight in Kgf	50 - 75 more than 75	100	3
Power Rammer	Weight in Kgf	100 more than 500	150 275	6 12

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Note	In no circumstances should heavy compacting plant be operating close to adjoining building foundations where damage may occur. The Contractor shall be responsible for any damage which may occur to adjoining property resulting from these operations.

2.2.14. BINDING OF HARDCORE FILL MATERIAL

Where specified on drawings, the surface of binding hardcore fill shall be blinded with sand, moistened as necessary, before the final rolling, to produce a flat smooth surface.

2.2.15. TEMPORARY WORK ETC.

The Contractor shall provide, protect, place and compact fully against structures, membranes or buried services in sequence and manner which will ensure stability, avoid out-of-balance situations and avoid any damage. The Contractor shall design any temporary support necessary to ensure stability during filling and submit details thereof.

2.2.16. COLD WEATHER WORKING

No frozen materials or materials containing ice shall be used for filling. Fill shall not be placed on a frozen surface.

2.2.17. FORMATION

The formation level shall be defined as the top of subgrade. This is the bottom of the final excavation upon which the sub-base is laid.

2.2.18. REMEDY FOR FROST ACTION

Any material which has been affected by frost shall be removed and after thawing re-compacted in accordance with Clause 3.6 Performance and Tests.

2.2.19. TOLERANCES

The permissible deviations of the formation levels as defined in Clause 1.1.3 from the position shown or calculable from the Drawings and with reference to the nearest datum level shall be as follows:

Beneath mass concrete foundations	+/- 25mm
Beneath ground bearing slabs and RC foundations	+/- 15mm
Beneath road construction.	+/- 25mm
Embankment and cutting slopes.	+/- 50mm

2.3. Form work

2.3.1. SUITBALE FORMS — Forms shall be made of steel and edges shall be truly square. Approval of other (proprietary or otherwise) systems may be granted upon written permission by the Engineer.

2.4. Vibrator

2.4.1. VIBRATING SCREEDER — A vibrator screeder may be used provided that care is taken to ensure that an upward camber greater than the tolerance limit is not built into the floor.

2.4.2. POKER VIBRATOR — A poker vibrator must be used at corners and edges of the bay.

3. Construction

3.1. General

3.1.1. CASTING — All concrete shall be poured under cover or within a weather tight enclosure/building.

3.2. Sub-base

3.2.1. COMPACTION — Compaction to be carried out as per previous section.

3.2.2. JOINTS — Joints in the polythene must be made with a double fold or lapped at least 150mm and sealed with a moisture resistant adhesive.

3.3. Base Slab

3.3.1. CASTING — Unless otherwise agreed, the floor shall be cast in long strips and of a width suitable for use of a standard screeder. The concrete shall be thoroughly vibrated particularly at edges and corners.

3.3.2. REINFORCEMENT — The slab is to be reinforced with a top layer of mesh as shown on the relevant drawing, unless otherwise agreed with the Engineer, or such is indicated on the Engineers drawings.

3.4. Finish

3.4.1. POWER FLOATING — After the initial set has taken place i.e. (when the floor can be walked on without deep imprint) the surface shall be power floated for the first time using a mechanical disc trowel.

3.4.2.	FINAL FINISH	At least one further trowelling is required within 1½ hours to 2 hours (of the disc trowel) using a rotary blade type trowelling machine. The final trowelling should be carried out at such a time that considerable pressure is required to make any impression on the surface. A steel trowel finish by hand should be used at all edges and corners.
3.4.3.	LAITANCE	Care should be exercised when trowelling to avoid bringing an excess of laitance to the surface.
3.4.4.	REMOVAL OF LAITANCE	Any laitance appearing should be removed and not trowelled back into the topping.
3.4.5.	VACUUM DE-WATERING	The Engineer will be prepared to consider the use of vacuum de-watering process provided the Contractor can demonstrate suitable experience in this process.
3.4.6.	SURFACE GRINDING	The Engineer will be prepared to consider the use of surface grinding as an alternative to Mechanical Trowelling providing the the Contractor can demonstrate suitable experience in this process.

3.5. Curing

3.5.1.	MINIMUM RETENTION OF FORMWORK	Formwork shall be left in position for a minimum of 48 hours.
3.5.2.	MINIMUM CURING TIME	The concrete shall be cured for at least 7 days by keeping the surface continuously moist and covering with polythene, straw matting or Frost Blankets as appropriate. An approved curing agent may be used only on written agreement by the Engineer.

3.6. Joints

3.6.1.	LOCATION OF JOINTS	The location and construction of all joints shall be as shown in the Engineer's Floor G.A Drawing. Alternatively, the Engineer will be prepared to consider Contractor proposals, subject to fully detailed submission written in an appropriate time frame to allow approval.
3.6.2.	SAW CUTTING JOINTS	Saw cutting of joints shall be carried out no later than 24 hours (max) after casting the portion of slab or earlier should the concrete have achieved sufficient strength without damaging the arises.

3.6.3. SEALING OF JOINTS GENERALLY — All joints shall be sealed off with an approved sealing. The joint shall be taped on both sides to ensure a mushroom head on the sealer.

3.6.4. SEALING SAWN JOINTS — Sealing of sawn joints shall be carried out immediately the joint are formed.

3.7. Precautions

3.7.1. BASIC PRECAUTIONS — The following areas are those which cause the greatest problems in completed slabs.

a) Lack of proper curing.
b) Incorrect timing of power floating.
c) Incorrect timing for saw cutting and forming joints
d) Use of screeds with rounded edges.
e) Lipping of concrete over screeds.
f) Improper vibrator at edges and corners.
g) Inappropriate slab/surface moisture content and curing for applied finishes.

4. Tolerances

4.1. Variation of Plan

4.1.1. PLAN TOLERANCES — Variation in construction bay width on plan. In any metre length +/-5mm. Maximum for 12.00 metres of more +/-12mm.

4.2. Variation from specified level

4.2.1. FLOOR FLATNESS AND LEVELNESS — Floor Flatness and Levelness shall follow the guidance and requirements as set-out in Concrete Society Technical Report No. 34 (TR34) and as amended below. Unless noted otherwise or elsewhere, the following building floor classifications shall be achieved.

	Free Movement (FM) Areas	Defined Movement Areas
Ground floors generally in buildings (other than Industrial/ Warehouse/Manufacturing/Open Plan Retail etc and as set out below)	FM3	
Industrial/Warehouse/ Manufacturing/Open Plan Retail and Buildings containing wide	FM2	Category 2

aisle racking with stacking or racking over 6m high and less than 10m high		
Buildings with defined movement where Materials Handling Equipment (MHE) lift height up to 8m	--	Category 1
Buildings with defined movement and high bay racking over 8m		Superflat (SF)

4.2.2. LEVEL TOLERANCES

Variation from level for sub-base shall be +0 -25mm.