PROJECT No: 1823

PROJECT TITLE: Herne House

CLIENT: Impressive Erections

SPECIFICATION FOR BELOW GROUND DRAINAGE

T01	FOR TENDER	MAC	SH	JS	14/06/19
Revision	Purpose/ Description	Originated	Reviewed	Authorised	Date

R12 DRAINAGE BELOW GROUND

To be read with Preliminaries/General conditions, Architectural, Landscape Architect, M & E Engineers and Ground Contamination Consultant drawings and specifications.

Ensure that the local Authority and Building Control are fully aware for the proposed installation that they have all the necessary documentation and that approval has been gained before commencement of works on site. All work shall be in accordance with the 'Civil Engineering Specification for the Water Industry 7th Edition'.

Design: Design of the below ground drainage system is in accordance with:

- Building Regulations 2002 – Approved Document Part H;
- Sewers for Adoption 7th Edition;
- BS EN 752:2008 Drain and sewer systems outside buildings;
- BS 12056-3:2000 Gravity drainage systems inside buildings. Roof drainage, layout and calculation;
- BS EN 1610:1998 Construction and testing of drains and sewers.

GENERALLY

100 EXISTING DRAINS:

- Before starting work, check invert levels and positions of existing drains, sewers, inspection chambers and manholes against information shown on drawings and report any discrepancies to Contract Administrator (CA).
- Adequately protect existing drains where retained and maintain normal operation during construction.
- All existing drainage which forms part of the new works including sewer connections to be CCTV surveyed at the earliest opportunity on acquisition of the site.

102 WORKMANSHIP:

- Comply with BS 8000: part 14.

103 SEQUENCE OF WORK:

- Any temporary suspension of drainage services to the existing site is to be agreed with the client and the CA well in advance of any operations taking place.

104 APPROVALS:

- Ensure that the Local Authority, Water Company and Building Control are fully aware of the proposed installation; that they have all the necessary documentation and that approval has been gained before commencement of works on site.

106 IN-SITU CONCRETE:

- Unless specified otherwise, in-situ concrete for use in drainage below ground to be to BS 8500 as shown in the table below or an equivalent or higher grade mix subject to approval:

Application	**Concrete mix**
Trench backfill	C10, ST2 or GEN1
Structural protection to pipelines Surrounds to chambers, separators and tanks Concrete bagwork Bed and surround to drainage channels	C20, ST4 or GEN3 with SR cement
Plain concrete in structures (e.g. manhole bases)	C20, ST4 or GEN3 with SR cement
Reinforced concrete (e.g. chamber cover slabs)	RC30

- Different mixes may be used for different parts of the drainage work.
- All mixes to suit a DS-4 Design Sulphate Class and an AC-3s ACEC classification.
- Wearing screeds (previously known as "high strength toppings" or "granolithic finish") for benching to be to BS 4483-2, class AR3/Ws or AR3/DF or better.

107 AS BUILT RECORDS:
- Keep marked up copies of drawings showing 'As Built' information.
- Maintain records of inspection and test.
- Details of all products installed should be provided within the O&M manual. This should also contain information on all associated cleaning and maintenance requirements.

108 REDUNDANT DRAINS:
The following methods should be used as appropriate subject to building control recommendations:
- The drain run should be removed in its entirety and sealed at the manhole/branch connection.
- The drain run should be filled with a weak mix concrete or cement grout to prevent collapse (this may not be necessary if the drain is under the building as it may be encased in concrete).
- The drain can be sealed at either end by the use of concrete plugs.
- Extend the drain to above ground level and seal with proprietary blank caps.

It will not be necessary to extend the drain above flood level of fittings if the redundant drain is effectively sealed and made watertight, this is also essential to prevent foul smells from entering the building.

108R WORKS AROUND RETAINED TREES:
- Any excavation works undertaken around retained trees must comply with the requirements of the landscape Architect and tree preservation officer (where applicable).

109 EXECUTION
Study all drawings and specifications to familiarise with the structural and architectural details and the work of other trades.
- Ensure that the work under this section will not interfere with those of other trades and are compatible with the architectural finishes, prior to placing orders, fabrication and installation.
- Coordinate with electrical and mechanical works to ensure drainage elements do not clash with other services.
- Furnish necessary templates, patterns, setting out plans and other items for incorporation in the works or for leaving necessary provisions for the work. Ensure timely placement of sleeves, inserts and the like.
- Where work is installed in close proximity to or will interfere with other works, assist in working out satisfactory space arrangements. Prepare composite site drawings to a suitable scale showing how the work is installed in relation to other trades.

110 QUALITY CONTROL
- For each product specified, provide from same manufacturer throughout where possible to the CA.
  - Test certificates from approved independent laboratories, accreditation or testing agencies shall be furnished at no extra cost if required by the Contract Administrator or Municipality.

- Maintain uniformity in respect of connection standards, (socket or flange if required) throughout.
- The drainage works shall be executed by contractors engaged in the installation of drainage works as their primary business for at least five (5) years as approved by the Local Authority.

111 DELIVERY, STORAGE AND HANDLING

- Deliver products to site, store and protect.
- Store plastic and uPVC pipes on elevated racks only.
- Store plastic and uPVC pipes out of direct sunlight.
- Keep ends of pipes closed with factory manufactured plugs to prevent entry of foreign matter.
- Repaint ductile iron and cast iron fittings with factory recommended paint prior to installation where factory coating has been damaged.

112 ABOVE GROUND DRAINAGE SYSTEMS

- Surface water and rainwater drainage:
  - Internal systems as detailed by DMWR Architects/Silcock Dawson Ltd. Refer to their drawings for connection and configuration of the internal drainage system;

- Foul drainage:
  - Internal systems as detailed by Carmel MEP. Refer to their drawings for connection and configuration of the internal drainage system;

TYPE(S) OF PIPELINE

154 PLASTIC PIPELINES: For Surface Water or Foul Water Drainage.
- Pipes: PVC-U with BBA Certification.
- Bends and fittings: Agrement Certified.
- Manufacturer and reference: Wavin 'Plastidrain' or similar.
- Size(s): DN100, DN150, DN225.
- Assumed type of subsoil: Refer to Site Investigation.
- Bedding: Type S or Type Z

155 PLASTIC PIPELINES: For Surface Water or Foul Water Drainage.
- Pipes: Polypropylene with BBA Certification.
- Bends and fittings: Agrement Certified.
- Manufacturer and reference: Wavin 'Twinwall' or similar.
- Size(s): DN100, DN150, DN225.
- Assumed type of subsoil: Refer to Site Investigation.
- Bedding: Type S or Type Z

157 CLAY PIPELINES: For Surface Water or Foul Water Drainage.
- Pipes, bends and junctions: Vitrified Clay to BS EN 295-1, with flexible joints, Kitemark certified
- Manufacturer: Hepworth or similar approved
- Size(s): up to DN300
- Assumed type of subsoil: Refer to Site Investigation.
- Bedding: Type S or Type Z

160 CONNECTORS - WASTE PIPES TO ABOVE GROUND DRAINAGE
- Material and standard: Plastics to BS 4660 and Kitemark certified.
- Type: Osma or similar approved.

162 DESIGN – BELOW GROUND DRAINAGE SYSTEMS:
Design: Complete the design of the below ground drainage system in accordance with BS EN 752-1, -2, -3 and -4, BS EN 1295-1 and BS EN 1610.
Proposals: Submit drawings, technical information, calculations and manufacturers' literature.

EXCAVATING/BACKFILLING

201 EXISTING DRAINS:
Setting out: Before starting work, check invert levels and positions of existing drains, sewers, inspection chambers and manholes against drawings. Report discrepancies.
Protection: Protect existing drains to be retained and maintain normal operation if in use.

205 EXCAVATED MATERIAL:
- Unless otherwise specified, set aside turf, topsoil, hardcore, etc. for use in reinstatement.

206 SELECTED FILL FOR BACKFILLING:
Selected fill: As-dug material, free from vegetable matter, rubbish, frozen soil and material retained on a 40 mm sieve.
- Compaction: By hand in 100 mm layers.

210 LOWER PART OF TRENCH:
- From bottom up to 300mm above crown of pipe the trench must have vertical sides and be of a width as small as practicable but not less than external diameter of pipe plus 300mm or larger dimension if specified.

220 LOWER PART OF TRENCH:
- Where the depth of cover exceeds the transition depth for the size of pipe, trench width up to 300mm above crown of pipe to be not more than:

Nominal pipe size DN	100	150	225	300
Transition depth (m)	6.0	5.4	4.0	2.9
Maximum trench width (mm)	600	700	800	900

221 LOWER PART OF TRENCH:
- Where bedding class S is specified (see clause 370) trench width to be not more than the following, regardless of depth of cover:

Nominal pipe size (DN)	100	150	225	300
Maximum trench width (mm)	600	700	800	900

230 ASSUMED TYPE OF SUBSOIL:
- Where the type of subsoil at the level of the crown of the pipe differs from that stated for the type of pipeline, obtain instructions before proceeding.

240 FORMATION FOR BEDS GENERALLY:
- Excavate to formation immediately before laying beds or pipes.
- Remove mud, rock projections, boulders and hard spots and replace with consolidated bedding material.
- Harden local soft spots by tamping in bedding material or Type 1 sub-base material.
- Inform CA in advance to give him reasonable opportunity to inspect excavated formation for each section of the work.

250 COMBINED TRENCHES:
- Where one pipe is at a lower level than another adjacent pipe in a common trench:
- A subtrench is permissible provided the soil of the step is stable and unlikely to break away.
- If a subtrench is not permissible, the whole trench must have a depth related to the lower pipe, with increased thickness of bedding to the upper pipe as necessary.
- The lower pipe must be backfilled with compacted granular material to not less than half way up the higher pipe.

260 TRENCH SUPPORTS:

- Remove trench supports and other obstacles sufficiently to permit compacted filling of all spaces.

270 BACKFILLING TO PIPELINES GENERALLY:

- Unless specified otherwise, backfill from top of specified surround or protective cushion with material excavated from the trench, compacted in layers not exceeding 300mm thick. Do not use heavy compactors before there is 600mm of material over pipes.

280 BACKFILLING UNDER ROADS AND PAVINGS:

- Backfill from top of specified surround or protective cushion up to formation level with Granular base Material Type 1 to Specification for Highway Works, Clause 803, laid and compacted in 150mm layers.

281 BACKFILLING OVER CONCRETE:

- Do not start backfilling within 24 hours of placing concrete. Do not use heavy compactors and prevent imposition of traffic loads within 72 hours of placing concrete.

290 TEMPORARY BRIDGES:

- Provide temporary bridges over trenches as necessary to prevent construction traffic damaging pipes after backfilling.

BEDDING/JOINTING

310 INSTALLATION GENERALLY:

- Obtain pipes and fittings for each pipeline from the same manufacturer unless otherwise specified. Joint differing pipes and fittings with adaptors recommended by pipe manufacturer.
- Lay pipes to true line and regular gradient on an even bed for the full length of the barrel with sockets (if any) facing up the gradient.
- Joint using recommended lubricants, leaving recommended gaps at ends of spigots to allow for movement.
- Adequately protect pipelines from damage and ingress of debris. Seal all exposed ends during construction.
- Arrange the work to minimise time between laying and testing. Backfill after successful testing.

370 CLASS S GRANULAR SURROUND:

- Lower part of trench width to be as clause 221.
- Granular material: BS 882 and BRE Digest 433:

Pipe size (DN)	Nominal single size (mm)	Graded size (mm)
100	10	Not permitted
150	10 or 14	14 to 5
225 - 375	10, 14 or 20	14 to 5 or 20 to 5

- Lay and compact to a thickness not less than 50mm for sleeve jointed pipes, 100mm for socket jointed pipes, over full width of trench. Where trench bottom is uneven due to hard spots or other reason, increase depth by 100mm. 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 more granular material in 100mm layers to 150mm above crown of pipe.
- When laying in very soft ground provide a stable foundation to the trench comprising 600mm of compacted gravel and 50mm concrete blinding all surrounded in an infiltration geotextile.

461 CLASS Z CONCRETE SURROUND:

- Concrete mix as specified under Generally.
- 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 flexible 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.
- When laying in very soft ground provide a stable foundation to the trench comprising 600mm of compacted gravel and 50mm concrete blinding all surrounded in an infiltration geotextile.

470 TRENCHES LESS THAN ONE METRE FROM FOUNDATIONS:

- Where bottom of trench is lower than bottom of foundation, use Class Z concrete surround as clause 461. Top of concrete to be not lower than bottom of foundation.

480 TRENCHES MORE THAN ONE METRE FROM FOUNDATIONS:

- Where bottom of drainage trench is below a critical level, (defined below) Class Z concrete surround as clause 461 is to be used, the top of the concrete being not lower than the critical level.
- For the purpose of this clause the critical level is D mm lower than level of foundation bottom, D mm being equal to the horizontal distance of the near side of the trench from the foundation, minus 150mm.

490 CROSSOVERS:

- Where two pipelines (other than plastics pipes) cross with less than 300mm separation, surround each with Class Z concrete surround as clause 461 for not less than 1 m centred on the crossing point. Extend length of concrete surrounds as necessary to within 150mm of next nearest flexible joints.

512 PIPELINES PASSING THROUGH STRUCTURES:

- Where pipelines must be cast in or fixed to structures (including manholes, catchpits and inspection chambers) provide short length or rocker pipes near each external face, with flexible joint at each end:

Pipe size (DN)	Distance to first joint from structure (mm)	Short length (mm)
100 to 225	150	600
300 to 525	225	600

- Where pipelines need not be cast in or fixed to structures (e.g. walls to footings) provide either:
- short length or rocker pipes as specified above, or
- openings in the structures to give 50mm minimum clearance around the pipeline and closely fit a rigid sheet to each side of opening to prevent ingress of fill or vermin.

515 PIPELINES PASSING THROUGH WALLS, SLABS AND MANHOLES:

- Where pipes pass through structural slabs, walls and manhole walls a water stop is to be installed on the penetrating pipe by using either of the following methods:
- A puddle flange is to be installed on the pipe to prevent the passage of water along the pipe.
- An expanding rubber seal as Hydrotite or similar to be wrapped around the pipe to form a water stop.

520 BENDS AT BASE OF SOIL STACKS:

- Unless specified otherwise, use a 90 degree nominal rest bend with a minimum radius of 200 mm to centreline of the pipe.
- Invert of horizontal drain at base of stack to be not less than 450 mm below the finished floor level FFL or 450mm below the centreline of lowest branch pipe.

525 DIRECT CONNECTION OF GROUND FLOOR WCS TO DRAINS:

- Drop from crown of WC trap to invert of drain must not exceed 1.5 m.
- Horizontal distance from the drop to a ventilated drain must not exceed 6 m.

530 RIGID BACKDROP PIPES:

- Outside the manhole wall: Encase with not less than 150mm of concrete as specified under Generally. All excavation beneath the backdrop pipe and its surround must be replaced with concrete.

570 FLEXIBLE COUPLINGS:

- To BS EN 295-4, WIS 4-41-01, or Agreement certified.

- Manufacturer and reference(s): Flex-Seal
- Ensure that the ends of pipes to be joined are cleanly cut and square.
- Ensure that outer surfaces of pipes to be joined are clean and smooth. Where necessary, e.g. on concrete or iron pipes, smooth out mould lines and/or apply a cement grout over the sealing area.

580 PERMEABLE GEO-TEXTILE

- Manufacturer and reference: Terram 1000 or similar approved.
- Install in accordance with the manufacturer's recommendations and advice.
- Manufacturer to provide specialist advice on suitability of geo-textile.
- To be installed;
  - As geo-textile wrapping to soakaway crates and permeable paving

TERMINAL/ACCESS FITTINGS

611R BIN STORE GULLY
- Manufacturer and reference: Osma Yard Gully gully (Ref 4D800) (trapped with removable silt bucket) or similar approved, with Class B125 grating (Ref 4D810).
- Install in accordance with manufacturer's recommendations
- Bed and surround with minimum 150mm mix ST4 concrete

622R CHANNEL DRAIN:
- Manufacturer and reference(s): ACO Multidrain M100D 0.0 Constant Depth Channel (ACO Product Code: 23100) 135mm overall width, 150mm overall depth, invert depth 130mm
- Grating: C250 ACO Heelguard slotted ductile iron grating at Building Thresholds
- Load Class: C250 in pedestrian areas
- Bed and surround with minimum 150mm of Mix ST4 concrete

680 MANUFACTURE:
- Obtain each complete assembly of fittings, traps, etc., including appropriate couplings, from the same manufacturer, and check compatibility of components with each other and with the pipe system.

690 INSTALLATION OF FITTINGS:
- Set fittings square with and tightly jointed to adjacent construction as appropriate. If open to doubt obtain instructions.
- Bed and surround fittings, traps, etc. in concrete, 150mm thick, mix as specified under Generally.
- Permissible deviation in level of gully gratings to be +0 to - 10 mm,
- Fit purpose made temporary caps over exposed openings in fittings and protect from site traffic.

MANHOLES/CHAMBERS/TANKS

720R ORIENTATION OF MANHOLE CHAMBERS AND COVERS
- All manhole/inspection chamber covers, gratings and step irons to be orientated on site to ensure alignment with external pavings and kerbs.

741R 450mm/600mm DIAMETER PLASTIC INSPECTION CHAMBERS: Surface Water and Foul Water Drainage (Type 3A and 3C)
- Plastic inspection chambers: To BS EN 13598, Kitemark certified.
- Manufacturer and reference: Wavin 'Range 450 IC' or 'Range 600 IC' Inspection Chambers' or similar approved.
- Bed and surround: Minimum 150mm GEN 3 concrete or pipe bedding material as specified on the drawings
- Cover support: 225mm deep x 150mm wide GEN3 concrete collar (where required).
- Access covers and seating: As Clause 811R and 812R.

757 SURFACE WATER SOAKAWAY UNITS:
- Location: As shown on general arrangement drawings; minimum cover depth 750mm
- Size: As shown on general arrangement drawings.
- Manufacturer and reference: TBC by Contractor
- Storage Units: Interlocking modular cell units typically Wavin Aquacell Core, or similar approved
- Bed and Surround: TBC by Contractor when manufacturer chosen
- Installation to be in strict accordance with manufacturer/supplier requirements and details.
- Protection from vehicular loading must be provided where there is likely to be construction vehicle loading in the short term (to be in accordance with the recommendations of the actual suppliers of the attenuation units).

811R ACCESS COVERS AND SEATING: External to building
- Covers:
  - Foul water: 450x450mm and 600x600mm single sealed, solid, ductile iron covers to BS EN 124.
  - Surface water drainage: 600x600mm single sealed, solid, ductile iron covers to BS EN 124.
- Manufacturer: Manhole Covers Ltd or similar approved.
- Load class B125 within pedestrian areas and D400 within vehicular areas.
- Covers to align with nearby paving.

835 LIFTING KEYS:
- Provide suitable lifting keys for each type of access cover and hand over to the Employer at Practical Completion.

861R CONNECTIONS TO SEWERS:
- Connect new pipework to existing adopted sewer(s) to the requirements of the Sewerage Undertaker or its agent.

CLEANING/TESTING/INSPECTION

900 CLEANING:
- Flush out the whole of the installation with water to remove all silt and debris before final testing, before CCTV inspection if specified and immediately before handover.
- Safely dispose of washings and any detritus without discharging them into sewers or watercourses.

910 TESTING/INSPECTION GENERALLY:
- Give CA advance notice to allow the opportunity to attend all tests and inspections.
- Give the Statutory Authority appropriate notice to enable pipelines to be inspected and tested as required.
- Provide water, assistance and apparatus as required.
- All lengths of drain, manholes and inspection chambers must pass the tests specified. If permitted test loss or infiltration is exceeded, remedy defect(s) before re-testing after an appropriate period.

920R TESTING GRAVITY DRAINS AND SEWERS:
- To ensure that all pipelines are sound and properly installed, air test short lengths to BS 8000-14, paragraph 5.1.4.4 immediately after completion of bedding/surround.
- For final checking and statutory authority approval, water test to BS 8000-14, clause 5.1.4.3 all lengths of pipeline from terminals and connections to manholes/chambers and between manholes/chambers.

940 WATER TESTING OF MANHOLES/INSPECTION CHAMBERS:
- Before backfilling test each manhole or chamber in accordance with BS 8000-14, clause 5.1.4.5 for:
- Exfiltration: Drop in water level to be not more than relevant dimension in Table 2.
- Infiltration: Inflow to be not more than 5 litres per hour per manhole.

970 CCTV INSPECTION PIPELINES:
- Prior to practical completion and prior to the defects expiry period, carry out and record internal inspection of all underground/underslab drainage with CCTV equipment.
- Provide all necessary equipment, including suitable covered accommodation for viewing monitor screen, together with personnel experienced in operation of the equipment and interpretation of the results.
- Ensure that adequate intensity of illumination within pipe(s) is maintained. Provide for continual position recording, still photographs and stopping movement of the camera at any point requested by CA.
- Obtain instructions from CA on remedying any defects which may be revealed.

APPENDIX A:
TEST RECORD SHEETS

DRAINAGE TESTING RECORD SHEET

Test Sheet No __ of __

Project Title	Job or project No:
Date:	File Ref.:
Test Sheet Prepared By:	Circulation:

Purpose of Test: Interim - ☐
Final - ☐

System Tested (tick as applicable) : Foul Drainage - ☐
Surface Water Drainage - ☐
Combined Drainage - ☐
Cavity Drainage - ☐
Land Drainage - ☐

Other (State) …….

Type of test undertaken: Water - ☐ Air - ☐ Other (State) ……

Section of system being tested: (Description i.e. between manholes) ……
……
……
(Or attach part copy highlighted drawing to define pipeline or system being tested)

Test results: Pass - ☐ Fail - ☐

Upon failure of testing state corrective measures undertaken:…….
……
……
Observation comments noted during testing: ……
……
……

Contractor's representative – (Print name) …….

(Sign) …….

CA's representative (if in attendance) ……

(Sign) ……..

Building Control / District Surveyor (if in attendance) …….

(Sign) ……..