HL Structural Engineers

BELOW GROUND DRAINAGE SPECIFICATION

PROJECT SPECIFICATION

JOB: TOXTETH FOOD CENTRAL

CLIENT: SQUASH NUTRITION

JOB NO: 0195

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INTRODUCTION

This specification accompanies the below ground drainage drawings and details for the new Toxteth Food Central in Liverpool.

This Specification should be read in conjunction with Drainage Drawings D-L-001, D-L-002, D-D-003 and D-D-004.

SITE SAFETY

General Site Safety
The Contractor shall throughout the duration of the Works have full regard for the safety of all persons entitled to be on Site and shall provide for the appropriate measures to ensure safety of all concerned.

SCOPE OF WORKS

The scope of works associated with the Below Ground Drainage installation are, but may not necessarily be limited to:

- Drainage surveys
- Trench excavation;
- Installation of drainage pipework, service mains and ducting;
- Setting out of all drainage pipework, service mains and ducting works;
- Construction of manholes, draw pits and valve chambers;
- Protection of open excavations during construction;
- Connection to existing infrastructure and sewers
- Reinstatement;
- Testing and commissioning of all works within the Contract;
- Production of test certification;
- Liaising with Building Control and other regulatory/statutory bodies;
- Production of As-built Drainage Drawings, Details, and Schedules.

SUB-STRUCTURE

The substructure design has been carried out by HL Engineers.

BELOW GROUND DRAINAGE

The below ground drainage systems have been designed to comply with the requirements of the current editions of:

- BS EN 752 – Drain and Sewer Systems Outside Buildings.
- Sewer for Adoption 7th edition.

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- Building Regulation Part H - Drainage and Waste Disposal.

The new foul and surface water drainage networks shall be installed as two completely separate gravity systems, which connect to the external drainage network.

Surface Water Drainage

This system will receive surface water flows from the roof drainage system and external pavement areas. Surface water flows will be transported to the external drainage network by gravity flow.

All surface water branch drains shall connect to external manholes. Access for cleaning and maintaining the below slab surface water drainage system shall be provided via rodding points in the above and below ground drainage system and via the external manholes.

All drainage pipework that passes through the substructure shall be installed in epoxy coated cast iron to BS EN 877.

All drainage pipework and fittings installed within concrete pads or ground beams shall be installed in epoxy coated cast iron to BS EN 877.

Unless otherwise stipulated, all drainage pipework and fittings shall be installed using vitrified clayware to BS EN 295-1 and laid in a Class S Bed and Surround. All drainage pipework shall be jointed using flexible polypropylene couplings with EPDM ring seals.

All below ground drainage pipework and fittings shall be installed in conjunction with the specified manufacturer's installation requirements.

The surface water drainage shall be trapped prior to connection to sewer. This will be achieved via the use of individual water traps or via a primary interceptor trap serving the entire system. Individual water traps will not be permitted below the building footprint.

All drainage pipework that passes below a ground beam or pad foundation shall have a cork or polystyrene 'soft pack' installed the full width of the trench. Refer to standard drainage details for clarification.

All drainage pipework penetrations through substructure gas or damp proof membranes shall be sealed in accordance with the membrane manufacturer's requirements.

All drainage pipework and fittings with less than 300mm cover over the crown of the drain shall be encased in a Class A3 concrete bed and surround.

All internal rodding eyes in public circulation areas shall be infill pattern and double sealed. Refer to drainage detail sheets for confirmation of access cover specifications.

Foul Water Drainage

This system will receive soil and waste flows from sanitary fittings and kitchen drainage. Foul water flows will be transported to the external drainage network by gravity.

All foul water branch drains shall connect to external manholes. Blind drainage connections shall not be permitted below the building footprint.

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Access for cleaning and maintaining the below slab foul water drainage system shall be provided via rodding points in the above ground drainage system and via the external manholes.

The foul water drainage system shall be installed using vitrified clayware to BS EN 295-1 and laid in a Class S Bed and Surround. All foul water drainage pipework shall be jointed using flexible polypropylene couplings with EPDM ring seals.

All foul drainage pipework that passes through substructure shall be installed in epoxy coated cast iron to BS EN 877.

All foul water drainage pipework and fittings installed within concrete pads or ground beams shall be installed in epoxy coated cast iron to BS EN 877.

All below ground drainage pipework and fittings shall be installed in conjunction with the specified manufacturer's installation requirements.

All drainage pipework that passes below a ground beam or pad foundation shall have a cork or polystyrene 'soft pack' installed the full width of the trench. Refer to standard drainage details for clarification.

All internal rodding eyes in public circulation areas shall be infill pattern and double sealed. Refer to drainage detail sheets for confirmation of access cover specifications.

All drainage pipework penetrations through substructure gas or damp proof membranes shall be sealed in accordance with the membrane manufacturer's requirements.

All external drainage pipework with less than 300mm cover over the crown of the pipe shall be installed in a Class A3 concrete bed and surround.

BELOW GROUND DRAINAGE SPECIFICATION

Standards

Ground work for the installation of drainage shall be in accordance with the current editions of the following:

- BS 6031.
- BS EN 752.
- BS EN 1295-1.
- Sewers for Adoption - Water Services Association - 7th Edition.
- Building Regulations - Part H

Pipework and manholes

Pipe and fittings shall be obtained from one manufacturer only. Joints shall be made using gaskets supplied by the pipe manufacturer only.

Pipes shall be evenly and solidly bedded. After making the joint, side fill material shall be carefully packed around it.

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Manhole cover and frame types shall be set square to structure or kerb lines.

Ductile iron manhole covers and frames shall be manufactured to BS EN 124, and coated with bitumen.

Steel manhole covers and frames shall be manufactured to BS EN 124, and coated with bitumen or be hot dip zinc-coated to suit finishes.

Two sets of manhole lifting keys for each type of manhole shall be provided.

All internal manholes shall be constructed using pre-fabricated polypropylene chambers with bolted access channel construction, manufactured by Pipex Ltd.

Food Production Kitchen

To prevent the ingress of fats oils and grease (FOG's) from entering the below ground drainage system, all waste outlets from the food production kitchen area shall discharge through a below ground gravity separator. The separator shall be installed adjacent to the kitchen area in an external location to facilitate cleaning and maintenance. The separator installation shall conform to the requirements of BS EN 1825 part 1.

Testing

Interim tests shall be carried out before backfilling and suitable anchoring provided. Interim test certificates shall be submitted for acceptance prior to backfilling.

Final tests shall be undertaken on completion of the works and surface reinstatement.

Work that fails tests shall be completely re-tested after defects have been rectified.

Statutory Undertakings

Arrangements shall be made for the relevant Statutory Undertaker to lay and connect communication pipes and manholes from their service up to and including boundary chambers, stop valves and meters.

Records

All ground works including existing and disused land drains, thrust block etc. shall be recorded on record drawings.

General Site Clearance, Trenches & Reinstatement

Site Clearance

Site clearance and preparation shall include:

- Secure stacking of materials deemed suitable for re-use.
- Disposal of unwanted material.
- Generally clearing the site at all times.
- Correct disposal of contaminated material.

Holes caused by clearances shall be filled with selected material and compacted to the surrounding ground level.

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Undergrowth and trees shall be cleared from the line of trenches. Trees, shrubs or hedges shall not be removed unless authorised.

Excavation

Appropriate supports shall be provided.

Open excavation shall be minimised and excavations shall be free of water at all times.

Temporary de-watering sumps shall be constructed clear of permanent works. Discharged water shall not be disposed of into the permanent works.

Material suitable for backfill shall be protected and placed at a safe distance from excavations.

Disused Drains & Obstructions

Disused drain shall be completely filled through its entire length with pulverised fuel ash/ ordinary Portland cement to a 7:1 ratio.

Disused manholes shall be removed and the excavation backfilled and compacted.

Old foundations within excavations shall be broken out and cleared away. The excavation shall be backfilled and compacted.

Trenches

Trench widths shall be as shown in the table below. Trench widths apply from the bottom of the trench to a level 450mm above the crown of the pipe.

Pipe Nominal Diameter (mm)	Minimum Trench Width (mm)	Maximum Trench Width (mm)
100	450	525
150	490	600
225	580	700
300	680	750

Trenches shall not be greater than these dimensions. Where the specified width is exceeded, to the detriment of the support of any of the pipe, the overdig shall be refilled with ST2 concrete.

The sides of the trench shall be vertical, with no undercutting, from the formation level to a height 450mm above pipe crown levels.

Where pipes are in made up ground, the ground shall first be compacted to 450mm above their crown level before the trench is excavated.

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Soft spots at trench formation level shall be removed and filled with suitable material then compacted to the required level.

Over-excavation below formation level shall be backfilled then compacted to the required level.

Materials for Pipe Bed & Surrounds

Porous concrete and drainage backfill aggregate shall consist of 40mm single size coarse aggregate.

The nominal mix proportions shall be 165kg of cement to 1m3 of aggregate unless otherwise specified.

Granular material shall comply with BS EN 1610, Table B15.

Vitrified Clay Pipes & Fittings

Vitrified clay pipes and fittings shall comply with BS EN 295-1.

Concrete Bed & Surround

Where soft trench conditions occur, 50mm ST2 concrete blinding shall be provided to the full width of the trench.

Where persistent wet conditions occur, a sub-drain and granular bedding shall be provided below the blinding.

Concrete bed and surround shall be grade ST4 to minimum depth of 100mm.

The full length of the pipe shall be bedded. The concrete shall be sufficiently plastic to permit adjustment of level.

When set the bedding shall be cleaned before the concrete surround is placed carefully and evenly on both sides of the pipe.

Granular Bed & Surround

Granular material shall be to BS EN 1610 Table B15.

Bed and surround shall be carefully placed in shallow layers to the full width of the trench until the required depth of surround is obtained.

Where ground water runs through the trench, water-stops shall be provided at manholes and at 20m intervals along the drain.

Water-stops shall be constructed across the excavation and the trench. The waterstops shall be proprietary clay/bentonite matting and extend above the height of the bedding.

The water-stops shall be constructed clear of pipe joints and with a flexible joint within 300mm of either side of the water-stop.

Drains through Structures

Flexible joints shall be positioned at 150mm and 750mm from the face of the structure.

Drains less than DN150 within 300mm of the underside of a concrete slab or footing shall be encased in 150mm of concrete.

Manholes & Chambers

Open manholes shall be suitably protected.

Infill type manhole covers shall be filled to the manufacturer's recommendations, and to match the surrounding surface finish. Covers must be securely fixed within frames and in their final location before infill is applied.

Invert channels shall be accurately finished to a smooth, curved surface with either purpose-made channels or in situ concrete finish.

Channels greater than 600mm diameter shall be fitted with a 10mm closed-link galvanized steel safety chain fitted to the outgoing pipe.

The sides of main channels above half diameter shall be vertical up to the level of the soffit of the inlet pipe.

The soffits of the incoming and outgoing pipes shall be level or to the mean gradient of the drainage run.

The chamber shall be tested before casting the rough benching.

Corbelled brickwork shall not oversail the course below by more than 30mm.

Concrete lintels or arched brickwork shall be provided above DN300 or larger drains.

Precast concrete rings shall be selected to ensure backdrop rodding eyes do not occur at chamber rings joints.

Pipework Testing

All drains and sewers shall be tested with air after being laid and jointed, but before surround and backfilling is commenced, to ensure that the jointing is satisfactory.

A water test shall be carried out after the completion of backfilling and manhole construction, the length tested being between manholes.

A further water test shall be carried out on to ensure the nominal bore of the drain is clear of any restriction.

Air tests shall be applied using method L3 in Table 3 of BS EN 1610.

Manhole Testing

Manholes shall be tested using the procedure below:

- Manholes shall be sealed, and filled with water to a level 1.5m above the channel invert, or 0.5m above the highest connection and left for 1 hour.
- Any drop in the water level shall be made good and no more water added for 30 minutes.
- At the end of this period, if the water has not dropped in level by more than 25mm, the manhole shall be regarded as satisfactory.
- If the drop is more than 25mm, the leakage shall be located and rectified, and the manhole re-tested.

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Manholes constructed below the ground water table shall have all outlet pipes closed by means of expanding stoppers. After a period of 30 minutes, if water has entered the manhole at a rate of 0.40 l/m2 or more, the manhole shall be deemed unsatisfactory and remedial works undertaken.

CCTV Surveys

The entire Below Ground Drainage System shall be surveyed with CCTV and the recorded footage and defects report shall be submitted for inspection prior to the commencement of the Above Ground Sanitation and Rainwater installation. The purpose of this survey is to check that the drainage system has been installed correctly in accordance with Construction Drawing information. Final acceptance of the installed system will not be given until the survey information has been viewed and approved.

AS-BUILT INFORMATION

The Contractor shall be responsible for producing a comprehensive set of as-built drainage drawings, details, and manhole schedules for inclusion into the Health & Safety file.

SCHEDULE OF PIPEWORK AND FITTING MATERIALS

Service	Pipe	Fittings & Valves
Gravity Foul Water	Epoxy coated Socketless Cast Iron to BS EN 877	Flexible mechanical joints to BS EN 877 with EPDM ring seals. (For pipes passing through concrete foundations)
	Vitrified Clay to BS EN 295-1	Plain ended pipework and fittings, flexible couplings, EPDM ring seals.
Gravity Surface Water Drainage	Epoxy coated Socketless Cast Iron to BS EN 877	Flexible mechanical joints to BS EN 877 with EPDM ring seals. (For pipes passing through concrete foundations)
	Vitrified Clay to BS EN 295-1	Plain ended pipework and fittings, flexible couplings, EPDM ring seals.
	Thermoplastics solid wall pipes BS 4660 or BS 5481 or BS EN 1401 (PVC-U), BS EN 1852-1 (PP) BS EN 12666-1 (PE)	

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