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OUTLINE METHOD STATEMENT AND GENERAL SPECIFICATIONS FOR THE DEMOLITION AND RE-BUILDING OF AN EXISTING MASONRY WALL AT LADYSWELL, THOMASTOWN, CO. KILKENNY

INTRODUCTION

To facilitate the construction of a development of social housing at Ladyswell, Thomastown, Co. Kilkenny it is necessary to widen the existing public road approaching the development to provide a 6metre wide road with a 2metre wide public footpath.

The land required to widen the road can only be provided by removing the existing roadside boundary wall at the northern side of the existing public road.

The works to be carried out include the demolition and re-building of approximately 72 linear metres of the existing stone boundary wall approximately 3 metres behind the present location of the wall. The works also include the re-location of the existing open field drain at the rear of the boundary wall and the construction of a new road structure on completion of the wall re-construction.

Details of the proposed road widening works are shown on drawing no 19018-105-P1.

This document consists of an outline method statement only of the proposed works for planning permission purposes. It will be a requirement of the construction contract that the works contractor develop a Construction and Demolition Waste Management Plan for the proposed works prepared in accordance with the "Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects" (Department of Environment, Heritage and Local Government, 2006). The contractor must also ensure that all demolition material is managed, stored and disposed of in an appropriate manner in accordance with all relevant waste legislation.

RECORDING

All masonry to be dismantled for re-use must first be recorded such that the coursing of the original masonry, where it exists, is preserved or in the case of random masonry to preserve the rhythm of the original construction.

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The method in all cases is the same which is to number all of the individual stones and when numbered to draw them on to a sheet of clear plastic with their reference numbers and with the commencement level benchmarked. In the case of ashlar masonry replication will be entirely dependent on conforming to the original jointing thickness. In the case of squared or snecked rubble the joint thicknesses may vary but the rebuilt work must conform to the original coursing. Random rubble masonry requires the retention of all pinning stones so that the rhythm and texture of the original may be replicated and where it is built to courses the same attention to coursing is essential.

GENERAL PROTECTION

The contractor shall begin by securing the site of the works to protect site operatives and the general public during the course of the works.

The Contractor should avoid damage to trees by erecting suitable fencing to create a tree protection zone for any trees in the area of the works to be retained.

The Contractor should also avoid damage to existing wall structures and culverts at the east side of the proposed works site by laying down plastic protection and by erecting suitable hoarding/fencing to create a protection zone for the walls and culverts ensuring that they are left undisturbed during construction work.

The Contractor should allow for measures necessary to ensure compliance with the traffic regulations.

FIELD DRAIN

The contractor shall begin by re-locating the existing open field drain at the rear of the stone boundary wall. The works shall be carried out during the summer months when there is no flow in the drainage channel and the risk of run off to the drainage channel is at a minimum. The contractor shall excavate a new drainage channel as indicated on the plans to match the original drainage channel in depth and profile. The new drainage channel shall terminate in the same location as the current drainage channel at the rear of the existing stone boundary wall facing onto Ladyswell Street.

DISMANTLING

Dismantling should always be done by hand starting with the removal of coping stones where they exist or dismantling the cap. Joints should then be raked out and the stones be prised out from the middle of the wall. Grinding discs are not suitable for removing the jointing mortar because of the risk of damaging the stonework. Original lime mortar can always be raked out using hand tools however where the original masonry has been repointed using sand and

cement mortar, its removal may prove difficult and may result in the loss of a small amount of masonry to create an initial opening so that all further stones would then be secured by a bedding and vertical joint only, which would make them easier to remove.

REBUILDING

On completion of the demolition works the contractor shall excavate into the existing ground to form a new reinforced concrete strip foundation for the re-construction of the boundary wall. The foundation shall be constructed in accordance with the Engineers design and shall be stepped so as to remain below the level of the adjacent ground following the existing ground levels along the length of the new foundation.

The contractor shall re-build the boundary wall to match the original wall construction re-using the original stone supplemented with additional stone as necessary. The stone should be bedded in lime mortar using a natural hydraulic lime mortar mix. The record template should then be used to check the stones for the correct position as the rebuilding progresses.

ROAD WIDENING

On completion of the boundary wall reconstruction the contractor shall construct the new road structure in accordance with the Engineers design and specification. The new road construction generally consists of a wearing Course of 40mm of dense bitumen macadam complying with B.S. 4987 on a base course of 60mm dense bitumen macadam complying with BS 4987. The wearing and base courses shall be rolled and compacted in accordance with the specification for roadworks.

The road surface shall be supported on a carriageway base consisting of 225mm dry bound macadam consisting of material conforming to Clause 804 D.O.E. on a road sub-base of 300mm minimum depth hardcore, which conforms with IS EN 13242 and Table E.1 from Annex E of SR 21 ‘Guidance on the use of I.S. EN 13242:2002 – Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction’.

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SETTING OUT

.01 Bench Marks

Establish a master benchmark on the site for the duration of the Contract. Relate the master benchmark to nearest benchmark and secondary BM shall be plus or minus 5mm.

.02 Setting Out Base Reference Lines

Set out the Works in accordance with the drawings. Establish, in an approved manner, base reference lines for setting out the Works and set out additional reference lines at the following maximum spacings:

Vertical	-	5m
Horizontal	-	10m

.03 Setting out Reference Levels

Establish reference levels at vertical intervals not exceeding 5m. The permissible deviation between any reference level and the master benchmark shall be plus or minus 5mm.

.04 Permissible Deviations, Reference Lines

The permissible deviation in the horizontal distance between two adjacent reference lines shall be plus or minus 5mm. The permissible deviations for the plumbness of the intersections of reference lines over the corresponding intersections of the base reference lines shall not exceed 5mm.

.05 Accuracy of Construction

The accuracy of the construction shall be in conformity to B.S. 5606: 1990 “Accuracy in Building”.

EXCAVATION AND EARTH WORKS

.01 Site Clearing

The Contractor shall demolish, break up and remove structures and superficial obstructions on the site in the way of or otherwise affected by the works. The Contractor shall clear each part of the site at times and to the extent required by the Engineer. Demolition shall be carried out in accordance with B.S. 6187: 2011 – "Code of Practice for Full and Partial Demolition".

.02 Excavation

All excavations are to be taken out strictly to the lines and levels shown on the drawings or to such further depths as may be ordered by the Engineer. The Contractor shall ensure that all excavations are carried out in an efficient and expeditious manner. They shall be cut to straight edges and to sufficient depths to receive the outline of the elements shown on the drawings. The excavations shall be kept dry, free from any excess of pools of water and in proper working condition. The Contractor shall ensure that during the course of the excavation the excavated material is placed to avoid any unnecessary obstruction to any thoroughfare and that all surplus excavated material is removed expeditiously at the conclusion of each section of the work. Excavation and earth works shall be carried out in accordance with B.S. 6031: 2009 – "Code of Practice for Earthworks".

.03 Types of Excavation

"Solid Rock" shall mean rock met with in excavation, which is of such size or position that it can be removed only by means of special rock breaking equipment or other special plant or explosives.

Materials encountered in excavations, unless specifically defined as rock, shall be classified as "Normal Excavation".

The Engineer's decision in the interpretation of rock will be binding.

Topsoil shall mean soil capable of supporting plant growth, containing plant remains, roots, and organic matter and of a darker colour than the underlying subsoil.

.04 Disposal of Excess Excavation

All materials arising from site clearance and excavation, which are surplus to or unsuitable for use in the Works, shall be disposed of off the site to tip provided by the Contractor.

.05 Topsoil Disposal

Topsoil excavated shall be reserved for reuse. Bushes, undergrowth or small trees, the trunks of which are less than 300mm in girth and 1 metre above ground level, tree stumps less than 100mm diameter, and hedges shall be uprooted and disposed of.

.06 Hedgerows

The Contractor shall not break through or otherwise disturb any hedgerow except where shown on the drawings. Where roads or service lines are parallel to hedgerows the Contractor shall keep excavations in the root zone of the hedge to a minimum, shall not strip topsoil nor deposit material beyond the limits of the designated working area and shall not run machinery between the excavation and the hedgerow. Any tree roots over 50mm diameter severed during excavation shall be cut cleanly back to sound wood and treated with 'Arbrex' or other sealing compound with the prior approval of the Engineer.

.07 Trees

The Contractor shall not fell or injure any tree, which is not within a designated working area. Excavated soil, rock, rubble or rubbish shall not be deposited under the canopy of any tree. No fires shall be lit under the canopy of any tree. No machinery shall be parked nor materials deposited under any tree.

.08 Compounds

Compounds shall be sited by agreement with the Architect/Engineer. No materials shall be deposited or machinery parked outside the agreed areas, which shall be fenced. No fuel oil or chemical product shall be stored outside a compound area, nor be permitted to flow onto adjoining ground.

.09 Fields and Grass Surfaced Areas

The Contractor shall restrict his access routes for construction to the lines of the proposed roads, underground services and fences, and shall not form other routes for access across grassed areas without the prior written agreement of the Engineer. Topsoil shall be stripped from all access routes prior to their use by any vehicle heavier than a light agricultural tractor or small tracked excavator.

.10 Topsoil Strip

Vegetable soil (topsoil) shall be stripped 225mm deep and stockpiled separately from subsoil, clay and rock. Topsoil shall be stripped from the full-designated working area for underground services and stacked parallel to the trench line. Topsoil stripped from all other works shall be stockpiled in the areas indicated on the Contract Drawings. Stockpiles shall not exceed 2 metres in height. Topsoil shall not be stripped when the ground is frozen or waterlogged.

.11 Loss of Topsoil

The Contractor shall be responsible for replacing, at his own expense, with good material any topsoil contaminated, slurried on, churned or compacted by heavy machinery.

.12 Pumping and Temporary Drains

The Contractor shall provide and maintain all the pumps, pumping channels, sumps, troughs, chutes, temporary drains and any other necessary equipment to collect and dispose of any water from trenches and excavations or whenever necessary from the works. If, owing to leaving the excavation open too long or neglecting to drain it properly, the bottom of a trench becomes unsuitable for laying concrete or pipes, the Contractor shall excavate the unsuitable material and replace it with 10N/mm² concrete, at his own expense.

.13 Explosives

The use of explosives shall not generally be permitted, however, should special circumstances arise where the Contractor wishes to use explosives, then the written consent of the Architect and Engineer will be required, but may not necessarily be granted.

Permission to use explosives shall not relieve the Contractor of any of his responsibilities for injury to persons or property.

.14 Support of Sides of Excavations

The Contractor shall, where necessary, support the sides of the trenches and other excavations by suitable timbering or metal trench sheeting in accordance with B.S. 6031: 2009 – "Code of Practice for Earthworks".

.15 Protection to Existing Building Structures and Services

The Contractor shall, as part of this contract, make all necessary provision for protecting, shoring, strutting, underpinning and supporting any buildings, structures, fences, cables, pipes or services which may be encountered, displaced or disturbed during the contract and must restore, replace or make good same to the reasonable satisfaction of the owner or interest concerned. He shall make allowance for this work in his tender.

.16 Obstruction of Roads

The Contractor shall not occupy or obstruct by his operations more than the allowable width of any road or street, which shall be as agreed with the relevant Local Authorities and Gardaí. If insufficient space shall then be left for public and private transit, he shall remove the materials excavated and bring them back again when the trench is required to be refilled, except in cases where the traffic can conveniently be diverted.

.17 Trenches for Sewers and Drains

Trenches for sewers and drains shall be excavated to a sufficient depth and width to enable the pipe and any specified or agreed joint, bedding, haunching and surrounding to be accommodated. The minimum depth of trench shall be such that the whole of the pipe is in original ground and that the cover on the pipes shall be not less than 1,200mm in roads and grass margins and 900mm in fields and open grass areas, unless otherwise agreed by the Engineer or shown on the drawing.

.18 Trenches for Sewers and Drains Through Rock

Where excavation for sewers is through solid rock, the rock must be cut out to a depth of 150mm below the level of the bottom of the pipes and replaced with 150mm of granular material Class B.

.19 Width of Trenches

The width of any trench for a single sewer or drainage pipe at the level of the pipe centre line shall be sufficient to accommodate the pipe and specified bedding, haunching or encasement. Working space to facilitate construction or to comply with Statutory Regulations for safety shall be deemed to be included in the construction price.

.20 Support for Sewers and Drains

Immediately following excavation of the trench pipes shall be laid and jointed on pipe bedding material. Brickwork or other hard materials shall **not** be placed under pipes for temporary support.

Pipe bedding shall generally consist of granular bedding as described below unless otherwise indicated on the drawings.

<u>CLASS B HALF DEPTH GRANULAR SUPPORT FOR RIGID PIPES.</u>

Granular material to B.S. 882: 1992

Pipe size (DN)	Nominal single size (mm)	Graded size (mm)

100 – 250	10	Not permitted
300 or greater	10,14 or 20	14 – 5 or 20 – 5

Material containing particles over 20mm or under 5mm shall not be used. Pipes shall be laid so that each one is in contact with the bed through out the length of it's barrel, bedding material being scraped away at each socket in the case of socketed pipes so that the socket does not bear on the bed. Beds shall be a minimum 100mm to a maximum 200mm thick and shall be haunched up to the half diameter of the pipe when it has been laid or aligned.

When pipes, drains, manholes and access appurtenances have been tested and approved the trenches are to be re-filled.

Backfill over and around pipes to a depth of 300mm above crown of pipe with a protective cushion of selected fill free from vegetable matter, rubbish frozen soil and material retained on a 40mm sieve, compacted by hand in 100mm layers. The remainder of the filling may then be placed in position in layers not exceeding 225mm in depth and each layer to be thoroughly rammed and water may be used in consolidating the filling.

CLASS P FULL DEPTH GRANULAR SUPPORT FOR FLEXIBLE PIPES.

Granular material to B.S. 882: 1992

Pipe size (DN)	Nominal single size (mm)	Graded size (mm)
100 – 250	10	Not permitted
300 or greater	10, 14 or 20	14 – 5 or 20 – 5

Lay and compact to a thickness not less than 100mm over full width of trench. Scoop out locally at couplings/sockets and lay pipes digging slightly into bed and resting uniformly on their barrels. Adjust to line and gradient.

After initial testing, lay and compact by hand more granular material to slightly above the crown of the pipe.

Backfill with a protective cushion of selected fill, free from vegetable matter, rubbish, frozen soil and material retained on a 40mm sieve. Compact by hand in 100mm layers to 300mm above the crown of the pipe. (100mm of granular material may be used in lieu).

The remainder of the filling may then be placed in position in layers not exceeding 225mm in depth, and each layer to be thoroughly rammed and water may be used for consolidating the filling.

CLASS Z CONCRETE SURROUND FOR RIGID PIPES

Concrete with minimum compressive strength of 10N/mm² as described in the specification.

Lay concrete blinding, 25mm thick over full width of trench and allow to set.
Lay pipes on blinding on folding wedges of compressible board to give a minimum 150mm clearance under the pipe. Anchor the pipeline or fill with water, if necessary, to prevent flotation.

Form vertical construction joints in surround at face of pipe joints using 18mm thick compressible board pre-cut to profile of pipe. Fill any gap between spigot and socket with resilient material to prevent entry of concrete.

After initial testing, place and compact more concrete for full width of trench to encase pipe to 150mm above crown or to other height as specified or shown on drawings.

The remainder of the filling may then be placed in position in layers not exceeding 225mm in depth, and each layer to be thoroughly rammed and water may be used for consolidating the filling.

CLASS Q GRANULAR SURROUND WITH CONCRETE PROTECTION FOR FLEXIBLE PIPES

Granular material as for Class P bedding. Lay pipes as per class P bedding.

After initial testing, lay and compact by hand more granular material to 75mm above crown of pipe. Rake out to form an even bed.

Widen trench above granular backfill by minimum 200mm each side of trench.

Cast minimum 150mm thick concrete slab on top of granular backfill with A393 mesh reinforcement. 50mm bottom cover to reinforcement.

If the excavated material is considered unsuitable for backfill, or if there is insufficient material available, the Contractor shall provide at his own expense sufficient suitable material to make up the deficiency.

The remainder of the filling may then be placed in position in layers not exceeding 225mm, in depth, and each layer must be thoroughly rammed and water may be used in consolidating the filling.

.21 Temporary Restoration of Surfaces

The filling in existing roads and other thoroughfares shall consist of backfilling in granular material similar to granular bedding described above, up to 600mm below the surface. The 600mm left shall be filled with drybound macadam to 75mm below the surface.

Private roads and car parks shall be reinstated to match the original construction, but, in any event, shall not be less than 75mm of dense bitumen macadam.

The Contractor shall provide bituminous macadam temporary surfaces to trenches in public roads and shall keep all temporary restoration in a condition that is safe and suitable for traffic and must from time to time, as required, make up any depressions or settlements.

.22 Maintenance of Surface

The Contractor shall maintain and uphold the surfaces of the trenches during the continuance of the contract, including the period of liability for maintenance, to the satisfaction of the Engineer in so far as trenches in public roads are concerned and shall have the surfaces properly inspected from time to time and shall fill in such portions as may sink below the level of the adjoining surfaces.

.23 Penalty for Excess Damage to Road Surface

The width of road surface, which the Contractor shall be, permitted to cut away or damage shall not exceed the width required for the trench. The Contractor shall take all necessary steps by timbering trenches etc. to prevent damage to the road crust outside the width required.

.24 Suitable Earth Filling

Suitable earth filling shall mean material arising from excavations, which is capable of being compacted as specified.

.25 Unsuitable Filling

Unsuitable filling material shall mean any of the following:

Perishable material, material from marshes or bogs, peat, stumps, topsoil, slurry or mud, material susceptible to spontaneous combustion, material in a frozen condition, clay or liquid limit exceeding 80% and for plasticity index exceeding 55, material having a moisture content exceeding the maximum permitted, which for cohesive soils shall be not greater that the soils plastic limit multiplied by 1.1.

.26 Hardcore

Hardcore shall mean hard, broken stone, free from unsuitable filling material and capable of passing through a 100mm diameter ring.

The Contractor shall ensure that unbound granular fill under floor slabs conforms with IS EN 13242 and Table E.1 from Annex E of SR 21 'Guidance on the use of I.S. EN 13242:2002 – Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction'.

The Contractor shall obtain material for hardcore only from a supplier who has tested and certifies that the hardcore is in accordance with quoted advice of SR 21.

.27 Imported Filling

Imported material for filling shall be uniformly graded gravel with stones larger than 150mm removed and have not more than 20% fines. The mix need not be washed and may have up to 20% clay content.

.28 Compaction of Fill

The Contractor shall compact and consolidate each layer of fill thoroughly. Each layer of fill is to be compacted until the full density of the soil is not less than 95% of the density obtained by compacting a sample of the soil at its in situ moisture content by the methods specified in B.S. 1377: 1990. Compaction of back fill to rising walls shall be undertaken at each side of walls in sequence to prevent damage to the wall.

.29 Cuttings in Rock

The slopes of cuttings shall be cleared of all rock fragments which move when prised by a crow-bar and shall be cleaned of all loose material.

.30 Forming of Embankment and other Areas of Fill

All earthwork material placed in or below embankments, below formation level in cuttings or elsewhere in works shall be deposited and compacted as soon as practicable after excavation. Embankments shall be built up evenly over the full width and shall be maintained at all times with a sufficient camber and a surface sufficiently even to enable surface water to drain readily from them.

Compaction of embankments and other areas of fill shall comply with this specification and the D.O.E. Specification for Road Works.

.31 Earthworks to be Kept Free from Water

The Contractor shall arrange for the rapid dispersal of water shed on to the earthworks or completed formation during construction, or which enters the earthworks from any source. Adequate means for trapping silt shall be provided on temporary systems discharging into permanent drainage systems.

.32 Filling Existing Watercourses

Where watercourses have to be diverted from the sites of embankments or other works, the original channels shall be cleared of all vegetable growths and soft deposits and carefully filled in with suitable materials deposited and compacted as specified.

.33 Ground Modelling

Topsoil shall be stripped over the full area of earthworks prior to deposition of fill material. Form earth mounds to levels and contours indicated on the drawings with excavated subsoil in layers not exceeding 300mm thick, consolidating each layer as the work proceeds. Grade the subsoil formation to flowing contours.

.34 Levels in Reinstatement

Make up levels over all excavations and ground modelling to allow for minimum depths of topsoil as follows:

Grass Areas	:	150mm
Shrub Planting	:	400mm

Allow for topsoil to stand 30mm proud of all kerbs, paths and manhole covers.

.35 Ripping in Preparation for Topsoiling

Prior to topsoiling, rip the subsoil formation thoroughly to a depth of 450mm with a single fine ripper at 1-metre centres, to produce an even fracturing of the surface. Ripping shall not be carried out when ground is too wet to show fracturing. Remove all rubbish, rubble and stones over 75mm diameter from surface.

.36 Topsoiling to Verges, Earth Mounds & Lawns

Spread topsoil evenly to depths and finishes specified herein. Topsoil shall be moved and spread only in dry weather. No work to topsoil shall be carried out when it is waterlogged, or if its moisture content is conducive to structural deterioration. Minimise compaction of subsoil and topsoil during spreading.

.37 Seeding for Grassed Area

Seeds shall be of certified varieties, and shall conform in all respects to the European Communities (Seed and Fodder Plants) Amendment Regulations, 1997. Seed shall be delivered to site in sealed bags, obtained from and sealed by a firm registered as a Seed Mixer under the said Regulations. Each bag of mixed seed shall be labelled in accordance with the Regulations.

Fertilizer shall be supplied to the site in bags bearing the name of the manufacturer and the analysis of the contents.

.38 Seeding of Grassed Areas

Cultivate 125mm deep with rotovator or flexible line cultivator to produce a tilth free from clods over 50mm diameter. Remove weeds, rubbish and stones over 50mm diameter. Grade level areas evenly to produce a maximum deviation of 75mm over a grade boned at 45 metres. Grade slopes to even, flowing contours. Maintain finishes as specified. Produce firm, even seedbed.

Spread fertilizer 18:6:12 (N:P:K) in two transverse applications at a total rate of 30 grammes per square metre.

Seven days after spreading fertilizer, broadcast the following seed mixture in two transverse applications at a total rate of 25 grammes per square metre.

Argotis tenuis 'Highland'	20%
Festuca rubra commutata 'Waldorf'	40%
Festuca rubra litoralis 'Dawson'	40%

Lightly rake or harrow to cover seed not exceeding 10mm deep. Roll lightly in prolonged dry weather.

Cut grass as follows:

1st cut:	cut to 75mm from 100mm
2nd cut:	cut to 50mm from 100mm
Subsequent cuts:	cut to 40mm from 75mm

Leave cuttings spread evenly over the surface.

Include for application of loxynil herbicide 'Actrilawn' to newly sown swards at 11.2 litres/ha.

Produce a sward of uniform colour, density and texture, free from weeds, from stones greater than 50mm diameter, and from pockets of smaller stones. Different species of grass shall be thoroughly mixed.

Reseed any areas which fail to germinate, make up and seed over any depressions which develop after seeding, and make good any areas not of the specified quality.

.39 Seeding of Meadows

Prepare for seeding as specified above and seed with commercial seed at the rate of 70kg./Ha.

Festuca rubra, rubra	70%
Poa pratensis	25%
Trifolium repens	5%

ROAD AND FOOTPATH CONSTRUCTION

.01 Specification for Road Works

The "Specification for Road Works" published by the Department of the Environment and "Recommendations for Site Development Works for Housing Areas" published by An Foras Forbatha, shall be read in conjunction with the following clauses. Taken together they shall form the Specification for Road Works to be undertaken under this Contract.

.02 Setting Out

Before works are commenced, the Contractor shall accurately set out on the ground the centre lines of all roads and sewers.

.03 Strip Topsoil

Topsoil shall be stripped to a depth of 225mm (minimum) over the areas to be occupied by roads and paths.

.04 Formation

The formation shall be well cleaned, properly shaped and graded to horizontal and vertical profiles shown and compacted by rolling to a firm and uniform surface and shall be kept free from mud and slurry.

The camber on the carriageway sub grade shall not exceed 1 in 36 or be less than 1 in 48.

Formation is to be kept free of traffic until the sub-base and base are constructed. Prior to sub-base construction all drains shall be completed.

Any soft areas shall be cut out and replaced with suitable hard dry filling material and again consolidated.

Provision shall be made for the removal of surface water from the edges of the formation.

.05 Formation over Trenches

After filling in of all trenches for drains has been completed and consolidated to within 150mm of the formation level of the roads, the remainder of the trenches shall be filled with hardcore 50mm maximum size, and thoroughly compacted so as to avoid any further settlement in the trenches. The remaining surface of the sub grade of the road shall be finally graded to correct formation level longitudinally and transversely.

.06 Filling

Filling shall consist imported fill as specified herein or in Clause 804 of the Department of the Environment Specification for Road Works ‘Granular Material Type B’ and shall be placed and consolidated in accordance with that specification. The final surface of filling shall be carefully levelled and graded finishing parallel to the profile of the finished road surface.

.07 Horizontal Alignments

Horizontal alignments shall be determined from one edge of the carriageway pavement surface unless otherwise shown on the drawings. The edge of the carriageway pavement surface as

constructed and all other parallel alignments shall be correct within a tolerance of ±13mm there from.

.08 Surface Levels of Pavement Courses

The levels of pavement courses shall be determined from the true finished road surface calculated from the vertical profile and crossfalls as shown on the drawings. Tolerances for surface levels shall conform to the requirement of the D.O.E. Specification for Road Works.

.09 Cold Weather Working

No material in a frozen condition shall be incorporated in the works but shall instead be retained on the site for use if suitable when unfrozen.

Material for use in road pavements shall not be laid on any surface, which is frozen or covered with ice.

Laying of materials containing tar or bitumen binders, or mixtures thereof, shall cease if the temperature of the surface to be covered is at or falls below 2 degrees Celsius. Where, however, the surface is dry, unfrozen and free from ice, laying may proceed at temperatures at or above 1 degree Celsius on a rising thermometer.

.10 Use of Surfaces by Construction Plant

Construction plant used on pavements or roadways under construction shall be suitable in relation to the material, condition and thickness or the courses it traverses so that damage is not caused to the subgrade or the pavement courses already constructed.

.11 Road Sub-Base

The road sub-base shall be made and constructed with 300mm minimum hardcore, which conforms with IS EN 13242 and Table E.1 from Annex E of SR 21 'Guidance on the use of I.S. EN 13242:2002 – Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction'.

The Contractor shall obtain material for hardcore only from a supplier who has tested and certifies that the hardcore is in accordance with quoted advice above of SR 21.

The sub-base material shall comprise of natural gravel crushed rock or crushed concrete, which shall be within the grading limits set out in the following Table:

Range of Grading	
BS Sieve Size	Percentage by Mass Passing
75.00mm	100
37.50mm	85 – 100
10.00mm	40 – 70
5.00mm	25 – 45
600µm	8 – 22
75µm	0 – 10

The particle size shall be determined by Test A7 of B.S. 1377:1990. The material passing the 425µm B.S. sieve shall be non-plastic.

Where the Contractor proposes to use the sub-base for constructional plant he shall, with the agreement of the Engineer, increase where necessary, the thickness and/or strength of the sub-base to accommodate the method of construction and the type of plant and vehicles which he proposes to use to avoid damage to the sub-base or the subgrade. Any permanent thickening shall be across the whole width of the pavements, unless otherwise agreed by the engineer. Temporary thickening shall not impede drainage of the sub-base or the sub-grade.

The road base shall be finished true to gradient and be blinded with quarry dust or other approved material to give a smooth closed surface.

Where local weak areas of sub grade strength occur increased construction thickness, as approved, shall be used.

.12 Compacting Sub-Base

The road base shall be compacted in accordance with the relevant clauses of the Specification of Road Works issued by the Department of the Environment.

.13 Maintenance of Sub-Base

On completion of the sub-base and until any surfacing is laid on it, the finished surface shall be maintained free from pot holes, ruts undulations, irregularities, depressions, loose material or other defects.

.14 Road Base

The carriageway base shall consist of 225mm dry bound macadam consisting of material conforming to Clause 804 D.O.E. specification, placed in two layers, or dry bound macadam in accordance with Clause 811 of the D.O.E. specification. The material shall be laid and compacted to comply with the Specification for Road Works issued by the Department of Environment.

.15 Base Course

The base course shall consist of 60mm dense bitumen macadam of 20mm nominal aggregate size complying with BS 4987:1993. The base course shall be rolled and compacted in accordance with the specification for roadworks.

.16 Wearing Course

The Wearing Course shall consist of 40mm of dense bitumen macadam complying with B.S. 4987:1993. The nominal maximum aggregate size shall be 14mm and the composition used shall be as specified for Wearing Course macadam in B.S. 4987 :1993 and shall be rolled and compacted in accordance with that standard.

.17 Footpaths (Roadway)

Footpaths to be constructed with a crossfall of 1 in 50 towards the roadway. The footpath base shall consist of minimum 150mm hardcore 50mm maximum size. It shall be finished true to gradient and shall be blinded with quarry dust or other approved material to give a smooth closed surface.

Footpath surfacing shall consist 40mm of dense bitumen macadam of 10mm nominal size to BS 4987: 1993.

Concrete footpaths, where specified, shall consist of 100mm thickness of in situ concrete except at entrance drives when the thickness shall be increased to 150mm, with wooden float finish expansion joints at 6m intervals. When tested under a 3,000mm straight edge, the surface shall not show a variation from true surface of more than 5mm.

The concrete shall have a minimum compressive strength of 20N/sq.mm at 28 days and a minimum aggregate size of 20mm. The concrete shall have attained full strength before exposure to the effects of construction equipment.

Expansion joints shall have located at 6m centres maximum spacing shall consist of 12mm flexcell or equal approved compressible filler. Point top of joint with 12mm x 12mm Expandite or equal approved High Duty Sealer.

.18 Kerbs

At carriageway edges kerbs shall show between 150mm and 200mm above the channel except at vehicular accesses where they shall be reduced to 40mm over channel.

The precast kerbs shall be 250mm x 125mm complying with I.S. 146 and shall be laid on a 150 thick base 300 wide concrete bed and haunch. Alternative kerb types at carriageway edges shall be subject to the Engineer's approval.

.19 Grass Margins

Grass verges shall be cleared of stones and rubbish, evenly graded and free from mounds and depressions. The soil level when compacted shall be at least 25mm above the level of adjoining kerbs or footpaths. Drainage of these areas shall be provided where necessary to prevent the lodging of water.

.20 Permanent Traffic Signs

Informative warning and regulatory signs, where specified, shall comply with the requirements of the Road Traffic Signs Regulations 1962. The pedestrian crossing beacons and lights shall also comply with the above Regulations.

The signs shall be reflectorised and self-finished and shall be mounted at the regulation height on self-decorated poles founded on 450mm square x 600mm deep concrete Grade 20 bases. The Contractor shall allow in his rates for all excavation and backfilling and also for standing the pole to the correct alignment.

.21 Road Markings

The road markings, where specified, shall be white or yellow continuous or intermittent lines, letters, figures, arrows or symbols laid to the requirements of the Road Traffic (Signs) Requirements 1962. Statutory Instrument No. 171 road marking paint shall be by an approved manufacturer and shall be suitable for applying by brush or mechanical means to cement concrete or bituminous pavement to give chemically stable film of uniform thickness and shall be either chlorinated rubber, one pack epoxy or alkyd bases.

White paint shall maintain not less than 6% by mass of titanium dioxide as a pigment conforming to Type A (anatase) or Type R (rutile) specified in B.S. 1851:1978.

Yellow paint shall be standard colour B.S. 381C:1996 No. 355 except where an alternative shade has been specified in the contract and contain not less than 6% by mass of a suitable yellow pigment.

The paint shall be supplied fresh and ready for use in sealed containers and stored in accordance with the manufacturer's instructions. The paint shall be applied with the use of thinners or other additives.

Paint shall be applied at a covering rate recommended by the manufacturer and approved by the Engineer.

Where markings are to be reflectorised with ballotini it shall be sprayed uniformly on to the set paint film at the rate of 400-500 g/sq.m. Ballotini shall comply with the requirements of B.S. 3262:1989 Clause 15.

The pavement shall be finished in the following manner to receive markings:

On surface dressing, all loose chippings shall be removed from the surface before applying markings.

Road marking materials shall only be applied to surfaces which are clean and dry. Markings shall be free from raggedness at their edges and shall be uniform and free from streaks. Carriageway lane and edge lines shall be laid by approved mechanical means to a regular alignment.

.22 Road Retention Membrane

"Terram" or other approved road retention membrane shall be placed in accordance with the manufacturers instructions where directed by the Engineers.

.23 Access Tracks

Where access tracks to existing manholes, tanks or other services exist on site the Contractor shall facilitate the Local Authority or Statutory Undertaker in maintaining access to such services.

.24 Connection to Existing Roadways

The existing road surface shall be reformed locally to satisfy the alignment of the proposed site roadways. The Contractor shall include for the breaking out and making good of the existing roadway to the requirements of the Local Authority. The Contractor shall determine the requirements of the relevant Local Authorities.

DAVIDKELLY
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General Specification for NHL (Natural Hydraulic Lime) Mortar, Grout and Concrete for External Use

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DEFINITIONS

Lime for mortar making is produced in three categories and each category has distinct product types or gradings within the category. The three categories are calcium lime - designated CL, hydraulic lime - designated HL and natural hydraulic lime - designated NHL.

Calcium lime (CL) also known as air lime, is produced as quick lime, dryhydrated lime and lime putty. It is used in mortar mixes and widely used in decorative plasterwork. It requires air-drying to set and the slow process of carbonation to produce hardness.

Hydraulic lime (HL) is a manufactured product which incorporates a pozzolan into calcium lime to produce a hydraulic set. They are designated HL 2, HL 3.5 and HL 5.

Natural hydraulic lime, NHL, is produced from rock, the composition of which, when burnt to lime, produces a lime with a hydraulic set. Natural hydraulic limes are produced in three strength categories, NHL 2, NHL 3.5 and NHL 5, depending on the temperature at which the limestone is burnt.

Hydraulic limes set by chemical reaction in the presence of water and do not depend on drying alone for set and hardness.

STRENGTH DESIGNATIONS

The strength designations for natural hydraulic lime, as set out above, are standardised throughout Europe and should bear the European standard EN 459. Hydraulic limes produced by the addition of pozzolan must also conform to the same classification as the natural hydraulic limes.

<u>This specification is for use with natural hydraulic limes only</u> for the production of site mixed building and pointing mortars. The substitution of HL designated limes or CL limes with site additives is not covered or permitted by this specification.

GENERAL SPECIFICATION

1.0 WALL CONSTRUCTION

1.1 General

The use of NHL mortars for bedding and jointing structural elements in a wall follows normal good practice for wall construction.

1.2 Building with Brickwork

Bricks, depending on their porosity, may need to be pre-wetted to avoid excessive suction and shrinkage of the mortar. Excessive wetting should be avoided as this may lead to instability and/or mortar runs.

1.3 Stone Masonry

The need for suction control in building with stone depends on the stone type. Hard limestones should need no advance wetting but soft porous sandstones and some soft limestones may need some pre-wetting but, generally, wetting of stone is unnecessary. Stones should be bedded with their long axis horizontal and any voids greater than normal bed thickness should be filled with pinning stones to allow for reasonable additional courses of masonry in a day's work and to avoid the shrinkage problems which may arise due to the use of excessive volumes of mortar.

1.4 Finishing

Pointing may be undertaken as a follow on operation in which case the joints should be raked back as set out in the following specification, but they may also be finished in a single operation,

in which case it is best to leave the mortar slightly proud and to return to it when it has started to dry, at which time it can be cut back and struck to the agreed pointing detail.

2.0 POINTING, REPOINTING AND GROUTING

2.1 Preparation

Joints for repointing need to be raked out to a depth at least equal to 2 times the thickness of the joint. Joints should be thoroughly cleaned and free of the roots of vegetation or any build up of humus. A variety of raking tools will be required for cleaning out joints. Many of these will be home made, but bent spikes and old hacksaw blades will be found useful. Chisels should not be needed on random rubble masonry. Pinning stones which have been disturbed during the raking out process shall be retained and re-set in their original position. Where pinning stones have been lost they should be replaced. The purpose of the pinning stones is to reduce the area of exposed mortar and so assist its long term durability. Pinnings should be inserted in large joints to reduce the depth of the joint to between 15mm and 20mm. Coarse aggregate recovered from raking out shall be retained and may be re-used after washing.

2.2 Suction Control

It may be necessary to apply water to reduce excessive suction especially on bricks and porous stone. This should be done the day before and, where necessary, several applications of water should be made with the last damping before repointing commences.

2.3 Procedure for Repointing

It is essential that the masonry is neither too wet nor too dry at the commencement of repointing and it is essential, therefore, that, in the preparatory stage, trials on suction control be carried out to determine the extent of pre-wetting so that the joints are just damp and not wet at the time of repointing. The mortar needs to be well compacted into the joint. To achieve this, a range of steel bars, curved to allow penetration into the joint and with a flat spatula like end, slightly curved, and of a width suitable to the joint, should be used to compact the mortar in place. Bars of varying width will be required for use in repointing on random rubble masonry walls. Pinning stones shall be inserted to reduce the joint thickness to a maximum of between 15mm and 20mm. The mortar should be struck off flush with the face of the innermost of the stones which form the joint. When the mortar is going off, but before it has hardened, the surface of the joint should be hammered with a stiff bristle brush which will raise the coarse aggregate in the mortar and have the effect of reducing the risk of cracking.

2.4 Grouting of Rubble Masonry

This is a technique for solidifying the core of a wall where the original mortar has decayed or perhaps where the core was not originally mortared and the inside and outside leaves of the wall have started to take on an independent existence. The procedure is relatively straightforward. It has to be preceded by the consolidation of the exposed masonry, by the removal of vegetation, the raking out and cleaning of joints and the repointing of joints. In the raking out process some joints are raked through to the core of the wall in a regular pattern and a plastic grout tube is fitted and held in place by the repointing mortar. On completion of the repointing, a lime grout sometimes containing an intrusion aid such as “casein” is pumped in using a hand operated grout pump and commencing at the lowest grout tubes. Grouting using a gravity system fed from an elevated tank may also be used, but the tank will generally need to be elevated by between 2 and 4 metres. Pumping continues until the grout appears at the next tube vertically. Both tubes are then temporarily plugged and the sequence continues along the wall and thence to the next level, etc. As the grout hardens the grout tubes can be withdrawn and the joints re-pointed. Grout, by virtue of its high water content, is not suitable for filling very large voids which may have to be opened up to allow sufficient access for conventional filling with mortar and small stones.

2.5 Removal of Cementitious Pointing

Cementitious pointing which is finished flush with the face of the masonry may not be amenable to removal without damaging the masonry if it is well bedded. In general, it is better not to attempt removal in those circumstances. Failed cementitious pointing should be capable of removal without the use of chisels. Very often, it is not inserted deep enough in the joint and with shrinkage can come loose. If pockets of cement pointing are difficult to move, holes can be drilled at right angles to the face to facilitate removal. Hand chiselling may be necessary after the initial removal in order to clean the joint back to the original mortar. Electric saws or discs must not be used. They are difficult to control and cause damage to the stone.

3.0 CURING AND PROTECTION

3.1 Curing

Completed work needs to be protected from direct sunlight or excessive drying by wind. Netted scaffolding would usually provide sufficient protection in that regard. Protection against rain will also be required during the first seventy-two hours. Plastic sheeting is generally adequate for that purpose. Work should not be started in frosty conditions, or with temperatures below 5º centigrade generally.

3.2 Shrinkage

Light shrinkage may occur on heavier joints during the first twenty-four hours. If this occurs spray on a light water mist and tap gently with the bristle brush to close the crack.

3.3 Protecting NHL Mortars

The setting properties of NHL mortars require the following protection:

Mortars Made With	Protect from Frost, Heavy Rain, Strong Wind or Direct Sun for minimum of:
NHL 5	48 Hours
NHL 3.5	72 Hours
NHL 2	96 Hours

The preferred form of protection is damp hession cover which, with re-damping, could also, in some cases, contribute to curing the mortar.

Plastic sheeting, when used for rain protection, should not be allowed to brush against fresh work.

Frost protection should be applied when frost is forecasted during the night or within the protection periods given above from completion of work. Work should not start in frost conditions or with temperatures below 5º centigrade generally but, when working with NHL 2 or in rendering with fine finishing coats, when the temperature is below 8º centigrade.

Protection from drying winds or hot weather must be provided for example by using shading sheets on scaffolding.

4.0 MORTAR MIXES

4.1 Mix Proportions NHL/Sand (based on NHL with a bulk density of 0.72kg/dm^3.)

TYPE OF MASONRY	SAND	NHL2	NHL 3.5	NHL 5
Soft Bricks/Soft Stone	(A)	1 : 2	1 : 2.5	-
Medium Brick/Medium Stone	(B)	1 : 1.5	1 : 2	1 : 2.5

Hard Dense Stone/Hard Brick	(B)	-	1 : 1.5/1 : 2	1 : 2

Sand A: Sharp Medium
Sand B: Sharp Coarse

Grit to match existing mortars in the range 8mm down to 5mm

4.2 Application of Mixes

NHL 2 mortar	for sheltered locations
NHL 3.5 mortar	for general use
NHL 5 mortar	for extreme exposure on permanently wet situations

4.3 Grout

Fine: Use neat lime or with casein added to aid intrusion and reduce water content.

Composition of neat lime:	NHL 5	-	max. 60 litres water per 25kg bag NHL
	NHL 3.5	-	max. 50 litres water per 25kg bag NHL
	NHL 2	-	max. 40 litres water per 25kg bag NHL

Coarse: Use sharp medium sand (A) as per grading below.

Composition:	NHL 5	-	1 25kg bag NHL + 60 litres of sand + 60 litres of water (max.)
	NHL 3.5	-	1 25kg bag NHL + 50 litres of sand + 50 litres of water (max.)
	NHL 2	-	1 25kg bag NHL + 40 litres of sand + 40 litres of water (max)

The maximum amount of water includes the water contained in the sand. Water should be added to obtain a paste of the required fluidity, to a maximum as set out above. If casein, to a maximum of 1% by weight, is added, water may be reduced by between 25% and 50%.

4.4 Concrete (Limecrete)

Sand B: Sharp Coarse

Gravel: 12mm – 15mm clean washed gravel or crushed limestone.

Lime: NHL 5

Mixed Proportions:	NHL 5	:	Sand	:	Gravel
	1	:	1.5	:	2.5

Procedure: Mix the sand and lime for approximately 15 minutes before adding in the gravel. The final volume of gravel may need to be reduced slightly to aid workability, particularly with crushed stone. Keep the water content to a minimum to reduce shrinkage. The consistency should be that of a fat mortar which will require tamping when being placed.

4.5 Sand Gradings

Ideal Grading for:

Sharp Medium Sand (A)	**Size mm**	**% Passing**
	2.36	100
	2.00	98
	1.25	88
	1.0	83
	0.63	70
	0.4	52

	0.315	42
	0.2	25.5
	0.125	10
	0.075	0
Sharp Coarse Sand (B)		
	3.35	100
	2.0	95
	1.25	85
	1.0	81
	0.63	68
	0.5	60
	0.4	51
	0.315	41
	0.2	25
	0.125	10
	0.075	0

4.6 Comparison of Typical Bulk Densities of Natural Hydraulic Lime Sources

Manufacturer	RBD (kg/dm^3)	Factor	% difference in volume of lime
Roundtower	0.636	1.00	-
Cal Hidraulica	1.00	1.57	+57
Jura-Kalk	0.91	1.43	+43
St. Astier	0.72	1.13	+13
Castle	0.72	1.13	+13
Otterbein	0.68	1.07	+7

4.7 Storage of NHL in Bags

The bags of lime shall be stored off the ground (e.g. on pallets) in a weatherproof well ventilated store. Naturally Hydraulic lime produces a set when mixed with water and therefore must be kept dry until used.

4.8 Mixing of Mortar

A normal mixer (used for general mortar mixing) may be used. First introduce half of the sand, followed by all of the lime for the mix. After two to three minutes mixing (dry) add the remaining half of the sand. Add the water slowly until workability is achieved. Mix for twenty minutes, minimum, or longer for improved workability with less water. (The less water used to achieve the desired workability the less shrinkage in the finished work).

5.0 HEALTH AND SAFETY RELATIVE TO THE USE OF LIME

Dry bagged lime and lime mortar is caustic and can dehydrate the skin. When using lime it is advisable to wear gloves and protective overalls and goggles, and if working with lime for prolonged periods, to protect exposed parts of the body with a barrier cream. A dust mask should be worn when handling the dry lime from the bag and from bag to mixer or in any situation where lime dust may be released.