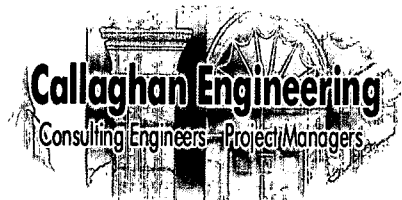


**D.9 MECHANICAL SERVICES
PERFORMANCE SPECIFICATION**

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REV	DATE	BY	REVIEWED	APPROVED	ISSUED FOR
A	08.02.06	DM	HH	DO'C	ISSUE FOR INFORMATION
B	08.03.06	DM	HH	DO'C	ISSUE FOR INFORMATION

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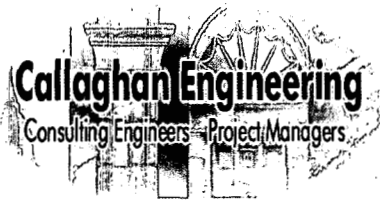
APPROVALS FOR PURCHASE OR CONSTRUCTION

CE PROJECT MANAGER

DATE

CLIENT PROJECT MANAGER

DATE

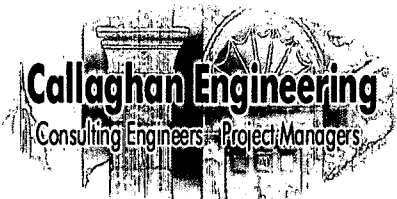


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1.0 INTRODUCTION

1.1 Description of Project

The new design and build facility consists of a two storey building with a basement effluent storage tank area. The building consists of the following:

- Basement effluent tank and treatment units – 11.0m X 11.7 X 5.0 high
- Ground floor warehouse
- Ground floor production areas
- Ground floor laboratory areas
- Ground floor electrolysis area
- Ground & first floor offices

1.2 Programme

The new build is programmed to start on site in March 2006 and to be completed by the end of the year.

2.0 SCOPE OF WORK

2.1 Services

This performance specification outlines the mechanical systems and design requirements for the mechanical services to be installed. Drawings indicating the areas requiring heating, ventilating, and comfort cooling are included in section 17 of this specification. The mechanical services contractor will be responsible for the design, supply, installation and coordination of the complete mechanical services installation for this new facility

The services provided area summarized as follows:

- Dedicated gas fired boiler and flue system
- LPHW heating system for part of the offices
- Split type comfort cooling installation in the offices
- Airconditioning installation for the Laboratory areas with the air handling unit located on the mezzanine level and the air cooled chiller located externally beside the offices.
- Unit heater installation in the raw materials general store
- Roof input units in the blender areas
- Extract ventilation in the Production areas P11, P10, & P5. The other production rooms to have fully louvred doors on both sides of the room.
- Specific input/output ventilation system for the MSA Room (P1)-to be completely self contained and separate from the rest of the plant area.
- Specific input/output ventilation system for the electrolysis room
- Specific input/output ventilation system for the Rectifier room
- Specific extract ventilation(EXrated fans) system for the P7 Flammable mixing room
- Specific extract ventilation(EXrated fans) system for the Flammable store
- Basement Effluent tank area ventilation system.
- Toilet extract ventilation systems
- General extract ventilation system in general stores-roof fans
- Chilled water cooling system
- Domestic cold and hot water system with water storage tank for the offices



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- Above ground drainage system for the office toilets
- Process cold water system and storage tank for the Production area wash down system
- All independent testing, balancing and commissioning of all systems to full operation
- All accessories
- Detailed as installed drawings
- Detailed co-ordination of services

2.2 Specific Standards and Codes

The following and any other relevant standards and codes shall apply to the Contracts Works:

- Irish Building Regulations & Technical guidance Documents
- CIBSE Design Guides & Technical References
- BSRIA Technical References.
- HVAC Specification for Sheet Metal Ductwork: DW/144
- British Standard 476:Part 24:1987: Fire Tests on Building Materials and Structures. Method For Determination of the Fire Resistance of Ventilation Duct
- ISO 6944:1985: Fire Resistance Tests- Ventilation Ducts
- HVAC Document: TR117 guide to good practice cleanliness of ventilation system.
- British Standard 5588: Part 9: 1989: Fire Precautions in the design, construction and use of buildings. Code of practice for ventilation and Air-conditioning ductwork
- BS 5454:2000: Recommendations for Storage & Exhibition of Archival Documents
- All relevant Irish, British and European Standards and Codes of Practices
- The ETCI Rules for Electrical Installations
- The Factories Act, 1955
- The Offices Premise Act, 1958
- S.I. 1972 No. 3 Factories (Electricity) Regulations, 1972 and 1979
- Safety, Health & Welfare at Work Act No. 7 of 1989
- Safety, Health & Welfare at Work (General Application) Regulations 1995
- Safety, Health and Welfare at Work (Construction) Regulations 1995
- Construction Regulations, 1995
- All other relevant legislation, Health and Safety, Employment, Environmental Fire Safety Building Regulations and Road Traffic Document as acted by the Irish Government

3.0 BASIS OF DESIGN

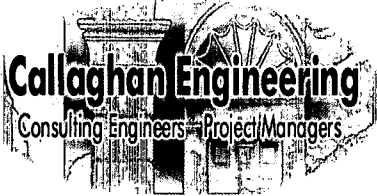
Following are the parameters used in the design, selection and sizing of plant and equipment to be procured as part of the Mechanical Services Contract.

1. External Air Conditions

Summer	24°C d b.	20°C w.b.
Winter	-2°C Saturated	

2. Internal Air Conditions (Minimum)

Toilet	18°C ± 1°C
Staircases	18°C ± 1°C
Entrance	16°C ± 1°C



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General Stores	16°C ± 2°C
Blending Area	18°C ± 2°C
Laboratory Areas	20°C ± 2°C
Offices	20°C ± 2°C

3. Ventilation Rates

a. Toilets	10 air changes/hour extract
b. Blending areas	3 air changes/supply
c. Laboratory area	15 air changes/supply/return/extract
d. Basement Effluent Tank area	10/20 air changes/supply/extract 2 speed operation

4. Infiltration Rates (for heat loss purposes)

a) Offices	2 air changes/hour
b) Warehouse	3 air changes/hour

5. Thermal Performance of Building Fabric

Overall Maximum Elemental 'U' Values

a) Walls	0.37 W/m ² °C
b) Roof	0.25 W/m ² °C
c) Floor	0.37 W/m ² °C
d) Glazing	3.6 W/m ² °C

6. Internal Heat Gains

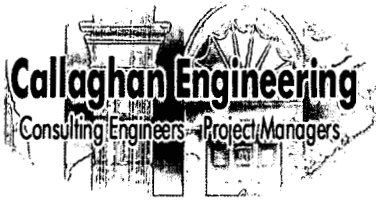
Lights	20 W/m ²
Equipment (offices only)	20 W/m ²
People	90 W _s /60W _L per person

7. Mechanical Services Plant Noise Levels

a) Reception Lobbies	NR30
b) Toilets	NR40
c) External Plant	NR45@10m

8. Pipe Sizing Criteria

Nominal Diameter (mm)	Maximum allowable pipe velocities (m/s)	Max Pressure Loss
10	0.25	300 Pa/m
15	0.30	
20	0.50	
32	0.65	
40	0.80	
50	1.00	
65	1.20	
80	1.50	
100	1.50	



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9. Duct Sizing Criteria

Maximum air velocities:

Diffuser connection ductwork	3.00 m/s	1 Pa/m
Extract air ceiling void ductwork	4.0 m/s	
Supply air ceiling void ductwork	4.0 m/s	
Branch ductwork	5.00 m/s	
Main riser and plant room duct	7.00 m/s	

Aspect ratios shall not exceed 4:1

10. Filtration

EU4/EU9 – No HEPA filter required on laboratory AHU.

11. Maintenance

Adequate plant access shall be provided.

All moving parts, bearing, shafts, etc shall be removable without impact on other plant items.

No dusting of fibrous materials shall be used with ductwork without a protective barrier.

Independent isolation, drainage and commissioning of all items shall be easily achieved.

The systems shall be durable and reliable.

4.0 DESCRIPTION OF WORKS

4.1 General Stores

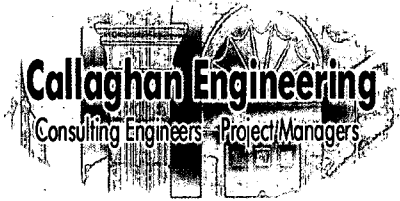
The general stores area shall be by high level unit heaters supplied from LPHW heating installation with a flow and return temperature of 82°C / 71°C. The unit heaters shall be supplied by Liberty Industries Limited.

Mounting Height	=	6.0m
Unit Output	=	45kW
Entering Air Temperature	=	15°C
No. of units Heaters	=	6

4.2 Blending Area

This area shall be served by roof input fresh air units as supplied by Liberty Industries Limited. The roof input units shall be complete with roof cowl, fresh air input fan, recirculation section, filter sections, heating coil sections and 4 way discharge diffusers .

Unit Ref:	RIU 500/S
No. of Units:	4



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4.3 Laboratories

The R & D laboratories L1, L2 and sample store shall be air-conditioned by a dedicated AHU package / chiller installation.

The air handling unit shall be located on the mezzanine level with the packaged air cooled water chiller located externally beside the office block. A minimum of 15 air changes/hour shall be supplied to the laboratories by a fresh air re-circulated air handling unit. The air handling unit shall contain pre panel filter, mixing box, bag filter EU8, cooling coil, heating coil supply fan, and return/extract fan.

4.4 Production Areas

Rooms P4, P3 and P2 shall have fully louvred doors on both sides of the room. Room P11 and P10 shall have one louver door with wall mounted extract fans sized to give 10 air changes/hour extract in the area.

The flammable store shall have an ex rated extract fan with the supply air taken from the general store area.

The tin electrolysis room and rectified room shall have side wall external and input fans.

4.5 Basement Effluent Tank Farm

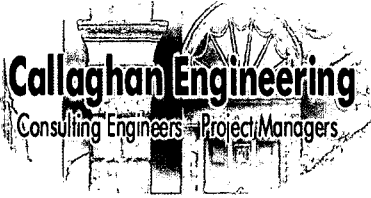
The tank chamber which is 5m high is to be mechanical ventilated by a dedicated supply and extract air system. Oxygen sensors shall be installed in the exhaust duct which will give an low oxygen alarm signal to a sounder and flashing strobe light located at the entrance to the basement tank room.

The exhaust fan will be ducted directly to the atmosphere with 100% fresh air. Both supply and exhaust system will be able to operate on high / low speed basis. Exhaust ducting shall run the full length of the tank room.

4.6 Ground Floor and First Floor Offices

The following areas shall be served by split type comfort heating / cooling cassette type heat pumps units.

▪ Dining Area	-	2 X 7.5kW Cassette Unit
▪ Material Manager	-	1 X 5kW Cassette Unit
▪ Reception	-	1 X 5kW Cassette Unit
▪ Emergency Room	-	1 X 5kW Cassette Unit
▪ Managing Director	-	1 X 7.5kW Cassette Unit
▪ Accounts	-	1 X 5kW Cassette Unit
▪ Conference Room	-	1 X 10kW Cassette Unit
▪ Sales Office	-	2 X 10kW Cassette Unit
▪ Sales Manager	-	1 X 5kW Cassette Unit
▪ Operational Manager	-	1 X 5 kW Cassette Unit
▪ Production Office	-	1 X 5kW Cassette Unit
▪ Maintenance Manager	-	1 X 5kW Cassette unit
▪ Documentation ISO	-	1 X 7.5kW Wall Mounted



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The system serving the cassette units in this office shall be the R410A super MMS range with simultaneous heating and cooling to each unit as supplied by G.T. Phelan Limited (Toshiba Units).

The outdoor units (MMY-MAP 3211HT8) shall be located at ground floor level outside the office block.

The computer room shall be served by an independent wall mounted split type system (10kW heating / cooling Toshiba).

The remaining rooms in the offices shall be heated by LPHW radiator system. The internal male and female toilets shall be mechanical ventilated.

The male and female changing rooms shall be mechanically ventilated by an independent ventilation system. The entrance doors to the changing rooms shall be louvred.

4.7 Boilerhouse Installation

A cast iron sectional boiler shall be dedicated to serve the unit heater installation, roof input units, laboratory air handling unit and the radiator heating system. The boiler size shall be a minimum size of 650kW. The boiler shall be a Buderus cast iron gas fired boiler as supplied by C&F Quadrant. The stainless steel flue shall be sized to match the boiler output and vertical height.

5.0 HEATING INSTALLATION

5.1 Pipework & Fittings

L.P.H.W. Heating pipe work shall be fabricated from medium quality black mild steel to B.S. 1387: 1985 and shall be suitable for use for the temperature, pressure and operating conditions of the system.

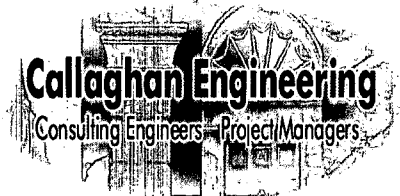
Pipe fittings shall be the same size as the pipes to which they are connected. Bends shall be long radius and all tees shall be swept pattern. Flanges shall be raised face slip-on boss type and comply with BS 4504 and secured to the pipe by screwed connection or welded connection.

Screwed fittings of black malleable iron type shall comply with BS 143 and BS 1256: 2000. Screwed fittings of cast steel type shall comply with BS EN 10241:2000. Gaskets shall be to BS 3063 or BS EN 1514 as applicable. Thread compound shall be PTFE tape to BS 6956 or BS 7786 as appropriate.

All pipe joints on space heating and cooling pipe work, except where pipe work is run exposed on the surface and where pipes connect to valves and equipment, etc., shall be welded joints with weld fittings to BS 1965.

5.2 Valves

Valves shall be suitable for the systems into which they are connected. The type and appearance of valves shall be consistent throughout the installation.



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Valves shall have the manufacturer's name, material designation, pressure rating and size clearly marked on the outside of the body. Isolating valves shall be fitted such that each circuit of each installation and each item of equipment can be isolated.

Isolating valves for heating installations up to and including 50mm dia. shall be ball valves to BS 5159 or BS 5351 as applicable with carbon steel body, stainless steel ball, PTFE seat and S.W. or screwed BSP ends.

Isolating valves for heating installations 65mm dia. and over shall be cast steel butterfly type to BS EN 593. Isolating valves for chilled water installations 65mm dia. and over shall be cast iron butterfly type to BS 5155 with EPDM seat, stainless steel shaft and aluminium bronze disk to suit BS4504 flanges.

Double Regulating valves shall be variable orifice double regulating globe type to BS 7350, BS 5152 or BS 5154 as applicable. Valves up to and including 50mm dia. shall be bronze body and threaded ends. Valves 65mm dia. and over shall be cast iron body and flanged ends.

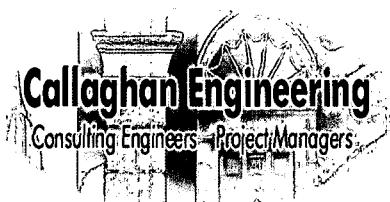
Flow measuring/ commissioning sets shall comprise combined measuring/regulating device with fixed orifice plate coupled to a double regulating valve installed on the return pipe with an isolating valve on the flow. Valves up to and including 50mm dia. shall be bronze body and threaded ends. Valves 65mm dia. and over shall be cast iron body and flanged ends.

Radiator hand wheel valves and lock shield valves shall be angle pattern type to BS 2767. Check or non-return valves up to and including 50mm dia shall be bronze swing type to BS 5154 with screwed ends. Valves 65mm dia and over shall be cast iron swing type with flanged ends to BS 5153. Float operated valves to feed and expansion tanks shall be to BS 1212. Floats shall comply with BS 1968 or BS 2456 as appropriate. Safety and pressure relief valves shall comply with BS 6759 Parts 1, 2 and 3.

5.3 Supplementary Items

5.3.1 Pipe Supports

Pipe supports, hangers and anchors required to support and control the movement of the various pipes shall be supplied and erected. Pipe supports, hangers and anchors shall be fixed to the structure independent of plant and equipment. Pipe work shall be adequately supported and in a manner to allow free movement due to thermal expansion and contraction.



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All pipe work shall be supported by means of clips, supports or hangers at the following centres measured along straight runs:

Nominal Bore	Rod. Diam. (Mix)	Horizontal Bare	Insulated	Vertical Bare & Insulated
15	9.6mm	1.8m	1.8m	1.8m
20	9.6mm	2.4m	2.4m	2.1m
25	9.6mm	2.4m	2.4m	2.4m
32	9.6mm	2.7m	2.4m	2.7m
40	9.6mm	3.0m	2.4m	2.7m
50	9.6mm	3.0m	2.4m	3.0m
65	12.7mm	3.7m	3.0m	3.0m
80	12.7mm	3.7m	3.0m	3.5m
100	16.0mm	4.0m	3.0m	3.5m

All pipe work shall be supported at each change of direction unless otherwise agreed with the Engineer. Brackets or supports shall be set out so that they do not obstruct the access to valves, flanges or other fittings requiring maintenance. All supports shall be adequate for the service, firmly and truly fixed and that they do not promote vibration. Where required spring type hangers shall be used.

5.3.2 Anchors

Anchors shall be installed. Anchors shall be fabricated from 100 x 50mm channel iron, fixed to the building structure. Pipe work shall be fixed to the anchor by means of 38mm x 6mm steel saddles, shaped to the circumference of the pipe and bolted to the anchor channels.

5.3.3 Sleeves

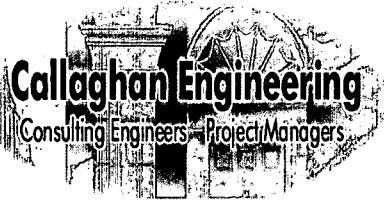
Where pipes pass through walls, floors, ceilings, roof membranes the Contractor shall provide suitable sleeves to be built in by the Main Contractor. The Contractor shall be responsible for the correct building in of all sleeves.

Gaps around pipes shall be sealed using a mastic sealant suitable for the temperature and operating conditions of the system. Sleeves shall protrude not less than 1mm and not more than 3mm proud of the finished surface.

5.3.4 Expansion Devices

Wherever possible advantage shall be taken of changes in direction of the pipe work to absorb expansion. Provision shall be made for expansion loops and where shown shall be of the 'U' type fabricated from welding bends. Expansion loops shall be designed to a limiting combined thermal and pressure stress of 70 N/sq.mm.

Where expansion loops cannot be accommodated and with the prior approval of the Engineers, axial bellows type expansion devices shall be used. Adequate provision shall be made at all connections to equipment and appliances to avoid stress due to expansion and contraction.



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5.3.5 Strainers

Strainers shall be 'Y' pattern type and shall be suitable for the pressure and service of the piping system in which it is installed. Strainer bodies for pipe sizes up to 50mm shall be of bronze to BS 1400 and 65mm and above shall be cast iron to BS EN 1562.

5.3.6 Air Vents

Air vent points comprising of an air bottle, stop valve and tail pipe shall be installed on the highest points of the distributions systems which are to be vented. Automatic air vents shall be supplied and installed as indicated on the drawings. A lock shield valve shall control each automatic air vent. Air release pipes shall discharge at a nearest gully or to a safe visible position without causing damage.

5.3.7 Drains

All drain cocks shall be 20mm dia., with hose connection, shall be fitted at low points in the distribution system and local to items of header pipe work and items of equipment and where indicated on the drawings. Drain valves shall be installed to allow flushing and cleaning of the systems. Drain valves shall be bronze lock shield gate valve type to BS 5154, with hose union connection. Drain valves shall be installed where indicated on the drawings.

5.3.8 Test Points

Self sealing test points shall be provided at the following positions and where indicated on the drawings:

- All secondary header pipe arrangements.
- All main branches.
- Each port of any automatic control device.
- At each inlet and outlet of heating and cooling coils and batteries and terminal units.
- At each entry and exit from each plant room.

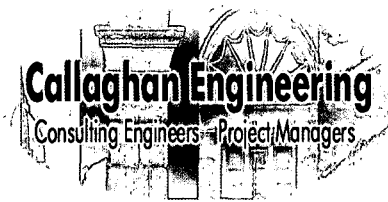
5.3.9 Pressure Gauges

Pressure gauges shall be provided at the following positions and where indicated on the drawings:

On the suction and discharge side of each circulating pump.
Pressure gauges shall be 100mm in diameter and shall be selected so that the normal operation pressure corresponds approximately with the mid point of the scale.
Each pressure gauge shall be supplied and installed with a suitable isolating cock.

5.3.10 Thermometers

Thermometers shall be provided at the following positions:



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On the suction and discharge side of each circulating pump. On each blended circuit.

Thermometers shall be 100mm in diameter and shall be selected so that the normal operation temperature corresponds approximately with the mid point of the scale. Each thermometer shall be supplied and installed with a suitable isolating cock.

5.3.11 Welding

Welding procedures and the competence of welders shall be in accordance with the recommendations of the following:

HVCA TR/5: Recommended Practice and Test Certificates of Competency for Oxy-Acetylene and metal Arc Welding in Mild Steel Pipe work.

BS 2640: 1982 Specification for Class II oxyacetylene welding of carbon steel pipelines for carrying fluids.

BS 2971: 1991 Specification for Class II Arc welding of carbon steel pipelines for carrying fluids.

All welding shall be undertaken by certified coded welders fully experienced in the class of work to be carried out.

Welders shall be in possession of a current certificate of competence issued by a recognised independent authority. Copies of all certificates shall be submitted to the Engineers prior to work commencing on site.

Welders shall permanently identify each of their welds with their own marker, which will withstand site conditions without damaging the system or component performance.

All welds shall be visually inspected in accordance with the recommendations of BS EN 970: 1997. Weld identified by the Engineer as unacceptable, welds shall be subjected to ultrasonic or radiographic non-destructive testing in accordance with BS 2523 or BS 2910 as applicable.

Welds found to be defective shall be rectified at the Contractors expense to a standard complying with BS 2640 or BS 2971 as applicable. Different welders to the original welder will carry out rectification work.

5.4 Heating Equipment

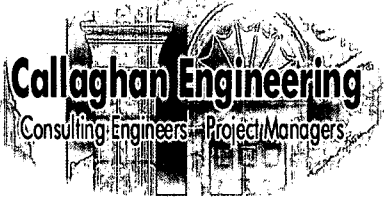
5.4.1 Boilers

Cast Iron sectional boilers shall comply with BS 779: 1989 constructed to reduce Nox emission.

Boiler shall be Gas fired with automatic burner, pressure jet manufactured in accordance with Bord Gais requirements and BS 5885 as required.

Boiler(s) shall be supplied complete with matching burners.

Boiler(s) shall be supplied with the following equipment:



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One or two safety valves as required.

Open vent pipe where system is open to atmosphere.

Pressure gauge

Thermometer

Emptying drain cock or valve operated by removal key.

Manufacturers name plate located on the side or top external casing, stating boiler series and type, serial number, rated output, design pressure, and date of manufacture.

Integrated boiler automatic control panel.

A full set of cleaning tools and brushes for the boiler(s) shall be provided on a painted rack and fixed at an agreed location on site.

5.4.2 Radiators

Radiators shall be of the column type tested and rated to BS EN 442.

Radiators in staff areas shall be provided with a hand wheel valve on the flow and lock shield valve on the return.

The Contractor shall include for erecting the radiators twice and dismantling once to suit other trades.

5.4.3 Unit Heaters

Unit heaters shall be rated and tested in accordance with BS EN 442 and BS 4856.

Unit heaters shall be constructed from heavy gauge steel sheet strengthened to prevent drumming and free from sharp edges.

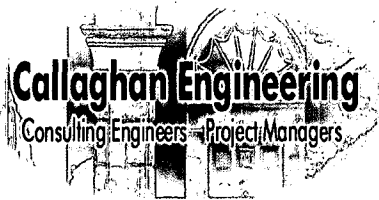
Internal casing shall be lined with fire retardant acoustic absorption material, free from surface erosion. Heating element shall be finned tube copper elements with aluminium fins. Screwed female connections to BS 21 shall be provided terminated in the casing.

Fans shall be double inlet double width centrifugal type, dynamically and statically balanced, suitable for high efficiency and quiet running.

Motors shall be totally enclosed with sealed sleeve type with bearings requiring no lubrication.

The fan and motor assembly shall be provided with anti-vibration mountings.

Each fresh air input unit heater shall be provided with fresh air intake duct connection, recirc. Damper arrangement and filters as required. Unit heaters shall be provided with 1, 2 3 or 4 way adjustable discharge louvre as applicable. Unit heaters shall be rigidly fixed in position and provided with protective guards.



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5.5 Circulating Pumps

5.5.1 General

Circulating pumps shall be suitable for the pumped media and pressure and temperature requirements.

Unless stated otherwise pumps shall be selected to operate at 1450 r.p.m. or by infinitely variable speed control drives where specified.

Pumps shall be installed in accordance with the manufactures recommendations and shall comply with the requirements of IS/EN 60335-2-51, BS 4082 AND BS 5257 as applicable. Pumps shall be tested in accordance with BS 5316.

Flexible connections shall be provided at the suction side and discharge side of all pumps.

Isolating valves shall be installed on the suction side and discharge side of each pump. An inline strainer shall be installed on the suction side of each pump. Where single duty and standby pumps are installed, suitable spring type non-return valves shall be fitted on the discharge side of the pump.

Pressure gauges shall be installed on the suction and discharge of each pump where practical.

The Contractor shall ensure that the pumps provided are capable of delivering the required fluid flow when operating against the actual total system resistance. The Contractor shall submit pump curves indicating the performance of the pumps under all likely operating conditions.

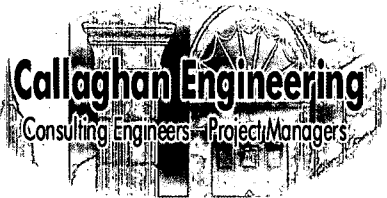
Centrifugal pumps shall be electrically driven by glandless or totally enclosed fan cooled (TEFC) squirrel cage motors to IEC standards. All motors shall be suitable for use with frequency converters.

5.6 Glandless Pumps

Glandless pumps shall be in line 3 speed or infinitely variable speed control type. Pumps shall be single head or twin head pump sets as detailed in the schedule. Pumps shall be suitable for mounting horizontally or vertically on brackets and shall be complete with thermal insulation to pump housing.

Pumps shall be constructed from the following materials:

	<u>LTHW</u>	<u>HWS</u>
Housing	Cast Iron	Bronze
Impeller	GFPP	GFPP
Shaft	Stainless Steel	Stainless Steel
Bearings	Metal Impregnated Carbon	Metal Impregnated Carbon
Seal	-	Between pump and impeller



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5.7 Centrifugal Pumps

Centrifugal pumps shall be direct coupled, in-line or end suction single stage dry motor type with mechanical seal. Pumps shall be suitable for floor mounting. Cavitation shall be minimized.

Fixed speed motors shall be suitable for use with a 3 phase electrical supply and shall be complete with overload protection. Thermistors where fitted shall be connected to an external supply.

Pump motors shall be suitable for use with frequency converters.

Pumps shall be constructed from the following materials:

Housing	Cast Iron	Bronze
Impeller	GFPP/Cast iron/Bronze	GFPP/Bronze
Shaft	Stainless Steel	Stainless Steel
Bearings	Grease lubricated seal	Grease Lubricated Steel
	For life ball type	for life ball type
Mech Seal	Silicon-carbide/carbon	Carbon/Ceramic/Viton

5.8 System Pressurisation

5.8.1 General

System pressurization for LTHW installations shall be provided by means a sealed packaged pressurization unit with expansion vessels, as applicable. Provision shall be made for quick filling of the system in parallel with the make up water system provided for normal service.

5.9 Pressurised System

Pressurisation equipment shall be of packaged construction mounted on a common base plate.

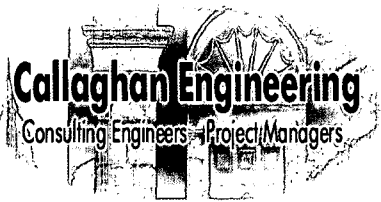
The automatic fill unit shall comprise break tank, foot valve, duty/standby pumps, where required, hydraulic accumulator, and all necessary controls, safety devices and power connections.

The pressurization unit shall be capable of maintaining the required fill pressure in the heating or chilled water system as applicable. The cold fill pressure shall be controlled by means of a pressure regulating valve or pressure switch. The pressure-regulating valve shall be adjustable.

Duplicate pump arrangements shall have controls to enable selection of duty pump and automatic changeover facility in event of failure of duty pump.

System expansion shall be accommodated by a suitably selected sealed diaphragm expansion vessel, suitable for a working pressure of 10 bar, unless stated otherwise, with EPDM rubber membrane. Diaphragms shall be of the replaceable type.

The pressurization system shall be connected to the system return main on the suction side of the main circulating pump(s) complete with all fittings as detailed on the drawings. An anti gravity loop of 2m (minimum) shall be installed.



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6.0 DOMESTIC HOT AND COLD WATER SERVICES INSTALLATION

6.1 General

The specification covers the installation of pipework, fittings, and supplementary items necessary to complete the domestic hot and cold water installation and the cold water supply to the production area for washing down.

Pipe work shall be graded to ensure that no air locking occurs.

Plugs shall be used during the installation of the pipe work to prevent dirt getting in to pipes. Where a stoppage occurs due to dirt and foreign matter, the trouble shall be cleared at the expense of the Contractor.

All pipe work and fittings shall be stored clear of the ground and shall be suitably protected from the weather. Pipe work corroded beyond normal 'stock rust' shall not be accepted by the Engineers.

The Contractor shall be responsible for final connections to all sanitary ware and other fixtures.

6.2 Pipework and Fittings

Domestic hot and cold water services pipework shall be fabricated from half hard copper tubing to IS EN 1057 and shall be suitable for use for the temperature, pressure and operating conditions of the system.

All concealed distribution pipework and pipework in plant rooms shall be jointed by means of brazing or bronze welding. All brazing shall be carried out as outlined elsewhere in this section.

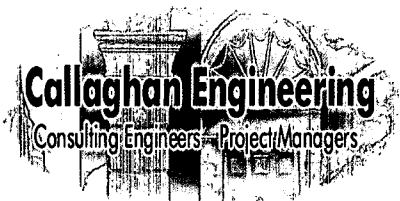
Where pipework up to 54mm diameter is exposed, compression fittings to IS EN 1254 – part 2 may be used with prior approval of the Engineer. Jointing compound used with these fittings shall be fit for the purpose.

Unions shall be used at connection to valves and equipment for pipework up to and including 54mm diameter. Flanges to BS 4504 shall be used on pipework greater than 54mm diameter.

Branches on copper pipes up to and including 54 mm shall be reamed and belled before branches are welded or brazed to mains. Branches on pipes 65 mm and over shall be trimmed and shaped to receive branch pipes before welding or brazing to mains. The cut out of the mains shall be the full bore of the branch pipe. Branch welds shall be at least one size smaller than mains size to ensure that pipe remains intact.

"Dead-legs" on hot water pipework shall be kept to a minimum and shall not exceed the maximum distances as recommended by the CIBSE.

Pipework shall be insulated in accordance with this specification.



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6.3 Valves

Valves shall be suitable for the systems into which they are connected. The type and appearance of valves shall be consistent throughout the installation.

Valves shall have the manufacturer's name, material designation, pressure rating and size clearly marked on the outside of the body.

Although they may not necessarily be shown on the drawings, isolating valves shall be fitted to all individual fittings or groups of fittings.

Isolating valves for domestic water services pipework up to and including 28mm diam. shall be ball valves manufactured from nickel chrome plated brass with chrome plated brass ball, PTFE seat and compression ends.

Isolating valves for domestic water services pipework from 28mm to 54mm diam. shall be full bore ball valves manufactured from bronze with chrome plated brass ball, PTFE seat and screwed BSPT ends. Isolating valves for domestic water services pipework above 54mm diam. shall be wafer type butterfly valves with cast-iron body and EPDM seat.

Isolating valves serving individual fittings may be of the "ballofix" type.

Drain cocks shall be provided as indicated on the drawings.

6.4 Supplementary Items

6.4.1 Pipe Supports

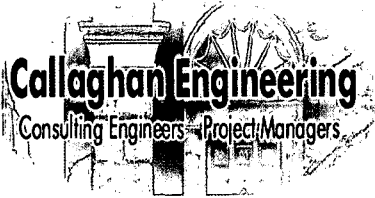
Pipe supports, hangers and anchors required to support and control the movement of the various pipes shall be supplied and erected. Pipe supports, hangers and anchors shall be fixed to the structure independent of plant and equipment.

Pipework shall be adequately supported and in a manner to allow free movement due to thermal expansion and contraction.

All pipe work shall be supported by means of clips, supports or hangers at the following centres measured along straight runs:

Nominal Bore	Road. Diam. (Mix)	Horizontal Bare	Insulated	Vertical Bare & Insulated
15	9.6mm	1.8m	1.8m	1.8m
20	9.6mm	2.4m	2.4m	2.1m
25	9.6mm	2.4m	2.4m	2.4m
32	9.6mm	2.7m	2.4m	2.7m
40	9.6mm	3.0m	2.4m	2.7m
50	9.6mm	3.0m	2.4m	3.0m
65	12.7mm	3.7m	3.0m	3.0m
80	12.7mm	3.7m	3.0m	3.5m
100	16.0mm	4.0m	3.0m	3.5m

All pipe work shall be supported at each change of direction unless otherwise agreed with the Engineer. Brackets or supports shall be set out so that they



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do not obstruct the access to valves, flanges or other fittings requiring maintenance. All supports shall be adequate for the service, firmly and truly fixed and that they do not promote vibration. Where required spring type hangers shall be used.

6.4.2 Sleeves

Where pipes pass through walls, floors, ceilings, roof membranes the Contractor shall provide suitable sleeves to be built in by the Main Contractor. The Contractor shall be responsible for the correct building in of all sleeves.

Gaps around pipes shall be sealed using a mastic sealant suitable for the temperature and operating conditions of the system.

Sleeves shall protrude not less than 1mm and not more than 3mm proud of the finished surface.

6.4.3 Air Vents

Automatic air vents shall be supplied on high points of the system. A lock shield valve shall control each automatic air vent. Air release pipes shall discharge at a nearest gully or to a safe visible position without causing damage.

6.4.4 Drains

All drain cocks shall be 20mm diam., with hose connection, shall be fitted at low points in the distribution system and local to items of header pipe work and items of equipment.

Drain valves shall be installed to allow flushing and cleaning of the systems. Drain valves shall be bronze lock shield gate valve type to BS 5154, with hose union connection.

6.4.5 Pressure Gauges

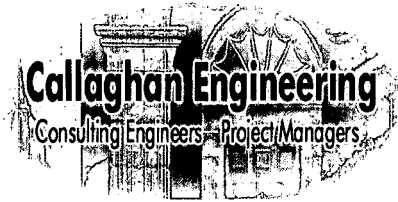
Pressure gauges shall be provided at the following positions and where indicated on the drawings:

- On the suction and discharge side of pumps and booster sets.
- On all domestic hot water generating equipment.
- On the inlet and outlet side of pressure reducing valves.
- Pressure gauges shall be 100mm in diameter and shall be selected so that the normal operation pressure corresponds approximately with the mid point of the scale.
- Each pressure gauge shall be supplied and installed with a suitable isolating cock.

6.4.6 Thermometers

Thermometers shall be provided at the following positions:

- On all domestic hot water generating equipment.



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- Thermometers shall be 100mm in diameter and shall be selected so that the normal operation temperature corresponds approximately with the mid point of the scale.
- Each thermometer shall be supplied and installed with a suitable isolating cock.

6.4.7 Welding and Brazing

Welding and brazing shall be carried out in accordance with the following codes and guidelines:

HVCA TR/3: Jointing of copper and its alloys - code of practice

HVCA TR/5: Welding of carbon steel pipework - code of practice

BS 1723: Brazing

BS 1845: Specification for filler metals for brazing

BS 2640: Specification for Class II oxyacetylene welding of carbon steel pipelines for carrying fluids

BS 2971: Specification for Class II arc welding of carbon steel pipelines for carrying fluids

Brazing flux having a borax base shall be used in paste form, which shall be evenly and thoroughly distributed over the surfaces to be brazed. Powder fluxes must be wetted to form a paste before jointing.

All welding and brazing shall be carried out by experienced competent certified welding and brazing operatives.

The Contractor shall be responsible for final connections to all sanitary ware and other fixtures.

6.4.8 Pipework and Fittings

Mains water and first aid fire hose reel pipework shall be fabricated from half hard copper tubing to IS EN 1057 and shall be suitable for use for the temperature, pressure and operating conditions of the system.

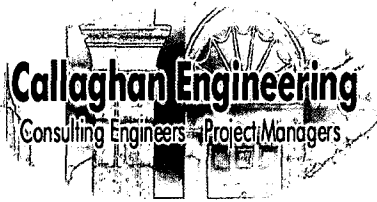
All concealed distribution pipework and pipework in plant rooms shall be jointed by means of brazing. All brazing shall be carried out as outlined in part 5 of this section.

The diameter of the fire hose reel rising main shall not be less than 54mm.

Where pipework up to 54mm diameter is exposed, compression fittings to IS EN 1254 – part 2 may be used with prior approval of the Engineer. Jointing compound used with these fittings shall be fit for the purpose.

Unions shall be used at connection to valves and equipment for pipework up to and including 54mm diameter. Flanges to BS 4504 shall be used on pipework greater than 54mm diameter.

Branches on copper pipes up to and including 54 mm shall be reamed and belled before branches are welded or brazed to mains. Branches on pipes 65 mm and over shall be trimmed and shaped to receive branch pipes before welding or brazing to mains. The cut out of the mains shall be the full bore of the branch pipe. Branch welds shall be at least one size smaller than mains



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size to ensure that pipe remains intact. Pipework shall be insulated in accordance with of this specification.

6.5 Underground Mains Water Pipework

6.5.1 Pipework up to 35mm Diameter

Underground mains water pipework up to and including 35 mm diameter shall be heavy gauge coiled low density polyethylene pipe to IS 135. Joints and branches shall be carried out by electro-fusion methods, in accordance with manufacturers specification.

6.5.2 Pipework 35mm to 110mm Diameter

Pipework shall be High Density Polyethylene pipe Class C to IS 135.

6.5.3 Pipework above 110mm Diameter

All underground mains water pipework above 110mm diameter shall be uPVC Class C to IS Branches shall be made using adaptor flanges in accordance with manufacturers instructions.

6.6 Underground Fire Mains Pipework

The complete fire mains installation shall be installed in accordance with BS 5306 – Part 1. Underground fire mains pipework shall be uPVC Class C to IS 123.

6.7 Cast Iron Flanges & Tees shall be used

CI flanged tail pieces shall be used for uPVC pipework and flange fitting connections. Fittings shall be Cast Iron, flanged to BS 4772. The Contractor is responsible for ensuring that thrust blocks are provided by the Main Contractor as recommended by the manufacturers.

7.0 NATURAL GAS

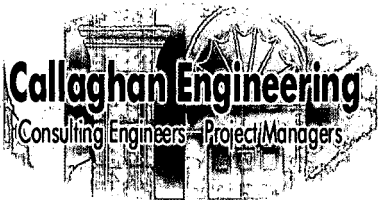
7.1 General

The complete natural gas/LPG installation shall be carried out in accordance with the requirements of IS 820 – Non-Domestic Gas Installations. In the case of Natural Gas, this specification covers installations with a maximum working pressure of 5 Bar defined as pipework between the primary meter and point of usage.

All metallic pipework shall be electrically bonded to earth. Buried pipework shall be bedded in sand to a depth of 150mm above and below the pipe. The minimum total depth of cover shall be 375mm. Where pipework is distributed in voids, service shafts or other enclosed space, adequate venting shall be provided in accordance with IS 820 and the pipework shall either be continuous or welded throughout its length.

7.2 Pipework and Fittings

Buried pipework up to 2 Bar working pressure shall be medium density polyethylene (PE) pipework to IS 266 Part 1. Buried pipework with a working pressure between 2



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Bar and 5 Bar shall be ungalvanised carbon steel to BS 1387, heavy grade suitably treated for corrosion protection.

Above ground pipework below 63mm diameter and with working pressures below 75 mBar may be copper to BS 2871. Above ground pipework with working pressures between 75 mBar and 5 Bar, shall be ungalvanised mild steel. Up to 150mm diameter BS 1387; 150mm diameter to 250mm diameter BS 3601 with 5.4mm wall thickness; 250mm diameter to 300mm diameter BS 3601 with 5.6mm wall thickness.

Joints in gas pipework up to 5 Bar working pressure shall be performed in accordance with the requirements of IS EN 1775. Joints in PE pipework up to 180mm shall be socket fusion welded in accordance with IS 266:Part 2.

Joints in PE pipework above 180mm diameter shall be butt fusion welded by specialists in accordance with IS 266:Part 3. Joints in copper pipework shall be brazed as specified in section 3.2 of this specification. Steel pipework joints shall be welded except where flanges are required for connecting to valves etc.

Flanges shall be raised face slip on type to BS 4504 and shall be fixed to the parent pipework by metal arc welding. Flange gaskets shall be spiral wound metallic type with non-asbestos filling. Welding shall be metal arc to BS 2971.

Joints on above ground steel pipework below 50mm diameter may be screwed to facilitate connection to valves and equipment. Jointing material shall be PTFE thread sealant tape that meets the requirements of BS 5292 Type C – no other jointing material shall be used. The tape shall be wrapped and overlapped on the joint in accordance with BS 4735.

Flanges on PE pipework shall be fixed using socket fused polyethylene flange adaptors in conjunction with NP16 back-up rings and gaskets. All fittings on PE pipework shall be to IS 266:Part 2. All fittings on steel pipework shall be to BS 1965.

7.3 Valves

Valves in PE pipework less than 25mm diameter shall be ball type of bronze construction with PTFE seats and seals, chrome plated brass ball complete with bottom entry blow out proof stem. Valves shall have female screwed taper thread and shall be tight shut off. The valve ends shall be fitted with PE transition couplings.

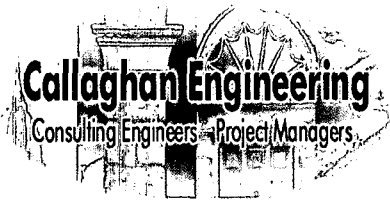
Valves in PE pipework between 25mm and 63mm diameter shall be butterfly type with polyethylene body, glass filled nylon actuator, high strength glass filled saddle, nitrile rubber seals, stainless steel stem and seat assembly comprising body stiffener sleeve with nitrile rubber seals and acetal disc. Valves shall be quarter turn operation.

Valves in PE pipework above 63mm diameter shall be angle lugged butterfly type with cast iron body, stainless steel disc and shaft and nitrile seats and seals. Valves shall have flanged connections.

Valves in steel pipework up to 50mm diameter shall be as specified in clause 2.3.1.

Valves in steel pipework above 50mm diameter shall be as specified in clause 2.3.3.

Valves on pipework up to 50mm diameter located in plantrooms or services risers shall be firesafe ball type with steel body, graphite reinforced anti-static stem seals,



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floating solid polished ball, reinforced PTFE seats, BS 21 taper thread screwed female ends and shall be fire certified to BS 6755.

Valves on pipework above 50mm diameter located in plantrooms or services risers shall be fire-safe lugged, double offset butterfly type with steel body, PTFE seat and secondary metal seat and shall be fire certified bi-directional to BS 5146.

8.0 GAS DETECTION

An automatic natural gas detection system shall be provided as part of the contract.

The gas detection system shall be suitable for use on natural gas and shall be complete with gas detection sensors, slam shut valves, monitoring and alarms and main control panel.

The gas detection system shall interface with the Fire Alarm System.

9.0 ABOVE GROUND SOILS AND WASTES INSTALLATION

9.1 General

This section covers the complete above ground soils and wastes installation including pipework, traps, vents and connection to fixtures and fittings. Below ground soils and wastes shall be carried out by the Main Contractor, unless otherwise indicated.

The complete installation shall be in accordance with BS 5572 and shall comply with the Irish Building Regulations Part H.

9.2 Joints and Supports

Joints on MUPVC waste pipework shall be solvent weld sockets with the exception of branch connections to stacks and connections to traps, which shall be o-ring joints.

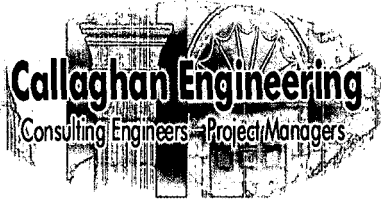
Joints on uPVC soil and vent pipework shall be o-ring joints.

Joints on socketless spun cast iron shall be flexible type to BS 6087.

WC connections to soil stacks shall be made using proprietary "multi-wick" connections. Where several connections are being made to a single stack, attention is drawn to separation distances and method of connection of opposing branches in line with BS 5572.

Supports shall be provided at all changes in direction and at the following intervals:

Material	Diameter (mm)	Vertical (m)	Horizontal (m)
Cast Iron	75 to 100	1.8	1.0
	Above 100	1.8	1.25
uPVC	Up to 50	1.25	0.60
	50 to 100	1.8	1.0
	Above 100	1.8	1.2
MUPVC	Up to 50	1.2	0.6



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Allowance shall be made for thermal expansion of pipework by utilising changes in direction or proprietary expansion couplings. The support brackets shall not hinder the movement of pipework due to expansion.

10.0 DUCTWORK INSTALLATION

10.1 General

The specification covers the installation of ductwork, fittings, and supplementary items necessary to complete the ductwork installation. The arrangement and sizing of all internal and external ductwork installations shall be agreed with the Engineers on site.

Duct sizes shall be taken to mean the clear internal dimension or diameter as relevant to the particular duct specification.

Ductwork materials, construction and installation shall comply with the following:

- HVCA DW/144 Specification for sheet metal ductwork – low, medium and high pressure/velocity systems.
- HVCA DW/143A Practical Guide to Ductwork Leak Testing
- HVCA DW/154 Specification for Plastic Ducts
- HVCA DW/171 Guide to Good Practice for Kitchen Ventilation Systems
- HVCA DW/ 191 Guide to Good Practice for Glass Fibre Ductwork
- HVCA TR/19 Guide to Good Practice, cleanliness of Ventilation System
- HVCA DW/TM2 Internal Cleanliness of New Ductwork Installations

The Contractor shall be responsible for taking all measurements on site and as necessary for the fabrication and erection of the ductwork.

Duct lengths constructional details shall achieve maximum economy of manufacture and erection, subject to compliance with construction standards and access into buildings.

All ductwork installations when erected shall be rigid and shall be free from sway, drumming or movement.

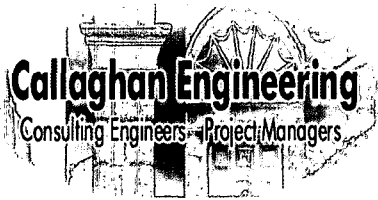
Local stiffening shall be incorporated to provide rigid mountings for instruments and controls.

Ductwork passing through roofs or external walls shall be provided with weathering aprons or other weatherproof fixing.

Perforated rivets shall not be used in the manufacture or erection of ductwork. The use of selftapping screws shall be limited to the completion of site joints in extremely difficult locations.

Access openings and doors for inspection and cleaning shall be provided in accordance with DW/144, TR/17 and DW/171, as applicable and where indicated on the drawings.

Connections to builder's work and openings shall be as detailed in DW/144 and as detailed on the drawings.



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Test holes formed for system balancing and commissioning shall be fitted with suitably sized easily removable rubber or neoprene sealing plugs.

The Contractor shall ensure that the Electrical Contractor prior to insulation earths the ductwork installation.

10.2 Ductwork

10.2.1 Galvanized Ductwork and Fittings

Ductwork shall be constructed from best quality galvanized sheet metal fabricated in accordance with DW/144. The ductwork classification shall be medium pressure Class B, unless stated otherwise.

All fittings, joints, stiffeners, fastenings, sealants and gaskets shall be in accordance with DW/144, with the following:

Ducts shall be provided with suitable stiffeners and bracing.

Angle bracing shall be carried around all four sides. Angles shall be installed flat-to-flat and rigidly fastened. All longitudinal joints shall be Pittsburgh pattern seams and all ducts shall have panels cross-broken.

Slope of transformation pieces shall not exceed 25mm in 175mm.

The angle of transformation at connections shall not exceed 15° in a line parallel to airflow on the entry side and 30° on the exit side.

All branches shall be shoe, conical, or bell-mouth type and shall enter main ducts on the larger side prior to transformation.

No two branches shall enter a main or branch duct diametrically opposite each other.

Radius bends shall be used where possible. Radius bends shall be provided with splitters. Square bends shall be provided with turning vanes.

Offsets shall be formed using radius bends where possible.

Shape changes in ductwork may be used to avoid obstruction or to suit available space, providing the cross sectional area of the duct is unchanged.

The Contractor shall issue a certificate confirming that all ductwork constructions comply with DW/144. Air leakage testing shall be carried out in accordance with DW/144 and DW/143.

The Contractor shall include for air leakage testing of not less than 10% of the installation for medium and low-pressure ductwork.

10.2.2 Flexible Ductwork and Joints

Flexible ductwork shall be used to connect between rigid ductwork and particular components or items of equipment. Flexible ductwork shall not exceed 600mm in length when fully extended and shall be free from kinks and excessive sagging.



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Flexible ductwork shall be fabricated from metal or fabric in accordance with DW/144 and shall be suitable for the temperature, pressure, and fire rating, flexibility and insulation value as applicable to the system.

Flexible ductwork connections to rigid duct sections shall be sealed with a suitable jointing paste or mastic compound and held in place using worm drive clips or band clips as appropriate.

The frictional resistance to air flow per unit length of flexible duct shall not exceed 150% of the frictional resistance per unit length of galvanized steel duct of similar diameter. Flexible joints shall be fabricated in accordance with DW/144 and shall be suitable for the temperature, pressure, and fire rating, flexibility and insulation value as applicable to the system.

Flexible joints shall be kept as short as practicable above a minimum effective length of 50mm. In no case shall a flexible joint exceed 250mm in length.

Flexible joints shall be fitted at fan inlet and outlet connections, building expansion joints and elsewhere as applicable. Care shall be taken to maintain alignment across joints/connections.

10.3 Dampers

10.3.1 Volume Control Dampers

Volume control dampers shall be constructed in accordance with the DW/144 fabricated from galvanized steel, stainless steel or aluminium as indicated. Damper frames and blades shall be constructed to ensure rigidity and prevent distortion and jamming in operation. The blades shall be securely fixed to the operating spindles so that differential movement cannot occur.

Volume control dampers shall be of the multi blade damper parallel or opposed blade type for rectangular ductwork and iris duct dampers for circular ductwork up to 300mm dia.

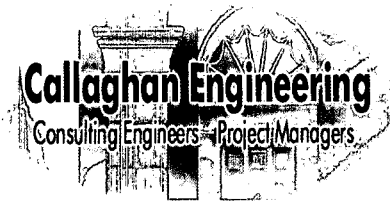
Dampers shall have a means for indicating externally the position of the blades and shall have a device for positioning and locking damper blades.

Dampers shall have a means of measuring the flowrate through the damper. Volume control dampers shall be provided at all branch connections and at final connections to grilles and diffusers. Iris duct dampers shall be used on all circular ductwork final connections.

Volume control dampers and iris duct dampers shall be provide with pitot connections for direct air flow measurement.

Volume control dampers shall be suitable for the pressure classification in which the dampers are installed.

Duct damper casings shall be constructed to meet the minimum leakage limits specified for the ductwork system to which they are installed.



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10.3.2 Fire Dampers

Fire dampers shall have an overall fire rating of not less than 2 hours and shall be in accordance with the requirements of BS 476 Part 22 and BS 5588 Part 9.

Each fire damper shall be held in the open position by means of a replaceable thermal release mechanism rated at 72° C +/- 4° C. Fire dampers shall be constructed in accordance with DW/144 fabricated from stainless steel or galvanized steel. Damper frames shall be constructed to ensure rigidity and prevent distortion during fire conditions.

Fire dampers shall be clearly marked with a permanent indication of the correct fixing, direction of airflow and side for maintenance and access. Fire dampers shall be located at the positions as indicated on the drawings. Fire dampers shall be accessible to facilitate periodic testing and re-setting purposes.

Fire dampers shall be supplied complete with installation frames complete with fixings. Fire dampers located in partition walls shall be supported independently of partitions. Intumescent fire dampers shall not be used.

10.4 Hangers and Supports

Hangers and supports shall be supplied and installed in accordance with DW/144. Ductwork supports shall be positioned close to dampers, diffusers and other similar equipment, which must not be subjected to distortion.

Hangers for ducts that require thermal insulation shall be spaced to provide clearance for the insulation. Supports where vapour seal treatment is required shall be external to the insulation. Fire rated ductwork shall be supported with suitably sized and designed hangers, which take account of the reduction of the tensile strength of steel in a fire situation. The support and hanger system used shall form part of an overall independent certification of the fire rated system.

Threaded rods supporting hangers shall be trimmed off to a length in accordance with Health and Safety requirements.

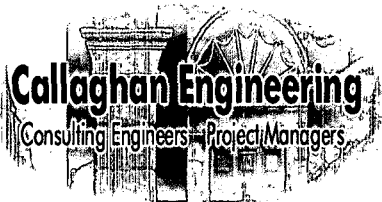
11.0 VENTILATION AND AIR CONDITIONING INSTALLATION

11.1 General

The specification covers the installation of equipment and plant items necessary to complete the ventilation and/or air conditioning installation.

The Contractor shall locate all items of plant and equipment.

The Contractor shall be responsible for the off-loading and lifting into position all items of plant and equipment and for the protection of the equipment until handover of the building and systems.



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The cost of repair of any item of plant and equipment damaged prior to commissioning and handover shall be borne by the Contractor.

11.2 Air Handling Units

11.2.1 Construction

Air handling units shall be of the packaged, sectional type suitable for indoor installation.

Air handling units shall be 60mm double skin construction using 75mm heavy-duty penta post construction.

Side, top and bottom panels shall be provided with a 60mm LFC free water based PU foam each provided with individual sealing gaskets. Panels shall be connected to each other by means of M5 bolts through plastic bushings to avoid thermal bridging. The U-value of the casing shall not exceed 0.59 w/sq.m K.

Access doors shall be provided at each fan section and at each access section between components. Access doors shall be arranged to open inwards when positioned on the supply fan discharge and outwards when positioned on the fan suction side. Access doors shall be complete with stainless steel hinge, heavy-duty lockable handle and marine inspection window with wire re-enforced glass.

Each fan and access section shall be supplied with a pre-wired and switched bulkhead light fitting complete with compact fluorescent lamp.

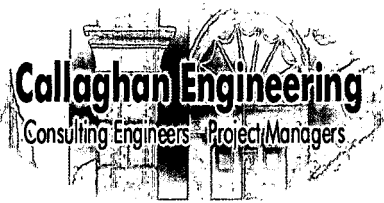
The casing of the air-handling unit shall comply with the requirements of EN 1886 leakage class B.

Air handling units shall comprise of the following sections where specified in the schedules.

- Return air attenuator section
- Return fan section with flanged inlet and hinged access door
- Mixing box section complete with fresh/recirculated/discharge air dampers complete with adjustable linkage and motor plate suitable for use with a damper motor
- Panel filter section with reinforced floor, outward opening door. Panel filters shall have individual front withdrawal frames and sealing gaskets
- Bag filter section with reinforced floor and outward opening door. Bag filters shall have individual front withdrawal frames and sealing gaskets
- Space only for future cooling coil section with cooling coil, mist and droplet eliminator
- Heating coil section with heating coil
- Supply fan section complete with flanged outlet and hinged access door.
- Supply air attenuator section

11.2.2 Filter Elements and Housings

Filter media shall be fire resistant, rot proof and offer no substance to vermin. The media and frames shall not be subject to corrosion or deterioration due to the effect of temperature or saturated air streams.



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Filters shall comply with the following standards:

- BS EN779 Particulate air filters for general ventilation - requirements, testing, and marking 1993.
- BS EN1822 High Efficiency air filters (HEPA and ULPA) Parts 1 to 5.

Filters shall be selected to achieve the following design clean and dirty condition resistance resistance to airflow and face velocities for various types of filters listed below shall not be exceeded.

- EU4 – EU5 Panel Filters Max. Clean 90Pa; Max. Dirty Max. Velocity 2.5m/s.
- EU9 Bag Filters Max. Clean 150Pa; Max Dirty 300 Pa; Max. Velocity 2.5m/s.

Primary filters shall be mounted on slide rails to allow side withdrawal. Clearances between filter frame and mounting rail shall be kept to a minimum to prevent air by-pass.

Final filters shall be mounted into manufacturers purpose made frames and be front loading. The frames shall be securely fixed to adjacent frames, duct to AHU casing and sealed to minimize air by-pass. Access shall be provided at filter sections to allow replacement of filters.

Each filter bank shall be fitted with either a 0 – 250Pa or 0 – 500Pa range magnehelic gauge as appropriate. The gauges shall be securely fixed to the AHU casing using self-tapping crews. Static pressure sensing tubes shall be fitted and sealed through the casing and connected up to the magnehelic gauge with plastic tubing. Gauges shall be supplied with a current calibration certificate.

11.3 Heating Coils

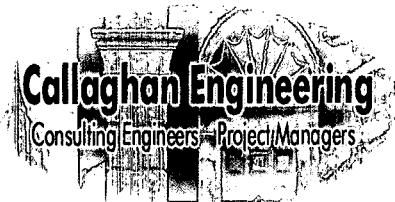
Heating coils shall be constructed from copper tubes with non-ferrous fins, fitted with copper headers mounted in galvanized mild steel casings not less than 1.2mm thick. Copper tubes shall comply with the test requirements of BS 2871 Part 1 and with BS 4857 Parts 1 and 2.

Heating coils shall be mounted on slide rails for ease of with drawl and shall be bolted to a full width diaphragm plate to eliminate air by-pass.

Heating coils shall be provided with header connections, which extend through the AHU casing and supplied with screwed BS21 male taper threads or flanges to BS 4504, as applicable.

The resistance to airflow of the heating coil shall not exceed 50Pa and the face velocity shall not exceed 3.5m/s. Fin spacing shall not exceed 400 fins per metre. The resistance to fluid flow of the heating coil shall not exceed 15kPa.

Each heating coil shall be works tested with air under water to one and a half times the maximum safe working pressure or to 700kPa, whichever is the greater. The testing shall comply with the requirements of BS 5141 Part 2.



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11.4 Cooling Coils

Cooling coils shall be constructed from copper tubes with non-ferrous fins, fitted with copper headers mounted in galvanized mild steel casings not less than 1.2mm thick. Copper tubes shall comply with the test requirements of BS 2871 Part 1 and with BS 4857 Parts 1 and 2.

Cooling coils shall be mounted on slide rails for ease of with draw and shall be bolted to a full width diaphragm plate to eliminate air by-pass.

Cooling coils shall be provided with header connections, which extend through the AHU casing and supplied with screwed BS21 male taper threads or flanges to BS 4504, as applicable.

The bottoms of the cooling coil casing shall be constructed from stainless steel to form a watertight drip tray. The drip tray shall be sloped towards a drain connection located on the downstream side of the coil and pipe work with screwed BS21 male taper threads or flanges to BS 4504, as applicable, shall extend through the AHU casing.

The resistance to airflow of the cooling coil shall not exceed 100Pa and the face velocity shall not exceed 2.5m/s. Fin spacing shall not exceed 400 fins per metre. The resistance to fluid flow of the cooling coil shall not exceed 35kPa.

Each cooling coil shall be works tested with air under water to one and a half times the maximum safe working pressure or to 700kPa, whichever is the greater. The testing shall comply with the requirements of BS 5141 Part 1.

11.5 Fans

Fans shall be tested in accordance with the requirements of BS 848 and selected to give the air volume flow rate at the static pressure as specified in the schedule. All belt driven fans shall be capable of running continuously at 10% in excess of selected duty.

The shaft and impeller assembly of all fans shall be statically and dynamically balanced in accordance with BS 6861. Vibration shall not exceed the limits set down in BS 4675 Part 1.

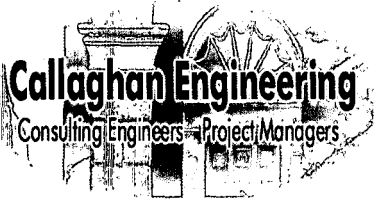
Appropriate flexible joints and vibration isolators shall be provided to minimize air leakage and transmission of noise and vibration.

Supply fans shall be belt driven double inlet backward curved centrifugal type with total fan efficiency of not less than 75%.

Return / exhaust fans shall be belt driven double inlet forward curved centrifugal type with a total fan efficiency of not less than 65%.

Drive motors shall generally be totally enclosed fan cooled type suitable for use with a 400 V/3 Phase / 50 Hz a.c. electrical supply. All motors shall be continuously rated and shall have insulation in accordance with BS 2757. Motor enclosures shall comply with BS 5490 and the degree of protection shall be as detailed in the schedules.

Belt drives shall comply with BS 1440 and BS 3790. No less than two belts per drive shall be used. The motor position shall be fully adjustable to enable correct alignment



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of the motor and fan pulley. Provision shall be made for adjustment of the tension in belt drives by slide rails. All adjustments shall be separately lockable.

Guards shall be provided on both the drive side and non-drive side of all fan/pulley assemblies. Guards shall comply with BS 5304 and shall be constructed from galvanized coated steel wire.

Fixed guards shall be used and the guards shall not be removable without the aid of a tool. Fans and motors shall be mounted on a prepared base frame incorporating anti-vibration mountings.

Impellers shall be of mild steel or aluminium alloy of riveted, welded or other approved construction with hubs of robust design.

11.6 Dampers

Dampers shall be constructed in accordance with DW144 fabricated from galvanized steel, or stainless steel. Damper frames and blades shall be constructed to ensure rigidity and prevent distortion and jamming in operation. The damper blades shall be fixed so as to ensure that differential movement cannot occur.

Dampers shall be of the opposed blade type with aerodynamic profile blades. Rubber seals shall be provided to damper blade edges so that air leakage is no greater than 0.150 cu.m/s per sq.m damper for 1000Pa pressure differential.

Dampers shall have a means of indicating externally the position of the blades and the blade spindle shall extend through the casing to allow for the mounting of an actuator drive assembly. Where the damper size exceeds 1200 x 1200mm, multiple dampers shall be used. In such instances the dampers shall be uncoupled when actuator driven.

11.7 Attenuators

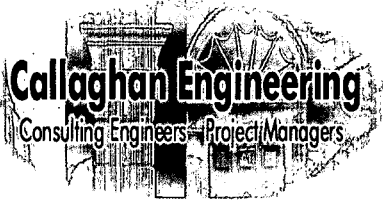
Where attenuators form part of the air-handling unit, the casing shall be constructed from the same material as the air-handling unit. Duct mounted attenuators shall be constructed from galvanized sheet steel not less than 0.8mm thickness and shall generally conform to DW144. Acoustic material shall either mineral fibre insulation or open cell acoustic/thermal foam insulation. The material shall be inert, non hygroscopic, rot proof, vermin proof and shall have a Class 1 rating for spread of flame in accordance with BS 476 Part 7. An impervious envelope shall be provided over the acoustic material.

Splitters shall be bull-nosed entry type. The attenuator face velocity shall not exceed 5m/s and the free airways should not be less than 40% of the face area. Pressure drop shall not exceed 75Pa.

L and T section attenuators shall be designed to allow for smooth airflow. Splitters in bend attenuators shall be fitted perpendicular to the plane of the bend.

Circular attenuators shall have casings constructed from spirally formed galvanized sheet steel.

Circular attenuators shall be provided with peripheral acoustic element and where required to achieve the specified performance shall also be fitted with a centre pod.



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Peripheral elements and pods shall be faced with galvanized perforated sheet steel and packed with acoustic media.

11.8 Extract Fans

11.8.1 General

Fans shall be tested in accordance with the requirements of BS 848 and selected to give the air volume flow rate at the static pressure as specified in the schedule. All belt driven fans shall be capable of running continuously at 10% in excess of selected duty.

The shaft and impeller assembly of all fans shall be statically and dynamically balanced in accordance with BS 6861. Vibration shall not exceed the limits set down in BS 4675 Part 1. Appropriate flexible joints and vibration isolators shall be provided to minimize air leakage and transmission of noise and vibration.

Drive motors shall generally be totally enclosed fan cooled type suitable for use with a 400 V/3 Phase / 50 Hz a.c. electrical supply. All motors shall be continuously rated and shall have insulation in accordance with BS 2757. Motor enclosures shall comply with BS 5490 and the degree of protection shall be as detailed in the schedules.

Belt drives shall comply with BS 1440 and BS 3790. No less than two belts per drive shall be used.

The motor position shall be fully adjustable to enable correct alignment of the motor and fan pulley. Provision shall be made for adjustment of the tension in belt drives by slide rails. All adjustments shall be separately lockable.

Guards shall be provided on both the drive side and non-drive side of all fan/pulley assemblies.

Guards shall comply with BS 5304 and shall be constructed from galvanized coated steel wire.

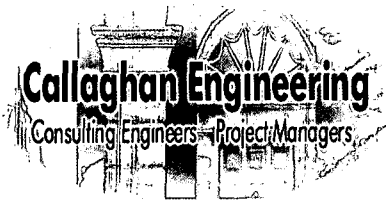
Fixed guards shall be used and the guards shall not be removable without the aid of a tool.

Fans and motors shall be mounted on a prepared base frame incorporating anti-vibration mountings.

Impellers shall be of mild steel or aluminium alloy of riveted, welded or other approved construction with hubs of robust design.

11.9 Axial and Mixed Flow Fans

Axial flow and mixed flow fans shall be rigidly constructed of mild steel or aluminium alloy, stiffened and braced where necessary to eliminate drumming and vibration. Fan casings shall be insulated for noise reduction.



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Mounting feet shall be provided where necessary for bolting to a base or supports. Inlet and outlet ducts shall terminate with flanges. For duct mounted fans the length of the casing shall be greater than the combined length of the impeller and motor(s).

Impellers shall be of steel, aluminium or plastic and the blades shall be secured to the hub or the blades and hub shall be one piece. The hub shall be keyed to the shaft. Blades shall be aerofoil section or laminar and be capable of pitch adjustment where specified.

An access panel with air seal shall be provided in the casing and suitably sized to facilitate maintenance.

11.10 Roof Extract Fans

Fans used in general roof extract units shall meet the appropriate requirements of the preceding clauses relating to fans generally and to particular fan types.

Fan cowls and bases shall be of materials that are resistant to weather, solar radiation and to particular types of fans. Casings shall be formed to facilitate a weatherproof fitting to the building structure. Adequate access to electrical supply terminals and lubrication points shall be provided by means of hinged cowls or otherwise as appropriate.

Back draught dampers and or fire release dampers shall be provided as detailed in the schedule(s). Bird guards of not greater than 25mm mesh shall be provided as an integral part of the unit.

11.11 Grilles and Diffusers

11.11.2 Supply Air Diffusers (including grilles and registers)

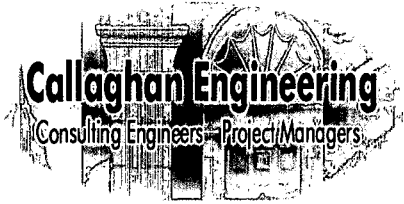
Supply air diffusers shall be tested and rated in accordance with Bs 4773 Parts 1 and 2. Diffuser sizes shall be selected to achieve the required air volume flow rate, air diffusion and noise rating.

Diffusers shall be of aluminium construction and be the louver face type. Where required each diffuser shall be provided complete with matching plenum box with either side or top spigot connection to the ductwork distribution. The plenum shall be mechanically fixed to the diffuser and sealed to eliminate air leakage. The plenum box shall include a flow regulating device and measuring grid. The regulating device shall be adjustable and lockable.

All diffusers shall be anti-ligature type and shall be complete with anti-tamper screw fixings. All wall mounted diffusers shall be cast in to concrete walls. Where walls are of block construction diffusers shall be built in and fixed to the wall construction.

11.12 Extract Air Grilles

Extract air grilles shall be tested and rated in accordance with BS 4773 Parts 1 and 2. Extract grille sizes shall be selected to achieve the required air volume flow rate, air diffusion and noise rating indicated.



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Extract grilles shall be of aluminium construction and be the louver face type. Wall mounted extract grilles shall be non-vision type to minimize view of ductwork behind.

11.13 Louvres

External louvres shall be constructed of galvanized mild steel or aluminium with fixed blades of the Z design pattern spaced not more than 70mm and set at a blade angle of 30° to the vertical plane. Steel louvres shall be protected against corrosion and shall be stove enameled finished.

Blades shall be welded to the frame and braces provided where necessary.

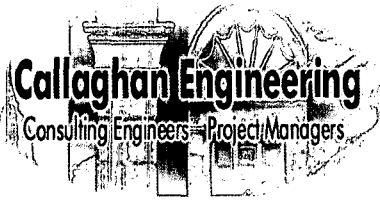
The Contractor shall calculate the dimension for external louvres. The Contractor shall build in, the louvres. External louvres shall be provided with bird guards and insect screen mesh. The minimum free area of the louver including the mesh and bird screen shall not be less than 40% with a face velocity of 2.5m/s.

12.0 THERMAL INSULATION

12.1 General

On satisfactory completion of the various hydraulic tests, all pipework and plant, with the exception of the final water services connections to the various fixtures, shall be insulated in accordance, with the following:-

- All supply air ductwork within the plant rooms shall be insulated with 50mm thick rigid insulation and finished with Aluzinc
- All other supply air ductwork including the low velocity ductwork to and from the air reheat terminals shall be insulated with 25mm thick rigid insulation Class "O" white aluminium 40 foil faced, and applied strictly in accordance with the manufacturer's instructions
- All lap joints and insulation terminations shall be properly taped to prevent fibre migration
- All Insulated Pipework not exposed to the atmosphere or exposed within the building
- All insulated pipework shall be covered with Class "O" white Allu 40 foil faced sheet with a 50mm overlap along the longitudinal seam. The overlap should be sealed with CHIL-STIX CP85 adhesive, or equal and approved.



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All radial bolt joints between sections of insulation shall be sealed with a band of 50mm wide self-adhesive matching Class "O" foil tape.

Minimum Thickness of Insulation on Cold Water Services Pipework:

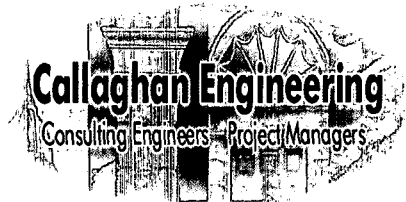
Nominal Internal Pipe Dia (mm)	Thermal Conductivity W/m ² K 0.031 Thickness of Insulation (mm)
13	25
19	25
25	25
32	25
38	32
51	32
63	32
76	32
102	38
152	38
200	38
250 and greater and flat surfaces	38

Reference: (1) Thermal conductivity measured at 10°C.
 Note: (1) All valves for pipes of nominal dia. 80mm and greater shall be provided with insulated valve boxes.
 (2) All flanges shall be provided with insulated flange boxes.

Minimum Thickness of Insulation on Hot Water Services Pipework

Nominal Internal Dia. (mm)	Thermal Conductivity W/m ² K 0.034 thickness of Insulation (mm)
13	25
19	25
25	25
32	32
38	32
51	32
63	32
76	38
102	38
152 and greater and flat surfaces	50

Reference: (1) Flow temperature not exceeding 65°C.
 (2) Thermal conductivity to be measured at 50°C.
 Note: (1) All valves for pipes of nominal dia. 40mm and greater shall be provided with insulated flange boxes.
 (2) All flanges shall be provided with insulated flange box.



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Minimum Thickness of Insulation on LTHW Services Pipework

Nominal Internal Dia. (mm)	Thermal Conductivity W/m ² K 0.034 thickness of Insulation (mm)
15	25
20	25
25	25
32	32
40	32
50	32
65	32
80	38
100	38
150	50
200	50
250 and greater and flat surfaces	63

Reference: (1) Flow temperature must not exceed 82°C.
(2) Thermal conductivity to be measured at 50°C.

Note: (1) All valves within the boiler rooms, plant rooms and service ducts to be provided with insulated valve boxes.
(2) All valves in other locations on pipes of nominal dia. of 40mm and greater to be provided with insulated valve boxes.
(3) All flanges to be provided with insulated boxes.
(4) Unions to be uninsulated.

13.0 PIPEWORK AND DUCTWORK IDENTIFICATION

13.1 General

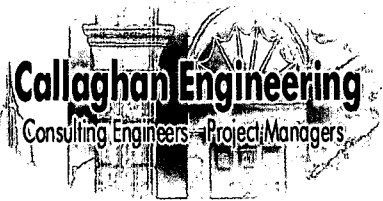
On satisfactory completion of the insulation pipework identification banding shall be applied after covering and/or protective and decorative painting is complete. Identification colours and bands shall comply with the recommendations of BS 1710.

Fire fighting systems pipework shall be identified by 150mm wide 'safety red' bands completely encircling the pipe. Colour coding shall be provided as follows:-

- at 6m intervals on straight runs
- at all changes of direction
- within 300mm of all valves
- within 300mm of all equipment items
- at all junction points and branch (unless end of branch is visible from junction) and
- all lines passing through walls and floors where lines are accessible not visible from an identified main

Direction-of-flow arrows and graphical symbols (where applicable) shall be stenciled in black on a regular white background.

Closed circuit heating pipes shall be labeled 'FLOW' and 'RETURN' as applicable.



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Letters and symbols shall be pipe nominal bore or 50mm in height whichever is the lesser. Symbols shall conform to the legend on the record drawings and plantroom charts.

Identification of Ductwork (Appendix C - DW/144)

Industrial and specialised ducted ventilation systems shall be identified by colour code.

Identification:

All other ductwork shall be identified in accordance with the following clause of Appendix C of DW/144:-

Location:

Symbols - position and frequency shall be as shown on the tender drawings and within 3 metres of each branch.

Colour Coding:

Table 33 to be used.

Direction of flow - example of duct identification symbol - Fig.172

Further instruction - Table 34 to be used.

Explanatory charts to be provided.

Method of Application of Symbols:

Symbols shall be permanently affixed by use of painted, stenciled letters and figures or self adhesive plastics properly applied to a smooth clean surface, or by use of engraved plastic or metal labels riveted or adhesively fixed to equipment items.

14.0 TESTING AND COMMISSIONING

14.1 Tests

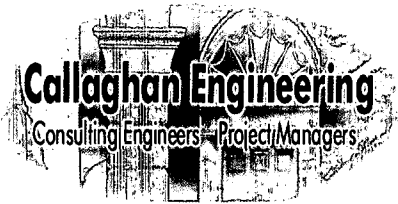
On completion of the works, or parts of the works, but before the application of any insulation, the contractor shall test the various installations, or parts of the various installations.

14.2 Pre-Commissioning Work

All hydraulic systems shall be thoroughly flushed through, to ensure removal of any residual matter within the pipework systems. The flushing and cleaning of pipework system shall be in accordance with B.S.R.I.A. Application Guide 8/91: Pre-Commissioning Cleaning of Water System.

All residual chemical deposits shall be removed from the system prior to commissioning. All strainers shall be removed and cleaned, during and after flushing and immediately prior to balancing of the system.

Advance notice, of an agreed duration, shall be give to the Engineers prior to removal and cleaning of strainers. Flushing and cleaning of the hydraulic systems shall continue until it can be demonstrated that the system has been cleared of all debris and contaminating matter.



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Flushing water shall be released and drained away in an approved manner as rapidly as possible through adequately sized drain valves, before the system is refilled, pre-operation cleaned as necessary, and put into service.

No hydraulic system shall be left empty once the chemical cleaning and flushing procedures have been completed.

No polluting matter, solid or liquid shall enter existing water courses, water supplies, storage tanks, etc.

All ventilation systems are to be completely clear of any obstructions, debris and superfluous matter prior to commissioning. All fire dampers shall be secured in the open positions and all access covers shall be secured in position.

All wiring within control panels shall be checked for loose connections, correct terminations and compliance with the wiring diagrams.

Wiring terminations to all control equipment shall be checked for compliance with the wiring diagrams, and interlocks with other equipment, as shown on the Electrical and HVAC wiring diagrams.

Any faults shall be rectified immediately on discovery unless associated with wiring carried out by others, in which case they shall be recorded and submitted as directed.

Current calibration certificates shall be submitted for all instruments that require periodic recalibration, immediately prior to the beginning of measurement work on site.

If it is proposed to install test equipment additional to that specified, written approval shall be obtained before proceeding to install any such equipment. No such equipment shall be left in the system after completion of the testing and commissioning work without written approval.

14.3 Commissioning Records

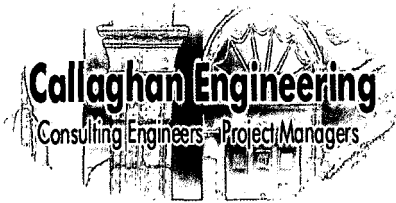
The Sub-contractor shall commission all of the mechanical services within his Sub-contract works and shall submit a logical commissioning programme, prior to commencement of the work, for approval. The programme shall be updated and amended as and when directed.

A commissioning method statement shall be submitted for each type of system to be commissioned. All air and hydraulic systems shall be balanced to within the tolerances detailed in the Specification, commissioning codes and guides.

All distribution systems shall be balanced with due regard to noise generation. Where system noise generation exceeds the acceptance levels specified, the Sub-contractor shall provide all relevant information to the Engineers.

All measurements and operational details shall be recorded as commissioning work proceeds and shall be subsequently submitted as Commissioning Records.

All air distribution system dampers shall be clearly marked in an approved manner when the individual system has been balanced.



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All hydraulic regulating devices shall have their final regulated positions recorded on the Commissioning Records. All hydraulic regulating devices shall be locked in their final regulated positions in an approved manner.

The final balance of all air and hydraulic systems shall be demonstrated. Commissioning Records shall be submitted and shall certify that the results are within the allowed tolerances. System performance tests shall not proceed until the certified Records have been submitted.

The complete commissioning and testing of the installation shall be in accordance with the latest edition of the relevant commissioning code as published by the C.I.B.S.E. The definitions for words and phrases associated with the commission for the mechanical and electrical installation shall be those of the IEE Regulations, the Institute of Plumbing Design Guide, CIBSE and BSRIA Guides, Irish and British Standards, Codes of Practice, associated Statutory and local authority regulations wherever applicable.

The CIBSE & BSRIA guides referred to are as follows:

CIBSE	Series A - Air Distribution Series B - Boilers Series C - Automatic Controls Series R - Refrigeration Series W - Water Distribution
BSRIA	1/75 Manual for regulating air conditioning installations 1/79 Manual for regulating water systems

14.4 Submission and Certification of Records

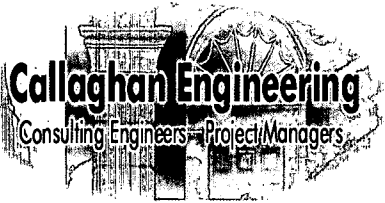
Two complete sets of data shall be submitted on all equipment and systems to be commissioned. Submittals shall be on A3 and/or A4 size paper as required to show the design figures and the final operating values at which the systems and equipment were set. The settings of all dampers and controls, etc. shall also be recorded.

All records and submitted data shall be dated, uniquely numbered and clearly referenced to the item tested by means of serial, chassis, or other manufacturer's reference number permanently marked in a conspicuous position on the item concerned.

Records, Certificates and relevant data shall be submitted to Statutory or Local Authorities as may be required. All Records shall be certified by the Sub-contractors to confirm that the item referred to has been shown under test to meet the requirements of Irish and British Standards, Statutory and Local Authority Regulations wherever applicable.

Immediately upon completion of the Commissioning Work the following shall be submitted.

Schedules of air terminal volumes, with each fan system detailed on a separate sheet. Schedules of fan details and duties obtained, electrical current consumed, full load current, speed and characteristic curve with site performance point clearly marked after pulleys and belts have been changed to meet design values.



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Schedules of pump details and duties obtained, current consumed, full load current, speed and characteristic curve with site performance points clearly marked. Schedules of all regulating valves, flow rates and settings. Schedules of electrical equipment application, types, and full load current and overload setting. Schedules of automatic control settings.

Schedules of all venturi meters and orifice plates with flow rates. Schedules for all other items of plant or mechanical systems. Schedule of set points for all pressure switches, sealed expansion vessels and other items of specialist equipment.

All items included in the Schedules shall be uniquely numbered and cross referenced to the Record Drawings.

15.0 OPERATION AND MAINTENANCE MANUALS AND RECORD DRAWINGS

15.1 General

The Contractor shall provide operation and maintenance manuals and record drawings for the complete mechanical services installation. Before completion the Contractor shall submit a draft copy of the operation and maintenance manual and record drawings for comment/approval by the Engineers. After comment/approval the Contractor shall provide 2 No. corrected bound copies and 1 No. electronic copy to the Engineer.

The electronic copy of the maintenance manual shall be written using Microsoft Word software. The electronic copy shall be submitted in CD-ROM format.

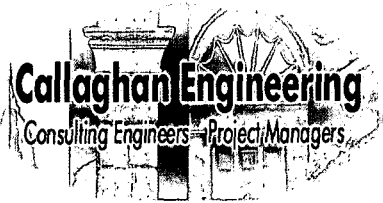
15.2 Maintenance Manuals

Maintenance manuals shall be prepared based on the guidelines as set down in the following documents:

- BS 4884, Parts 1&2 Specification for User Manuals
- BSRIA Technical Note TN 1/84 Guidelines for Building Services Operating and Maintenance Manuals
- BSRIA Application Guide 1/87 Operating and Maintenance Manuals for Building Installations
- BSRIA Technical Note TN 12/86 Fault Finding Procedures in the Building Services Industry

Unless stated otherwise, each maintenance manual shall contain the following information:

- Index, introduction and safety at work
- Description of all systems, their operational procedures and associated equipment
- Names, addresses and telephone numbers of all sub-contractors, suppliers and local firms for each item
- Original copies of all plant, component and technical documentation
- Equipment schedules and spare parts lists
- Operating Information
- Maintenance Instructions
- Fault finding/diagnostics for the finished systems
- Original copies of all system and plant test certificates
- Original copies of all commissioning certificates



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- Complete copies of 'as-installed' record drawings including CD-ROM
- Certificates from nominated suppliers and nominated contractors as necessary.

The above information shall be provided in the form of a suitably bound A4 size manual with hard cover. The operation and maintenance manual may be sub-divided into a number of bound volumes as required.

15.3 Record Drawings ('As-Installed' Drawings)

Record or 'as-installed' drawings shall be provided by the Contractor within two weeks of practical completion of the project.

Record or 'as-installed' drawings shall be drawn to a minimum scale of 1:100 on A1 sheets and 1:50 scale on A1 sheets for plant room and boiler room installations. The drawing shall be provided with a title block containing the project title, architects name and address, the Engineers name and address, a unique drawing number, drawing title and scale. The Engineers drawings shall not be accepted as representing record or 'as installed' drawings.

The Contractor shall submit a schedule of record drawings as part of the final set(s) of drawings to be included in the Operation and Maintenance Manuals.

All record or 'as-installed' drawings shall be prepared using AutoCAD software latest edition. A CD-Rom copy of the drawings shall also be provided.

16.0 OBLIGATIONS DURING DEFECTS LIABILITY PERIOD

16.1 General

The Contractor shall prepare and submit records of failures or malfunctions of any part of the Works during the Defects Liability Period, together with details of remedial action taken, subsequent re-testing and the results.

All defects shall be rectified so that an inspection may be carried out prior to the issue of a Final Certificate.

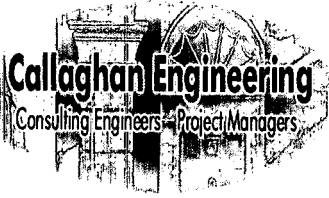
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D.10 ELECTRICAL SERVICES PERFORMANCE SPECIFICATION

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REV	DATE	BY	REVIEWED	APPROVED	ISSUED FOR
A	28.02.06	PC	HH	DO'C	INFORMATION
B	08.03.06	PC	HH	DO'C	INFORMATION

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APPROVALS FOR PURCHASE OR CONSTRUCTION

CE PROJECT MANAGER

DATE

CLIENT PROJECT MANAGER

DATE

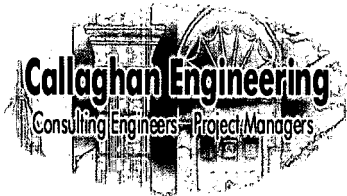


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1.0 GENERAL

The following is a performance specification for the Electrical Installation for the relocation of the Schlotter Ireland Industrial/Warehousing facility to Toughers Business Park, Newhall, Naas, Co. Kildare. The layout of the final installation shall be as specified by the designers electrical installation drawings.

The complete electrical installation shall meet the requirements and follow the recommendations of the ETCI National Wiring Rules, the IEE Wiring Regulations 16th Edition and all other relevant codes and standards as detailed in this Specification.

The Contractor shall test the installation on the completion of the work. Should the installation fail to fulfill the requirements of the above regulation the Contractor shall at his own expense alter, amend and retest until such requirements are met, carrying out the test in the presence of the Engineer or his representative. On completion of the installation a certificate shall be given by the Contractor to the Engineer.

2.0 MAIN POWER DISTRIBUTION

The Contractor shall include for the supply and installation of:

- A Main Distribution Board for the new factory located in the main switchroom
- Sub Distribution Boards as detailed within this specification and the accompanying drawings ED-100 and ED-101.

3.0 LV SWITCHGEAR

3.1 Main Distribution Board

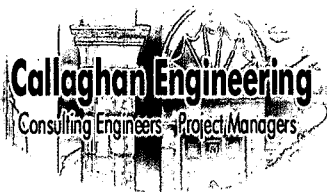
The entire switchboard shall be of metal clad construction including all external housing and doors and internal dividers and guards. The assembly shall be a multi-compartment switchboard of 1.5mm sheet steel construction and shall be compartmented to Form 4 Type 3, IP55 rated with each compartment clearly labelled. Partition fillets shall be of sheet steel manufacture. It shall be of cubicle design with separate compartment doors for each outgoing supply.

Glanding plates shall be supplied at top and bottom. It shall be suitable for over duct floor mounting. The assembly shall have a bake-on powder spray finish in the manufacturers standard colour. It shall have an ingress protection rating of at least IP55. The busbars shall be of bare copper mounted in their own compartment. The busbars and all associated connections shall be fully accessible throughout without having to remove switchgear. The busbar assembly shall be a fully type tested system and the manufacturers shall produce short circuit test certificates upon request.

Cable compartments shall be provided between the various vertical rows of breakers / switchfuses. They shall be wide enough to ensure that cables can be terminated easily and that cable-bending radii are not exceeded. Each one shall be fitted with an earth busbar. Each compartment shall be door interlocked so that the switch or circuit breaker must be 'off' before the door can be opened.

Contactors shall be DIN rail mounting and shall have an AC 23 duty rating in accordance with IEC 251.

The switchboard shall be equipped with surge protection units to suppress over voltages and transients due to network disturbances and or lightning strikes. These units shall be rail mounted



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within a dedicated compartment of the switchboard. They shall be of Furse manufacture or equal and shall comply with the latest relevant BS / IEC standard and fused at 60A.

All ACBs, MCCBs and MCBs shall be of the same manufacture throughout. All main air circuit breakers shall be fully withdrawable. Sub-main MCCBs shall be fixed type. All MCBs shall be minimum 10 KA rated and shall be 'Type C' characteristic unless otherwise specified. Switchfuses shall be HRC type using either B.S. 88 or NH type fuses. Switches shall conform to IEC 408. Switchfuses / fuse switches shall be single or triple pole double break as indicated with a separate neutral link in each compartment. Isolation of main boards and of individual sub-boards shall be as follows:

Up to 250 Amp	Switchfuses
250 Amp to 400 Amp	MCCBs to IEC 157-1, BS4752
400 Amp and above	MCCBs to IEC 157-1 with rated prospective short circuit current @40 KA and tested to IEC 157-1 PL Category

Earth fault relay protection shall be provided on all main circuit breakers. Each main circuit breaker shall be provided with independently powered tripping units.

The switchgear manufacturer shall select the circuit breakers to ensure full discrimination is achieved throughout the entire installation. He shall submit computer calculations to indicate the prospective fault levels throughout the installation along with verification that full discrimination is achievable.

The switchboard shall be fitted with energy meters to provide digital indication of phase and line voltages, phase currents and real, apparent and reactive power and max demand. Meters shall be provided with pulsed outputs for monitoring by the building energy management system (BEMS).

All main and sub-main breakers in the switchboards shall be provided with duplicate volt-free contacts to provide 'open', 'closed' and 'trip' status signal to the BEMS and a remote mimic panel (for later use).

All control wiring shall be connected via DIN rail terminals and shall be complete with a terminal designation chart fixed to the inside of the terminal cover.

Switchboards shall be provided with the following instrumentation:

- Voltage Indicator
- Voltage Selector switch – phase to neutral/phase to phase and off positions
- Current Indicator
- Current Selector switch
- Power Factor Correction Indicator

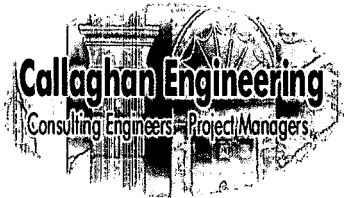
Switchboards shall be provided with spare cubicles for 25% expansion.

3.2 Sub Distribution Boards

The electrical contract shall include for the supply and installation of sub distribution boards to serve individual areas as detailed on the accompanying electrical services drawings.

Distribution boards serving individual areas shall be custom-built low voltage switchgear assemblies manufactured in accordance with IEC 439, Form 2 and the ETCI Code of Practice.

The housing shall be sheet steel minimum thickness 1.5mm, electrolytic galvanised with raised doors and sealing profile. Glanding plates shall be supplied at top and bottom.



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It shall be suitable for surface wall mounting. The cabinet shall have a bake-on powder spray finish in the manufacturers standard colour. It shall have an ingress protection rating of at least IP54: with the boards located within the production / warehouse facility shall be IP56 rated.

The interior shall consist of a supporting frame, top hat rails etc. It shall be fitted with touch/flash guards manufactured from sheet steel of proprietary manufacture.

The main switch for each board shall be a rotary padlockable double break type with neutral link to IEC 408. Sub-switchfuses for each section shall be similar with HRC fuses. Covers shall be interlocked so that the switch or circuit breaker must be 'off' before the cover can be removed.

The distribution boards shall be equipped with surge protection units to suppress over voltages and transients due to network disturbances and or lightning strikes. These units shall be rail mounted within a dedicated compartment of the switchboard. They shall be of Furse manufacture or equal and shall comply with the latest relevant BS / IEC standard and fused at 60A.

All protective devices for final sub-circuits shall be din-rail mounted. Integral busbar arrangements shall not be accepted. All lighting circuits shall be protected by 10 Amp type 'C' SP MCBs. Sockets etc shall be protected by means of 20 Amp x 30 mA SP&N type A RCBOs. Type AC RCBOs shall not be accepted. Security equipment and miscellaneous power supplies shall be protected by 16 Amp type 'C' SP MCBs. Contractors shall be DIN rail mounting and shall have an AC 23 duty rating in accordance with IEC 251.

All motive power distribution board sections serving extract fans shall be fitted with motor circuit breakers incorporating both magnetic release and an adjustable thermal overload release to give individual short circuit and overload protection of each motor circuit. Distribution boards will be provided with spare space for 25% spare capacity.

4.0 CABLE SUPPORT SYSTEMS

4.1 General

The Contractor shall co-ordinate the routes of the cable support system with other services and equipment. The Contractor shall be responsible for any costs associated with moving any cable support system as a result of failure to co-ordinate services.

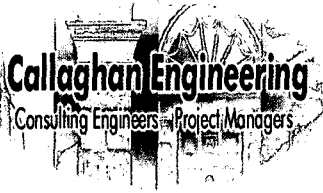
A minimum clearance of 150mm shall be maintained between services. Where cable support systems pass hot water adequate insulation precautions shall be taken. Allowance shall be made for expansion and movement of the cable support systems crossing structural expansion joints.

The Contractor shall be responsible for the satisfactory earth continuity of all complete irrespective of whether they are being used as an earth continuity conductor or not. Cable support systems shall be adequately supported at not less than 1,000mm centres and at each change in direction.

4.2 Cable Tray and Ladder Rack Systems

Cable tray and ladder rack systems shall be installed to support multi runs of cable. Cable trays shall be perforated and manufactured from cold rolled mild steel in accordance with BS 1449: Part 1 and finished hot dipped galvanised. Tray widths shall not normally exceed 600mm except for data cables.

All accessories including bends (vertical and horizontal), intersections, tees, risers and reducing sections shall be purpose made by the tray manufacturer. Only one manufacturer's tray and



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accessories shall be used on the project. The thickness of normal cable tray and accessories shall comply with the following requirements:

WIDTH OF TRAY ACCESSORY (mm)	MINIMUM THICKNESS (mm)
Up to and including 152	1.0
Above 152 up to and including 254	1.2
Above 254 up to and including 457	1.5
Above 457 up to and including 914	2.0

Where heavy duty cable tray is required due to the span between supports and/or cable loading necessitates its use, then the thickness of tray and accessories shall comply with the following requirements:

WIDTH OF TRAY ACCESSORY (mm)	MINIMUM THICKNESS (mm)
Up to and including 457	1.5
Above 457 up to and including 914	2.0

Heavy duty cable trays shall be manufactured with plain return flanges.

Except where specified or shown otherwise the Contractor shall be responsible for the selection of the correct grade of cable tray to meet site conditions and the requirements of this Specification.

Sections of cable tray and accessories shall be jointed in accordance with the recommendations of the manufacturers or alternatively by using mushroom-head roofing bolts, nuts and washers.

Cable tray and accessories shall be supplied with a hot-dip galvanized finish to BS 729. Any damage caused to the tray, accessories and finish during cable installation and prior to Practical Completion shall be made good using either a zinc rich epoxy primer or equal alternative with a generous overlap on the existing sound metal coating. The jointing screws, nuts and washers shall all be galvanized, brass shall not be used.

Cable trays shall be cut along a line of plain metal and not through perforations. Burrs or sharp edges shall be removed prior to the installation of tray sections or accessories. Holes cut in cable tray shall be suitably bushed with grommets complying with BS 1767. In either case the cut or damaged metal shall be made good by the Sub-contractor by first treating the surfaces with suitable rust-proofing agent, similar to that used in its original manufacture and then applying finishes comparable to the remainder of the surface.

Fixings and supports shall be formed from sections of purpose made racking with purpose made accessories.

Fixings and supports shall be installed at regular intervals of 1200mm and not more than 200mm from all bends, tees, intersections and risers. Mid-span joints between cable tray sections shall be avoided and they shall be positioned as close as practicable to the tray fixing or support.

A minimum clear space of 25mm shall remain behind all installed runs of cable tray. Cables shall be installed on trays in a single layer, leaving 25% of the tray width spare for future use. Cable trays shall preferably be installed such that they offer direct support to cables without the use of cleats or saddles. Purpose made straps, cleats, or saddles shall be employed, however, to maintain a neat and regular disposition of cables. Where trays do not directly support cables, e.g. vertical tray, then load bearing cable cleats or saddles shall be employed and securely fixed to the tray.

All cable cleats, saddles and straps shall comply with the cable manufacturer's recommendations and shall be compatible with the cable tray finish and cable sheath or serving.



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Cable tray and accessories shall be electrically and mechanically continuous throughout its length and bonded to the earth system. Tray carrying LV cables shall be bonded to earth with green/yellow PVC insulated stranded copper, single core cable.

4.3 Trunking

4.3.1 General

Surface mounted trunking runs shall be horizontal and vertical and where these requirements are not met the trunking shall be run parallel to the building lines.

Manufacturer's standard fittings shall be used for all connections and changes of direction. Where trunking passes through walls, floors and ceilings, non-combustible, non-metallic fire barriers shall be installed in the trunking. Trunking and connectors shall be manufactured generally in accordance with BS4678: Part 1.

Trunking and fittings shall have removable lids extending over the entire length. The lids shall be of the same thickness of material as that of the trunking.

Where trunking is run in floor trenches it shall be continuously hot dip galvanised plain sheet steel to comply with BS 4678, part 1.

The number of cables to be installed in the trunking shall be such that a space factor of 45% is not exceeded.

The fixings and spacing of fixings shall conform to the manufacturer's instructions. Where more than one circuit is run in the same trunking, or more than one service, the cables for each circuit or service shall be bound together at 1.2m intervals with PVC tape suitably coloured.

A protective conductor of not more than 2.5mm² shall be installed throughout the installation.

4.3.2 Lighting Trunking

Where specified, the lighting trunking shall be manufactured from 1.2mm, galvanised, sheet steel.

The trunking shall be a minimum of 100mm x 100mm in size and shall be complete with all necessary couplings, blank ends and all accessories. The trunking and suspension brackets shall be of a design to allow the trunking lid to be removed without disturbing the suspension bracket.

4.3.3 Dado and Skirting Trunking

Small power and data cable distribution within the laboratory and office areas shall be provided using 2-compartment PVC dado trunking, fixed to perimeter walls, partition walls and benches as appropriate. The height of the dado trunking above the finish floor level shall be agreed with the Engineer (nominal 1100mm AFFL).

Generally, dado trunking shall be mounted approximately 150mm above bench level. At each location a vertical dado trunking link of the same specification shall be installed to provide a wire way between the dado trunking and the ceiling trunking system.

All fixings shall be concealed where possible.



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All components and ancillaries used throughout the installation of the dado trunking shall be manufacturers standard components suitable for this specific type of installation.

All switched socket outlets, RJ45 outlets and associated back boxes shall also be of the manufacturers standard and shall be fully compatible with the system of dado trunking used. All outlets faceplates shall be of a similar finish to the dado trunking and shall be flush mounted within the trunking.

The complete installation shall include all flush finish covers, corner pieces and 'T' pieces so to present a single item continuous trunking system.

The back panel of the dado trunking system used throughout shall have a smooth finish. The nominal dimensions of the dado trunking shall not be less than 217mm wide x 72mm deep.

Conduit entry where required shall be concealed within the wall and terminate in the dado trunking or leave via a flush cable entry back box.

The dado trunking or trunking lid will fully describe the distribution board and circuit reference of all power circuits and RJ45 voice/data outlets contained within that particular section of dado trunking.

4.4 Conduit

4.4.1 General

The Contractor shall be responsible for co-ordination with other trades and for working to any conduit layout drawings.

All conduits shall be run horizontal or vertical. Where this requirement cannot be met then conduit shall be run parallel to the building lines. No conduit smaller than 25mm shall be installed in any part of the installation.

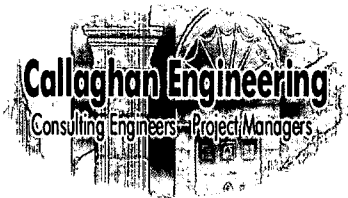
The maximum number of cables drawn into any one conduit shall not exceed 80% of those allowed by the relevant regulations and the ETCI National Rules and IEE Regulations, 16th Edition.

4.4.2 Metal Conduit

All conduit, bends and couplers shall comply with BS 4568: Part 1. The conduit shall be heavy gauge screwed. Internally screwed couplers shall be made from steel. Conduit fittings and components shall comply with BS 4568: Part 2 and be suitable for use with screwed conduit.

Inspection elbows and bends, tees and manufactured bends shall not be allowed. Particular attention shall be paid to the continuity of all conduits and fittings to avoid high resistance between joints and connections. Continuity tests shall be made at the completion of the conduit installation and details of the test results shall be entered in the Inspection Certificate.

Conduit shall be supported in accordance with the ETCI Rules. Where conduit is connected to surface mounted equipment or accessories it shall be additionally supported within 150mm of each side of the item.



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Where bends and sets occur the conduit shall be fixed at a distance of 150mm on each side of such diversion. Unless otherwise stated all concealed conduit work shall be installed on the "loop-in" system.

The inner radius of any conduit bend shall not be less than 2.5 times the external diameter of the conduit. Where conduit has to be bent it must be bent without altering its section.

Conduit buried in concrete shall have a minimum depth of 25mm cover over its entire length. Conduit buried in a plaster shall have a minimum cover of 20mm over its entire length. Conduits in chases shall be held in place by purpose made crampets.

All fixings shall be by means of spacer bar saddles using either slotted or keyhole pattern type saddle tops. No cables shall be inserted until the conduit and boxes are fixed and the plastering complete. No greater pull than 15kg shall be exerted.

Conduit boxes shall be installed at every 7.5m to enable easy drawing of cables. All conduit ends not connected to accessories shall be blanked off using a coupler and brass stopping plug. Connections to distribution boards, trunking, accessories shall be by means of conduit coupler and bush. Lock nuts or simple pass through type termination shall not be permitted.

4.4.3 Cleanroom Areas

In cleanroom areas, cables to wall mounted outlets shall drop through channels in the cleanroom paneling as directed by the cleanroom contractor.

5.0 CABLES

5.1 General

All cables shall be manufactured to British Standards, be BASEC approved and delivered to site in the manufacturer's packing with seals and labels intact. Armoured wired cables and cables over 10mm² used for switchgear interconnection specifically purchased in short lengths are excluded from the above requirement.

All cables shall have copper stranded conductors, be constructed and installed in accordance with British Standards and have the manufacturers identification and BS number clearly marked on the sheath.

Damaged cables shall not be accepted in the installation and shall be replaced at the expense of the Contractor. Where cables are exposed to the risk of mechanical damage they shall be protected to a height of 2m above finished floor level using galvanised steel guards.

All cables shall be sized in accordance with the relevant tables of the ETCI Regulations for Electrical Installations.

5.2 LSF Insulated Cables

LSF insulated cables shall be 600/1000 volt manufactured in accordance with BS Specification No. 6004. The conductors shall be high conductivity tinned copper. The minimum cable sizes for outgoing circuits from final distribution boards will be in accordance with the following:



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Light circuit not exceeding 10 amps - 2.5 mm²
General purpose socket circuits - 4.0 mm²

Radial circuits - in accordance with IEE directive.

In general, no conductor smaller than 1.5 mm² shall be used. Flex outlets shall be in 2.5 mm² cable on dedicated circuits. Cables for different phases shall be distinctively coloured as shown in ETCI rules.

Flexible cable used for connection lighting fittings shall, in all cases unless otherwise specified, be BS6500 heat resistant type suitable for temperature up to and including 2000F.

All flexible cables shall be manufactured by an approved manufacturer and shall comply with approved IEE regulations in all respects.

5.3 Armoured Cables

Armoured cables shall be XLPE/LSF/SWA/LSF and cables shall be installed as outlined below. All cables shall be suitable for installation on cable tray, ladder, in ducting or buried in the ground.

The cables shall comply with BS6346. Cables shall be of 600/1000-volt grade. They shall have copper stranded conductors. The cables shall be installed in strict compliance with the manufacturers requirements and bends in the cables shall be of the minimum radius of 8 times the overall diameter of the cable for cables larger than 25mm.

All runs of cable inside the building shall be supported on cable ladder; on Unistrut brackets and in all instances the spacing of supports shall comply with the cable manufacturers recommendations.

All cables shall be terminated in the manufacturer's glands. Termination of the cable cores shall be by means of manufacturer's compression termination lugs in accordance with the manufacturer's instructions. The cable armouring shall be carefully made off in the manufacturer's gland at each entry to switch fuses etc.

Bonding to the metal work for the earthing shall be by proprietary earth tags.

Armour alone shall not be relied on as the earth conductor and, where necessary, a separate earth wire shall be installed alongside the armoured cable to comply with the ETCI Regulations.

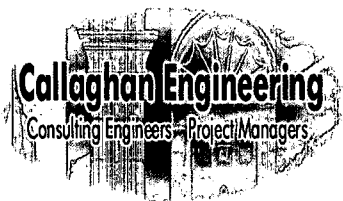
5.3.1 XLPE Insulated Armoured Cables

Cables shall be armoured and LSF sheathed. Multi-core cables shall be single wire armoured and single core cables shall be aluminium strips armoured. Generally multi-core cables shall be XLPE/LSF/SWA/LSF and single core XLPE/SWA/LSF.

The cables shall comply with BS 5467: 1989 and shall be of 600/1000 volt grade. The cables shall be installed in strict accordance with the manufacturer's requirements and bends in the cables shall be of a minimum radius of 8 times the overall diameter of the cable.

5.3.2 MICS Cable

MICS cables shall have copper conductor with seamless copper sheath and powdered mineral insulated high conductivity copper conductors in compliance with BS 6207. Unless otherwise specified, they shall be heavy duty (1000V) class.



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All wiring where MICS cable is specified shall be carried out in two or four core cable not less than 1.5mm² cross sectional area. MICS shall be as manufactured by BICC or equal and approved.

Cable manufacturer's terminations, fixings, accessories and tools shall be used. All MICS wiring shall be installed in accordance with the manufacturer's recommendations.

Termination for MI cables shall comply with BS 6081, and shall be made off strictly in accordance with the manufacturer's instructions. Sealing pots and glands shall be marked with the appropriate cable reference. All cables shall terminate using only screw-on pot type seals incorporated in the universal ring type glands and shall be adapted to suit the various boxes, switches, etc. All cables shall be effectively sealed using only the manufacturers sealing compounds.

All sheathing shall be electrically continuous across all joints and earthed in accordance with the clause marked "Earthing".

All cables shall be securely fixed at intervals, not greater than 300mm, with brass saddles and screws. Where cables pass through floors, walls or ceiling they shall be protected by a short length of galvanised steel conduit of suitable size, correctly bushed.

The bending radius for MICS with copper sheath shall be 6 times the diameter of the cable.

Connections between cables shall be by means of mechanical connectors of approved type. Every connector shall be easily accessible and shall not have a resistance greater than that of the equivalent length of the largest conductor to which the connector is fixed.

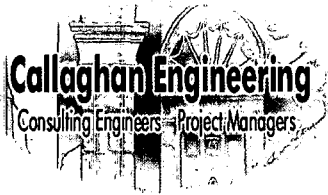
MICS cables installed in under-floor or similar ducts, on galvanized tray, or in damp or corrosive conditions, or where specifically called for in this Specification, shall be provided with an overall extruded orange sheath.

Terminations of PVC sheathed MI cables shall be protected by the correct size of plastic gland shroud. Any exposed metal sheath remaining after the installation of the cable gland shall be wrapped with PVC tape, as supplied by the cable manufacturer, before fitting the gland shroud. Immediately after cutting, each cable end shall be sealed, either by the permanent seal or by being dipped in bituminous compound.

Holes cut in gland plates, adaptable boxes and other equipment shall be correctly sized for the gland to be installed such that minimum of free play exists between the gland body and the cut metal. Paint or other finishes around the hole periphery shall be removed and the metal thoroughly cleaned before the gland is installed.

Large single-core cables shall be terminated in the manner recommended by the manufacturer to reduce losses due to eddy currents or circulating currents. Where glands are installed on non-conducting materials then earth tail seals or sheath earth bond clamps shall be employed. The earth tail or clamp shall be bonded to the appropriate earth terminal or bar.

All cables shall have their conductors tested for insulation resistance immediately prior to terminating the cable end. Tests shall be carried out with a 500V 'Megger' insulation tester, or similar instrument, to prove the integrity of the insulation between cores and the cable sheath.



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Cable clips and saddles shall be purpose-made by the cable manufacturer. The use of bare or PVC covered copper strip for site fabrication of saddles or clips will not be permitted. Clips with single hole fixings may be used when installing single cables.

Where two or more cables are grouped together then saddles with two hole fixings shall be employed. Plain copper sheathed cables shall be held with bare copper clips or saddles. PVC sheathed cables shall be held with PVC covered clips or adjustable nylon saddles. The type of fixings employed shall be consistent throughout the installation.

Cables fixed to the building structure or to cable tray shall have clips or saddles spaced at the following regular intervals:

Overall Diameter of Cable (mm) (excl. PVC Sheath)	Horizontal & Vertical Fixing Centres (mm)
Up to 7.5 inclusive	450
Above 7.5 up to 12.5 inclusive	600
Above 12.5	750

Cable saddles and clips shall be fixed to the building fabric or to cable tray as follows:

- (1) Building fabric - brass roundhead screws and fibrous or approved plastic plugs
- (2) Galvanized trays in damp or wet conditions - zinc coated roundhead screws, nuts and washers
- (3) All other cable trays - brass roundhead screws, nuts and washers

Where multi-core cables are installed and one or more cores are unused, then the spare cores shall be bonded to earth.

5.3.3 Cables Installed Underground

Underground cables shall generally be XLPE/LSF/SWA/LSF type and shall be suitable for the specified voltage, frequency, and phasing and environmental conditions:

Underground cables shall be installed in ducting at a depth of not less than 600mm and not greater than 750mm.

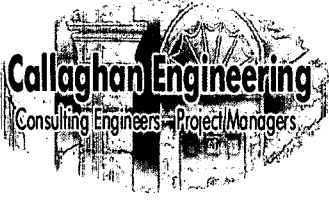
Warning tape shall be installed directly over the full length of the cable at a depth of 300mm below finished surface level. The tape shall be made of yellow self coloured polyethylene not less than 150mm wide with a continuous repeated text 'CAUTION ELECTRIC CABLES BELOW', or similar in black letters not less than 30mm high.

6.0 EARTHING & EQUIPOTENTIAL BONDING

6.1 Earthing & Bonding

All necessary earthing and equipotential bonding shall be done in accordance with the ESB area regulations and ETCI Rules. A main earthing terminal of sufficient capacity shall be installed in the main switchroom. Main bonding contactors shall connect the main engineering services (such as pipe works for gas, water, central heating, or ducting for air conditioning) to the main earthing terminal.

At switchgear assemblies, all new items shall be bonded by a conductor of not less than 6mm². A main earth terminal bar shall be used to centralise all earth connections. The Contractor shall size



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the main earthing conductors. The Contractor shall size the main earth electrode and all earth electrodes shall be enclosed in a C10A Furse earth pit.

7.0 LIGHTING INSTALLATION

7.1 Normal Lighting

The Contractor shall design, supply, install, connect, test and commission the complete lighting installation.

The type of luminaire required in each room will be as detailed by the final design drawings. A suggested luminaire type specification for each room is detailed within the accompanying room data sheets.

All fluorescent luminaires shall generally be complete with radio interference suppression equipment and individual cartridge fuses complying with BS 1362. Fluorescent lamps shall be high frequency T5 type with low energy input.

The Contractor shall ensure that all the luminaires required for the project are placed on order in due time to ensure delivery to suit the project construction programme. However, approval from the Engineers shall be obtained for final selection of the luminaires before the orders are placed.

All luminaires shall comply with BS 4533, the incandescent lamps with BS1101 and fluorescent lamps with BS 1853. All fluorescent lamps shall be of the Pluslux type. All luminaires shall be complete with correctly rated lamps.

The sub-contractor shall include for the luminaire trims to be finished in a colour of the Engineers approval rather than the manufacturer's standard (e.g. other than white).

LSF single core cables shall not be permitted to enter any of the luminaires. Such cables shall be terminated on porcelain fixed base connectors in a local conduit box or in plug-in ceiling roses and final connection to the luminaires shall be carried out using multicore heat resisting flexible cables. No cable smaller than 2.5mm² shall be used for the lighting installation.

Unless otherwise specified or recommended by the manufacturers, surface mounted luminaires shall be fixed directly to the conduit boxes at their rear.

For recessed luminaires, circuit wiring shall be terminated in plug-in ceiling roses or switching units having GREGG or ROCK plug and socket ceiling roses. Final wiring to the luminaires shall be carried out using insulated and sheathed circular heat resisting multicore cables.

All lighting circuits shall be complete with earth wire.

7.2 External Lighting

The Contractor shall design, supply, install, connect, test and commission the external lighting installation as described in the Specification. Wiring shall be carried out using XLPE/LSF/SWA/LSF cables installed in underground ducting.

Lighting columns shall be handled and erected in accordance with the manufacturers recommendations.

Columns shall be buried to the recommended depth, dependant on height, accurately plumbed and excavations back filled and compacted. A 150mm thick bed of concrete shall be placed in the hole prior to erection of the column. A 100mm PVC duct shall be routed into the column cut out



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below ground level for ease of wiring prior to the hole being backfilled with concrete to form the column foundation. Care shall be taken to ensure that concrete does not enter the cable entry cut out.

Where site conditions are not suitable for burying or where the column height dictates, the columns shall be mounted on a minimum of 1800 x 1800 x 1200mm square concrete base with 100mm diameter PVC pipe intersecting via vertical hole on both sides of column.

Lanterns shall be mounted at the top of the column and shall be fully enclosed, weatherproof with suitable securing screws. All fittings shall be vandal resistant and supplied complete with protective guards. A gear compartment shall be provided within the column base to house the control gear and service fuse unit. The Contractor shall wire between the service fuse and the column lantern.

A purpose made gland plate shall be mounted below the service fuse unit to accommodate an incoming cable glands. All cable armouring shall be bonded to earth at terminations using suitable armour clips.

Doors with tamper proof lock requiring a unique key tool for access shall be provided for the gear compartment.

Wall fixed luminaires shall be mounted on the external fabric of the building in accordance with manufacturer's recommendations using the correct fixings, reinforcing plates and brackets. All fittings shall be vandal resistant and supplied complete with protective guards. Luminaires shall be mounted at a consistent height around the building in order to achieve the specified illumination levels.

Cabling to wall mounted luminaires shall be by PVC single cables within a galvanised steel trunking and conduit installation run within the building.

Conduit connections shall be carried out direct to each luminaire from a circular conduit box within the building.

7.3 Lighting Switches-General

Light switches shall be single pole single or multi gang grid switches with a rocker switch mechanism.

All switches shall be of not less than 20A capacity and connected on the live side of the lamp and comply with BS 3676. All switches shall be mounted at a height between 900-1200mm (to the centre) from the finished floor level and inside the doorway of the room served unless otherwise directed.

Switch plates shall be suitable for mounting on a flush, special, electrical backbox c/w 4no threaded front plate mounting bushes. The plate shall be of 3mm minimum 316L stainless steel construction with a bright finish and shall be provided with 4no. M6 S/S countersunk anti tamper fixing screws. The plate shall incorporate a single flush pushbutton switch of S/S metal construction, rear mounting, anti tamper, of robust construction and vandal resistant. The pushbutton shall be sealed to IP67 and have a high impact rating (9).

All switches shall be flush mounted with the wall.

All parts of the lighting switching installation shall be earthed.

Switches in one location shall be grouped in a single enclosure and shall share a common plate. Where a group of switches are connected to more than one phase, the switches shall be



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separated by the use of proprietary phase barriers. Each compartment shall be covered by it's own internal warning plate suitably engraved 'DANGER 400 VOLTS PRESENT' or similar.

All switches shall be engraved to identify the function of the switch.

All switches within the production area shall be of non-tracking single pole c/w weatherproof enclosure, galvanised and to protection level IP65.

7.4 Dimmers

Dimmers within designated office areas shall be electronic type designed to complement the characteristics of the lamp being controlled.

Single or twin lamp luminaries may be controlled by the plate switch type dimmer unit having integral OFF/ON capability and potentiometer type control knob. The cover plate shall be of the same type and finish as that employed for lighting control switches.

7.5 Time Switches

Electronic time switches offering comparable battery reserve and automatic time setting variations comparable with solar dial control shall be used.

7.6 Passive Infrared Detectors

Passive infra red detectors (PIRs) shall be electronic type rated for use on inductive and resistive load.

Detectors shall be capable of switching individual rooms or controlling areas of a building via contactors.

Detectors shall incorporate an immediate response to body heat and movement.

Adjustments shall include an adjustable time delay facility from 30 seconds to 30 minutes and a light level adjustment variable from 5 to 300 lux.

Units shall be suitable for wall or ceiling mounting. Detectors shall be compatible for parallel connection i.e. two or more sensors controlling the same circuit.

7.7 Photocells

Photocells shall be of the electronic type for switching and shall be suitable for use with both inductive and resistive loads.

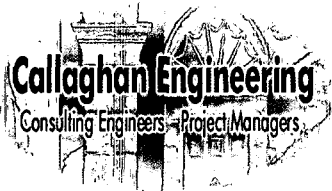
The minimum load switching capacity shall be 5A.

Photocell switching arrangements shall be:

- On at dusk, off at dawn – standard photocell
- On at dusk, off at midnight – photocell with electronic timer

Units shall have pre-calibrated levels to switch on 10 minutes early to allow a warm up period when controlling discharge lighting.

Units shall be suitable for wall mounting via bracket arrangement or directly into luminaire via a NEMA socket.



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Photocells shall be housed within a polycarbonate waterproof enclosure.

8.0 EMERGENCY LIGHTING

The complete emergency lighting system shall be designed, installed, tested and commissioned in its entirety, and be certified upon completion, in accordance with National Standard IS 3217:1989 "Code of Practice for Emergency Lighting" published by the NSAI and subsequent amendments (if any) where, when and if applicable.

All emergency lighting equipment shall show and signify compliance by CE Marking being present in a visible location as defined by the applicable directives.

All safety signage utilised in conjunction with the emergency lighting system must comply with the Health and Safety Authority's Safety and Health at Work (Signs) Regulations 1995 (S.I. No. 132 of 1995).

The entire emergency lighting system shall be fully addressable microprocessor based system, designed and installed such that each emergency luminaire can be tested in a manner as defined by IS 3217: 1989 - Clause 7.4.2.

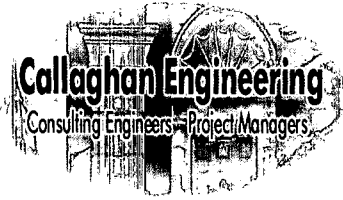
Each luminaire shall be provided with its own unique address which will be clearly identified on each luminaire by a permanent label or engraved. A drawing indicating the location of each fitting with its address will be provided.

The Contractor shall employ a single specialist emergency lighting company to supply, commission and certify the entire emergency lighting installation. The specialist company shall have an established and proven track record in the field of emergency lighting design, manufacturing, test, supply, commissioning and certification. The specialist company shall be in a position to undertake non standard or special work in-house. The specialist company shall have a standing service division resident within the Republic of Ireland (for at least the previous 5 years) to undertake, at the Clients request, preventative and remedial maintenance contracts on the completed installation so as to maintain the installation over its design life.

8.1 Emergency Lighting Conversions

All normal lighting luminaires to be converted to provide an emergency lighting function in the event of a power failure shall conform with the following specification.

- a. All inverters utilised shall be of the fully enclosed type (metal or plastic can).
- b. All batteries integral to luminaires shall be high temperature (55C) Sintered Plate Nickel-Cadmium, Secondary Cell type, Rechargeable.
- c. All conversions shall be integral to the original luminaire only following specialist assessment, investigation and test to ascertain the suitability for conversion from an electrical, electronic, mechanical, thermal, EMC, serviceability and safety viewpoint. In the event that integral conversions cannot be undertaken due to any of the above reasons, remote conversions are acceptable of the piggyback enclosure type if, and only if, access to the emergency lighting equipment can be made without removal of the original luminaire from the ceiling, wall or floor. In the event that the piggyback conversion option cannot be undertaken due to the above reason, remote conversions are acceptable of the remote enclosure type if, and only if, the interconnecting wiring between luminaire and remote gear is suitably protected mechanically, is fire rated as defined by IS 3217:1989 or equal, is suitably sized in relation to CSA (Cross Sectional Area) for the required load and distance traveled to minimise volt drop between source and load to 3% and is also electrically-suitably rated for the required purpose in terms of voltage and high frequency and/or DC characteristic.



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- d. All conversions shall not affect the Ingress Protection Classification (IPXX) of the original luminaire and shall not affect the photometric performance of the original luminaire and shall also not affect the Safety Classification of such luminaire (Class I, II, III).
- e. Overall responsibility of recertification of the original luminaire following the conversion process specific to the EMC and LV Directive, Ingress Protection Classification, Safety Classification and performance criteria shall be that of the specialist company.
- f. All conversions shall be undertaken off site in a specialist facility and all conversions shall undergo complete performance and safety tests upon completion. The conversion process shall be carried out by a specialist company operating a quality assurance program in line and detailed by IS/ISO 9001/EN 29001:1989.

8.1.1 Lamps

All lamps used as part of the emergency lighting system shall be suitable for the required purpose and be of recognised leading brand name manufacture only and shall be available within the Republic of Ireland ex-stock for a minimum period of 10 years following installation completion.

8.1.2 Metal and Plastics

All metals and plastics used as part of the emergency lighting luminaires shall be suitable for the required purpose and in line with the following specifications.

Metals: All metals used shall be either bright mild steel, galvanised steel, stainless steel, aluminium or brass finished in either polyester powder coated paint to specified RAL colour(s).

Plastics: All plastics used shall be polycarbonate or equal and approved with the following properties: High Temperature Rating, UV stabilised, Low Smoke and Fume (LSF), Self Extinguishing and Non Halogenous.

8.1.3 Emergency Lighting Exit Signs

All emergency lighting exit signs shall have the running man, arrow & door symbols, outlined by deep engraving into plastic diffuser to achieve high definition of symbols. The background colour of the blade shall be green as defined by ISO 3864 and the running man, arrow & door symbols shall be white. All pictograms must be silk-screened only to diffuser surfaces. All diffuser material shall be polycarbonate.

8.1.4 Inverter Modules (Self Contained)

All inverter modules used shall be fully encapsulated by metal or plastic can such that no components or conductive surfaces at LV or higher tension are accessible upon removal of louvre, diffuser and/or gear tray for preventive or remedial maintenance purposes.

8.1.5 Design

All luminaires shall be designed such that they may be installed and fixed easily to required surfaces. All luminaires shall provide areas for easy cable access and have internal cableways if required. All exit signs, conversions, interface units, central test units etc. are to be from a single source supplier to Engineers approval.



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8.1.6 General

Voltage sensing changeover relays shall be located within the luminaires to affect changeover from mains to emergency supply in the event of mains failure.

All cabling associated with the emergency lighting installation shall be carried out using fire protected cables in accordance with BS5266 Part 1 1988 and shall be MICC in accordance with BS6207 Part 1.

Where used, ceiling roses for emergency luminaires shall be 4 pin configuration and coloured red to indicate an emergency supply.

9.0 GENERAL SERVICES

9.1 Wiring

Socket outlets and small power services outlets shall be circuited to the relevant standards. Circuits shall be wired with insulated cables in galvanized conduit. Cable sizes are as follows:

- 2.5mm² – control panels for motorized doors and dock levelers, insect killers, power supply units, hand dryers, hair dryers.
- 4mm² – 13A 230V socket outlet circuits, 16A 230V industrial socket outlets, water heaters.
- 6mm² – 32A 400V industrial socket outlets, battery chargers.

9.2 Outlet Types

Socket outlets shall be 13A twin switched outlets. Fused spur outlets shall be switched or unswitched, as detailed herein, with neon light. Outlet types shall be as follows:

- General areas - flush mounted accessories, MK Electric Albany range or Legrand Sabre range.
- Offices - flush mounted accessories, [MK Electric Albany range or Legrand Sabre range / MK Electric Logic range or Legrand Saxon range].
- Dado & Skirting Trunking - MK Logic Plus WHI range.
- Clean areas - flush mounted accessories, [MK Electric Edge range with brushed stainless steel finish / MK Masterseal range with flush mounting frames].
- Plantroom, Production & Warehouse areas - surface mounted metalclad accessories as per MK Electric Metalclad range or Legrand Trojan range.

Industrial socket outlets shall be single phase 16A P+N+E and three phase 32A TP+N+E outlets. Types shall be as follows:

- Plantroom & Warehouse - surface mounted interlocked switched IP44 socket outlets to CEE 17 surface pattern with spring return covers as per MK Electric Commando or Legrand Hypra ranges and shall have integral 30mA RCD as per MK Electric Commando combination units or Legrand Hypra combined units.
- Clean Areas - panel mounted IP67 socket outlets to CEE 17 surface pattern with spring return covers as per MK Electric Commando or Legrand Hypra ranges, all mounted on a stainless steel backplate.



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9.3 Handryers

The Contractor shall supply and install Electric Hand Dryers within all toilet areas, to be manufactured by Worldwide Dryers (World DA 48) or ATC/Jofel (Ibero) or equal and approved. They shall have white stove enamel/brushed stainless steel/chrome finish with push button / automatic operation.

Final connections to the hand dryers shall be via a 20A DP switched spur with neon indicator.

9.4 Insect Killers

The Contractor shall supply and install wall mounted Insect Killers as necessary and as manufactured by Unitherm, Ref. Insectazap SW20/30/40 or Rentokil, Ref. D4 Electronic Fly Killer.

Final connections to the insect killers shall be via a 20A DP switched spur with neon indicator.

9.5 Canteen Installation

Small power circuits in the Canteen shall be wired with 4mm² insulated cables in galvanised conduit unless otherwise stated.

9.6 Assistance Alarm System

An Assistance Alarm Systems shall be provided in the Universal Accessible Toilet. The system shall generally comprise of the following:

- Control Panel at Reception
- Power Supply Unit
- Pull cord switch or call unit in the toilet cubicle

10.0 STRUCTURED CABLING INSTALLATION

TO BE CONFIRMED BY THE CLIENT, SCHLOTTER.

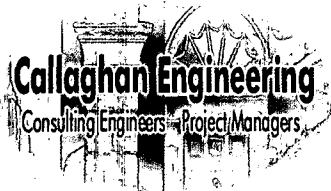
11.0 FIRE ALARM INSTALLATION

11.1 General

The electrical contract shall include for the complete design, supply, installation and commissioning of a complete fully addressable L1 type fire/ smoke alarm system which shall comply with IS 3218:1989. The complete system shall be wired in not less 2.5mm² MICS/LSF cables having red sheath and installed in cable trunking or on cable tray (in attic spaces) and conduit to final positions such as break glass units, detectors, etc. Cable tray and trunking shall have 25% spare capacity for future expansion. The system shall be Analogue Addressable complete with combined ionisation / optical smoke detectors, air sampling smoke detection in all areas, manual call points, heat detectors, short circuit isolators, etc. The system shall also interface with any other fire safety systems which may be deemed necessary within the factory.

The entire supply of equipment and commissioning shall be from a single supplier.

The fire alarm system shall be zoned. The maximum number of devices on a single loop shall not exceed 90. The fire alarm system shall be equipped with auxiliary relays and contacts to interface with other equipment such as mechanical plant, smoke control systems, fire doors, security doors, lift services, etc. The control panel shall be equipped with a key operated switch to allow these



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facilities be by-passed during test conditions, if required. The fire alarm system shall include an interface panel to facilitate connection to remote repeater panels, central alarm station/security panels and auto dialing facilities.

The control panel shall be capable of individually addressing the state of each device, isolation of fire brigade, plant shut down and sounder circuits.

A minimum of 2 circuits shall be used to serve sounders and shall be so arranged that all areas remain covered with loss of one circuit.

All devices on the fire alarm system shall be provided with a unique address and each device shall be clearly labelled with a permanent fixing.

A facility shall be available in the reception room to summon the local Fire Brigade.

11.2 Detectors & Call Points

Multi-sensor detectors (optical/heat) shall be used as standard with fixed temperature heat detectors used if required by the operating environment.

Smoke and heat detectors shall comply with BS 5445 and manual call points with BS 5839 Part 2. In addition, the call points may be used by staff as an attack alarm system. Manual call points shall of the 'frangible' type, and not the break glass type. In areas where there may be misuse of the fire alarm call points, key operated call points may be installed.

11.3 Air Sampling Detection System

Smoke detection shall be of the Air Sampling Smoke Detection System type, as manufactured by Siemens Cerebus, with 2 No. 25mm internal diameter sampling points in each area. Smoke sampling tubes shall be manufactured from ABF pipe and shall be cast into the concrete structure. The smoke sampling tube shall terminate at an anti-ligature stainless steel plate approximately 100x100mm, cast into the ceiling.

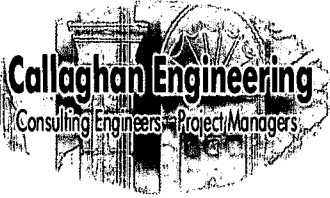
Each area will be provided with a dedicated **Air Sampling Smoke Detection System Type AD-2, as manufactured by Siemens Cerebus**, located in an appropriate space and referenced to the area served. The smoke sampling device shall enter pre-alert mode upon activation of the device.

The Air Sampling Smoke Detection System including pipework shall be installed in accordance with the manufacturer's recommendations. All smoke sampling pipework shall be continuous in length with no joints and shall be supported vertically and horizontally in accordance with the manufacturer's recommendations.

11.4 Air Sampling Smoke Detectors

The detection principle shall employ a multiple light pulse coincidence circuit, and be temperature compensated. The detector employed in the Air Sampling housing shall be connected directly to the same addressable loop as all other devices on the system and have the same functionality and appearance as those devices.

The detector must be immune to external Electro-Magnetic Interference (EMI) generated by radio equipment. It shall have EMI protection up to 50 Volts/meter electric field strength tested in accordance to EN54-7 and IEC 1000-4-3. Air flow monitoring shall be provided such that any blockage or pipe rupture shall indicate a fault on the system and transmit the information to the main control panel via the addressable loop.



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The detector shall have an emergency operation mode. If the CPU of the panel fails, the detector shall work with its latest parameter set as a conventional detector and create an alarm on the line. The alarm indicator of the detector shall be illuminated when an alarm occurs during emergency operation mode.

The detector shall have the computing power to determine the seriousness of an alarm condition, based on the evaluation of the signals sensed, without the need to communicate with the control unit. The following criteria shall be evaluated by the smoke detector: smoke density, variation of smoke density, rate of rise of temperature and maximum temperature.

The detector shall be designed to suppress transient interference and other deceptive phenomena without impairing the capability of detecting real fire and shall conform to EN54-7/9.

The detector shall be microprocessor controlled and have the capability to store in non-volatile memory several pre-defined application specific response characteristic driven by application specific parameters.

The detector shall have a built-in microprocessor with flash EPROM to accept commands from the control panel. The detector shall be able to evaluate alarm conditions up to 4 different danger levels ("normal", "potential danger", "probable danger" and "danger highly probable") and 4 different fault status ("normal", "notice", "impairments" and "faults") and, upon request of the panel, report the status of the sensor.

The detector shall be individually identifiable, with all relevant data, throughout its lifetime by a specific serial number and other corresponding information, readable at the control unit with authorization password. The data shall be stored in a non-volatile memory inside the detector.

The detector shall have a built-in line isolator that shall be able to isolate short circuits on the detector line such that any single short circuit in the detection loop will not impair the operation of the system or detectors.

All detectors shall be common and interchangeable to a common type of base. Smoke detectors that require manual setting of addresses will not be accepted. The detector shall be inserted into or removed from the base by a simple push-twist mechanism.

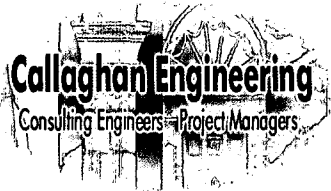
11.5 Power Supply Units

All devices shall be able to operate on mains power supply of 230VAC, -15% to +10% with 48 to 62Hz. Each power supply shall contain suitable over voltage protection to prevent any malfunction or damage due to power line surges.

Each power supply unit shall be equipped with standby battery of nominal voltage of 24VDC with the capacity to maintain its operation for at least 24 hours after mains failure and shall comply with EN standards. Detailed calculation shall be submitted to Engineer for approval.

In the event of main power failure, the power supply unit shall automatically revert to battery power to maintain the operational condition of the system. When the battery voltage drops below 20VDC, a fault signal shall be generated to indicate on the affected unit as well as the Main System Terminal in the Control Room.

When main power is restored, the power unit shall automatically revert to normal operation without any manual restoring procedure. The standby batteries shall automatically be maintained in charged condition by a built in short circuit proof charger. The load shall automatically be switched off when the voltage drops below 19VDC to protect battery cells from being damaged by complete discharge.



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Gas tight maintenance free lead calcium batteries shall be used for standby power supply and shall have a minimum life cycle of five (5) years.

Each power supply unit and charger circuit including all fuses shall be supervised. Any malfunction or blown or missing fuse shall result in a fault indication on the affected unit and the Main System Terminal.

Particular attention must be given to the following:

- There should be adequate fire separation between zones. The area of the zones may need to be greater than recommended in the normally accepted standards.
- The system shall be able to identify the exact location from which the alarm was raised.
- The central fire alarm indicator panel shall be located in the reception with a repeater within the production area.
- The central panel shall give an indication of the area in which the alarm was raised, and all indicator panels in the building shall give the location from where the alarm was activated.
- Detailed arrangements on the method of calling the Fire Brigade, and emphasising the importance of passing the alarm immediately to the Fire Brigade Control Room, must be part of the installation requirement.

12.0 MECHANICAL SERVICES

The Contractor shall supply and install all power and control cabling to mechanical equipment and control devices. The Contractor shall supply and install all power cables from the LV switchboard and distribution boards to individual items of plant and equipment.

12.1 HVAC Controls

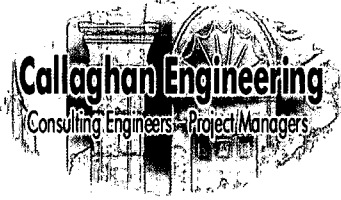
The Contractor shall be responsible for the design, supply, installation and termination of controls cabling and power cabling to all mechanical services loads and controls devices. The Contractor shall not supply or install any controls cables or power cables until full field cabling diagrams and schedules have been produced by the Specialist Controls Contractor and approved by the Engineer.

The Contractor shall liaise with the other Sub-contractors to establish the exact location of each field device. The Contractor shall supply and install a push lock isolator adjacent to each fan motor. Standard isolators shall be supplied and installed for other motors or loads.

The Contractor shall use a temporary cable labelling with the specialist controls contractor from which the mechanical contractor can easily develop his final labelling. Room mounted temperature sensors, or other such devices which require a wall box to be installed, shall involve supplying the wall box (or similar device) to the Electrical Contractor who will fit it into the wall. Termination of all sensors shall be by the Electrical Contractor.

All room or wall mounted sensors shall be cabled within galvanised steel conduit which on finished plaster surfaces shall be concealed. All detecting devices and control actuators shall have final terminations in flexible form, of sufficient length to permit the removal of the devices without disconnection.

All control cabling shall be run within galvanised steel trunking and conduit. Control cabling shall be Belden screened twisted pair for controllers and Belden double twisted pair with overall screen



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for regulators. All cabling shall be LSF rated. The Contractor shall obtain final confirmation on precise wiring specification for each device prior to ordering cables.

12.2 Control Cable

1. Valve and Damper Actuators:

22 AWG tinned copper conductors PVC insulation and PVC/LSF jacket as Belden 8443 (3 core) Belden 8444 (4 core) and Belden 8445 (5 core) or equal and approved.

2. Detectors and Sensors:

2.1 Single pair overall screen 24 AWG tinned copper S - R PVC insulated twisted, aluminium foil, drain wire and PVC/LSF jacket as Belden 9502 (2pair).

2.2 Multi pair individually screened 22 AWG tinned copper polyethylene insulated, aluminium foil, drain wire and PVC/LSF jacket as Belden 8777 or equal and approved.

2.3 Cable detailed as 0.5, 0.7 and 1.5mm² shall be PVC/PVC/LSF grey oversheath round cross section to BS 6231 and suitable for use as control cables rated at 120V max.

13.0 UNINTERRUPTABLE POWER SUPPLIES (UPS)

Subject to clarification by the client, the electrical installation shall include for a UPS system which shall be designed, supplied and installed to provide an uninterruptible power source with no break AC output during complete or partial failure of the main incoming power supply to the following systems:

- Data Communications within critical Office areas
- Security Installations

UPS systems shall comprise mains supply switchgear, manual bypass switch, static bypass switch system, rectifier and battery chargers, batteries, harmonic filter output switchgear and control system.

The incoming electrical supply, whether mains or generator supply, shall be rated to carry the output load plus losses and battery-charging unit. The output shall be maintained at a voltage +/- 2% and frequency +/- 0.5% irrespective of the incoming supply characteristics.

The control system shall be of the liquid crystal display type with keypad operation or mimic diagram type using pushbuttons or keypads. The system shall provide ON/OFF/BYPASS switching facilities together with self-diagnostic monitoring to give output characteristics and alarms. Facilities shall be provided for monitoring of urgent alarms on the Building Management System.

The UPS shall be equipped with incoming voltmeter, outgoing voltmeter, battery voltmeter, outgoing ammeter, hours run meter, operating gauges, overload recorder and alarm recorder, etc.

The UPS shall be complete with filters to minimise the effects of harmonic distortion affecting the output voltage and incoming mains system. Rectifiers having high pulse rates shall be used to minimise harmonics.

The Contractor shall ensure that the UPS system shall be compatible with all switchgear, standby diesel generator, and power factor correction equipment used generally in the complete electrical installation.

The UPS system shall be contained in a freestanding folded metal enclosure with lockable front doors. The operation and control shall be from the front panel without the need to open the doors.



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All equipment shall be clearly labeled and segregated to denote the service and all terminals and equipment running at 50V and above shall be suitably shrouded to prevent inadvertent contact. Danger 'VOLTAGE' notices shall be fixed to equipment.

The batteries shall be nickel cadmium sealed type as required and shall be housed in a matching metal enclosure. All batteries shall be of the same type and rating and be fully charged upon installation.

The design of the UPS and battery enclosures shall be such to prevent heat build up on equipment. Forced ventilation shall be included as necessary. Each UPS will be monitored by the BMS.

14.0 OPERATION AND MAINTENANCE MANUALS AND RECORD DRAWINGS

14.1 General

The Contractor shall provide operation and maintenance manuals and record drawings for the complete electrical services installation. Before completion the Contractor shall submit a draft copy of the operation and maintenance manual and record drawings for comment/approval by the Engineers.

After comment/approval the Contractor shall provide 2 No. corrected, bound copies and 1No. electronic copy to the Engineer.

The electronic copy of the maintenance manual shall be written using Microsoft Word software. The electronic copy shall be submitted in CD-ROM format.

14.2 Maintenance Manuals

Maintenance manuals shall be prepared based on the guidelines as set down in the following documents:

BS 4884, Parts 1&2 Specification for User Manuals
BSRIA Technical Note TN 1/84 Guidelines for Building Services Operating and Maintenance Manuals

BSRIA Application Guide 1/87 Operating and Maintenance Manuals for Building Installations
BSRIA Technical Note TN 12/86 Fault Finding Procedures in the Building Services Industry

Unless stated otherwise, each maintenance manual shall contain the following information:

- Index, introduction and safety at work
- Description of all systems, their operational procedures and associated equipment
- Names, addresses and telephone numbers of all sub-contractors, suppliers and local firms for each item
- Original copies of all plant, component and technical documentation
- Equipment schedules and spare parts lists
- Operating Information
- Maintenance Instructions
- Fault finding/diagnostics for the finished systems
- Original copies of all system and plant test certificates
- Original copies of all commissioning certificates
- Complete copies of 'as-installed' record drawings including CD-ROM
- Certificates from nominated suppliers and nominated contractors as necessary



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The above information shall be provided in the form of a suitably bound A4 size manual with hard cover. The operation and maintenance manual may be sub-divided into a number of bound volumes as required.

14.3 Record Drawings ('As-Installed' Drawings)

Record or 'as-installed drawings' shall be provided by the Contractor within two weeks of practical completion of the project.

Record or 'as-installed' drawings shall be drawn to a minimum scale of 1:100 on A1 sheets and 1:50 scale on A1 sheets for plant room and boiler room installations. The drawing shall be provided with a title block containing the project title, architects name and address, the Engineers name and address, a unique drawing number, drawing title and scale. The Engineers drawings shall not be accepted as representing record or 'as installed' drawings.

The Contractor shall submit a schedule of record drawings as part of the final set(s) of drawings to be included in the Operation and Maintenance Manuals.

All record or 'as-installed' drawings shall be prepared using AutoCAD software latest edition. A CD-Rom copy of the drawings shall also be provided.

15.0 TRAINING OF EMPLOYER'S STAFF

Before Practical Completion the Contractor shall demonstrate the purpose, function and operation of the installations including all items and procedures listed in the Operation and Maintenance Manual to the Employer's maintenance staff.

10 days training shall be provided for the demonstration and instruction in the use of all systems and equipment installed as part of the Contract.

Training shall commence prior to Practical Completion.

2 days training shall be carried out off site.

16.0 OBLIGATIONS DURING DEFECTS LIABILITY PERIOD

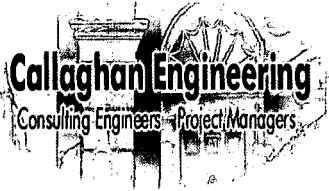
The Contractor shall prepare and submit records of failures or malfunctions of any part of the Works during the Defects Liability Period, together with details of remedial action taken, subsequent re-testing and the results.

All defects shall be rectified so that an inspection may be carried out prior to the issue of a Final Certificate.

17.0 STANDARDS, CODES & AUTHORITIES

All work shall meet all the Requirements of National and Local Statutory Authorities and shall be in accordance with, and not limited to, the following:

01. Irish Building Regulations 2000 and Amendments.
02. Electrical Supply Board Regulations.
03. All Applicable Irish, British and European Standards.
04. All Health and Safety Authority Requirements.
05. All Local Council Rules and Regulations.



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06. CIBSE - Chartered Institution of Building Services Engineers – Recommendations for Interior Lighting
07. Safety, Health and Welfare at Work Act, 1989.
08. Safety, Health and Welfare at Work Act, (General Applications) Regulations, 1993.
09. IEE Wiring Regulations (Current Edition)
10. The Management of Electrical Safety at Work – ET206: 2000
11. ETCI 101 (Current Edition)
12. National Rules for Electrical Installations Part 3-7 – Supplementary Requirements for Low Voltage Synchronous Generator Installations
13. National Rules for Electrical Installations in Potentially Explosive Atmospheres ET105: 2000
14. IS 3218: 1989 – Code of Practice for Fire Detections and Alarm Systems for Buildings
15. IS 3217: 1989 – Code of Practice for Emergency Lighting
16. BS 6651: 1999 – Code of Practice for the Protection of Structures Against Lightning
17. BS 7430:1001 Code of Practice for Earthing

18.0 ELECTRICAL SERVICES EQUIPMENT

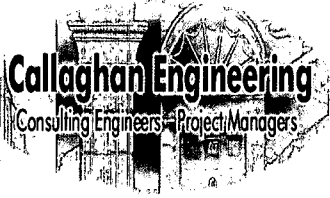
The following provides a list of items of equipment and approved manufacturers for use in the Electrical Services Installations at the premises. The purpose of this part of Section 2 is to ensure that the quality of the Electrical Services Installation is of a high standard by including previously tried, tested and installed equipment.

Once off or special items of equipment are avoided as much as possible. Where only one approved manufacturer is named, this is on the basis that the equipment or system has been used in previous installations and has out-performed alternatives in terms of product, service back-up and suitability to application.

Alternatives to approved manufacturers may only be included in the alternatives section of the tender return form at tender stage only. Alternatives to specified items not identified at tender stage will not be accepted post tender. **The specified item shall be included in the basic tender cost.**

All proposed alterations and/or additions to the list must be forwarded in writing for approval before the works commence or before any equipment is purchased. It is the sole responsibility of the Contractor to satisfy themselves that any alternative offered is of an equal standard. The Contractor shall consider the following issues in assessing alternative equipment proposals:

1. All equipment satisfies and where applicable is approved as meeting all relevant Irish Standards, British Standards, European Standards and Building Regulation requirements as detailed in the general materials specification.
2. The supplier firm has been based in Ireland for the last 3 years.
3. The supplier firm retains stock items of essential spare parts locally or has a just- in-time delivery management system in place.
4. The supplier firm offers maintenance contracts on all their equipment and can provide a reference of maintenance contracts in place over the last 3 years.
5. The supplier firm has technical after sales back up and support, in-house. A product submittal with full details of all proposed equipment shall be provided prior to placing an order.



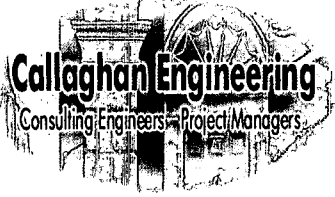
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Item Description	Approved Manufacturer	Ref. no.
Distribution Systems (see notes below)		
Distribution Centres must be of minimum class 3 form 4 construction in design and must have dedicated terminal compartments and all boards and must have capacity available.	Logstrup, Klockner Moeller, Cubic, Stromberg, Elek Assemblers: Control Equipment, Davenham Engineering, M&L, Hughes & Coyle	
Final Sub-Distribution boards must be minimum Form 3		
All submains distribution boards greater than 14 way shall have a dedicated terminal compartment		
Electricity Meters	Siemens, Landis & Gyr, Merlin Gerin, ABB, Electrex, IME.	
Electro Magnetic	As above	
Pulse type	As above	
Digital	As above	
Circuit Breakers (see notes below)		
All circuit breakers shall be of type P1 manufacture	ABB/Sace, Merlin Gerin, Mutsubishi, Hager	
Air circuit breakers (with drawable only)	As above	
Air circuit breakers (standard)	As above	
MCCB's	As above	
Fuse switches/switch fuses	Bremas, Kraus and Mazimer, ABB/Sace	
Main isolators (lockable)	Merlin Gerin, Mitsubishi, Hager	
Residual current devices	Bremas, Kraus and Naimer, Merlin Gerin, Mitsubishi, Hager	
Contactors (see notes below)		
	Klockner Moeller, Mitsubishi, Telemecanique, Kraus & Naimer, Sprecher & Schuh, Siemens	
Relays/Timers	Landis & Gyr Electromatic, Telemecanique, Omron, Releco	
Hand Off Switches	Klockner Moeller, Telemecanique, Kraus & Naimer, Crabtree, Siemens	
Stop Buttons	Klockner Moeller, Telemecanique, Kraus & Naimer, Crabtree, Siemens, Sprecher, & Schuh, Legrand	
Push Buttons	Klockner Moeller, Telemecanique, Kraus & Naimer, Crabtree, Siemens, Legrand	
Key Switches	Klockner Moeller, Telemecanique, Kraus & Naimer, Crabtree, Siemens, Sprecher & Schuh, Crabtree, Legrand	
Cable Support Systems (see notes below)		
Cable ladders for MV/LV services (Metal)	Baby Hercule (Ellicsons), Vantrunk	
Cable trays for LV services (Metal) HD return flange	Ellicsons, Vantrunk	



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Item Description	Approved Manufacturer	Ref. no.
Cablebasket for ELV Services (Metal/PVC)	Vantrunk, Uni-Trunk	
Cable trunkings for LV/ELV services (Metal) HD Multi-Compartment	Vantrunk, Uni-Trunk	
Cable conduits for LV/ELV services HD galvanized steel or PVC	Vantrunk, Uni-Trunk	
Flush floor trunking/floor box	Ackerman, Thorsman, MK	
Skirting/Dado trunking with or without busbar	Martial Tupplex, Thorsman, MK	
General Services Installations (see notes below)		
Light switches single/multi-way	Walsall, Crabtree, Wandsworth, MK, Ashley Rock, MEM and Legrand	Flush stainless steel c/w anti tamper fixings
Grid Switches	As above	As above
Dimmer Switches	As above	As above
Socket Outlets 5A, 13A, 16A	MK, Legrand, Contactum, Ashley, MEM	As above
Spur Outlets	Wandsworth, MK, Ashley & Rock, Legrand, Contactum	As above
Double Pole Switches 20A, 32A	Wandsworth, MK, Ashley & Rock, Legrand, Contactum	As above
Socket Outlets 16A, 32A, 63A, 220V, 380V	MK, Legrand	As above
Plug-In Lighting (slide plug or direct)	MK, Ashley & Rock, Klick	
Isolators 220V, 380V (lock off type)	Legrand, GEA, Crewe, Kraus & Naimer	
Time clocks din-rail mounted or otherwise	Sangamo, Landis & Gyr, Legrand	
Photo cells	Selc	



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Item Description	Approved Manufacturer	Ref. no.
Fire Alarm Equipment (see notes below)		
Cell Air Sampling Smoke Detection System	Siemens Cerebus	AD-2
BGUs	KAC, Omega, Apollo, Gent	
Bells	KAC, Omega, Apollo, Gent	
Sounders & corresponding strobes Apollo range	Apollo range	
PSUs	Apollo range	
I/P – O/P Units	Apollo range	
Remote indicator units	Apollo range	
Fireman/s switch/fire emergency switch shunt trip type only must be coloured red	MEM	
Smoke/Fire Dampers and Control Systems	Safeguard V3	
Fire Detection Equipment (see notes below)		
Smoke detection O/I.C.	Apollo, Menvier, Aritech	
Heat detection fixed temp. rate of rise	Apollo, Menvier, Aritech	
Beam detection	Apollo, Menvier, Aritech	
UV/IR beam detection	Apollo, Menvier, Aritech	
Fire Alarm Cabling (see notes below)		
FP 200 with permission. Mineral insulated copper cable c/w red LSP over-sheath	BICC, Pirelli	
Radox c/w LSFH over-sheath (red in colour) excluding bells	Huber & Suhner	
Delta fire tuf c/w LSFH oversheath with expressed permission from Technical Services	Huber & Suhner	

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Plating Technology

Attachment No. D2 DEVELOPMENT AND OPERATIONAL HISTORY OF THE SITE

The site is a Greenfield site located within Tougher Business Park. No development has taken place on the site previously.

Tougher Business Park is located approximately 6km from Naas and approximately 5km from Newbridge.

Tougher Business Park is relatively level throughout. There is a gentle slope downward into the Business Park when entering from the R445. The land to the south of the site gently slopes upward away from the site. Access to the proposed site is provided within the Business park by a 9m wide Business Park access road with Dual Carriage way access to the M7 via the R445.

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SECTION E EMISSIONS**E.1. Emissions to Atmosphere****E.1.A. Details of all point emissions to atmosphere**

Details of all point emissions to atmosphere should be supplied. Table E.1.(i) (for Boiler emissions) must be completed for boilers over 20MW thermal input. Complete Table E.1(ii) and E.1(iii) for all other main emission points. Complete Table E.1(iv) for minor emission points.

A summary list of the emission points, together with maps and/or drawings (no larger than A3), and supporting documentation should be included as **Attachment N^o E**. Plans of emission elevations, relevant roof heights, etc., should also be included, as should detailed descriptions and schematics of all abatement systems.

The applicant should address in particular any emission point where the substances listed in Schedule of S.I. 394 of 2004 are emitted.

For emissions outside the BAT guidance limit, a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within the limits as set out in the BAT guidance note(s).

E.1.B. Fugitive and Potential emissions.

Give summary details of fugitive and potential emissions in Table E.1(v).

In relation to activities listed in the Schedule of Council Directive 1999/13/EC on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations;

- specify the relevant category of activity in the Schedule
- specify how the requirements in relation to fugitive emissions will be met.

Full details and any supporting information should form **Attachment E.1.B**

E.2 Emissions to Surface Waters

Tables E.2(i) and E.2(ii) must be completed.

A summary list of the emission points, together with maps/drawings (no larger than A3) and supporting documentation should be included as **Attachment N^o E.2**.

The applicant should address in particular any emission point where the substances listed in the Schedule of S.I. No. 394 of 2004 are emitted.

Details of all List I and List II substances listed in the Annex to EU Directive 76/464/EEC (as amended), contained in any emission must be presented. All surface water runoff and storm water drains discharging to surface water bodies must be included. A National Grid References (10 digit, 5E, 5N) must be given for all discharge points. The identity and type of receiving water (river, ditch, estuary, lake, etc.) must be stated.

For emissions outside the BAT guidance limit, a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within the limits as set out in the BATNEEC guidance note(s).

E.3 Emissions to Sewer

Tables E.3(i) and E.3(ii) should be completed.

A summary list of the emission points, together with maps and/or drawings (no larger than A3) and supporting documentation should be included as **Attachment N^o E.3**. Details of all List I and List II substances listed in the Annex to EU Directive 76/464/EEC (as amended), contained in any emission must be presented. All relevant information on the receiving sewer, including any effluent treatment/abatement systems, not already described, with schematics as appropriate should also be included in **Attachment N^o E.3**.

For emissions outside BAT guidance limit (where given), a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within any limits set out in the BAT guidance note(s).

E.4. Emissions to Ground

Describe the existing or proposed arrangements necessary to give effect to Articles 3,4,5,6, and 7 of Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution by certain dangerous substances.

The applicant should supply details of the nature and quality of the substance (agricultural and non-agricultural waste) to be landspread (slurry, effluent, ash, sludges etc) as well as the proposed application rates, periods of application and mode of application (e.g., pipe discharge, tanker).

For emissions outside the BAT guidance limit, a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals

and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within the limits as set out in the BAT guidance note(s).

E.5 Noise Emissions

Give particulars of the source, location, nature, level, and the period or periods during which the noise emissions are made or are to be made.

Table E.5(i) should be completed, as relevant, for each source.

Supporting information should form **Attachment N^o E.5**

For emissions outside the EPA Noise Guidance Note limit, a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within the limits as set out in the guidance note.

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E.1 EMISSIONS TO ATMOSPHERE

AWN Consulting Ltd have been commissioned to carry out an air dispersion modelling study of boiler emissions from the proposed Schlötter (Ireland) Ltd Facility, Newbridge, Co. Kildare and to determine whether the emissions from the site will lead to ambient concentrations which are within the relevant ambient air quality standards for the nitrogen dioxide (NO₂) and carbon monoxide (CO). Please refer to Attachment I.1 for full report.

The information used in the dispersion model for the boiler emission points is shown in Table 1.

Stack Reference	Stack Location	Height Above Ground Level (m)	Exit Diameter (m)
B1 - Heating Boiler	E284090, N216830	12	0.25
B2 - Process Boiler	E284090, N216830	12	0.25

Table 1 Stack Release Points Used In the Air Modelling

Emission data for the model was taken from design information supplied by Schlötter Ltd and Callaghan Engineering Ltd. Details of the input parameters are given in Table 2.

Stack Reference	Scenario	Temp(K)	Actual Stack (Exit velocity)	Stack cross sectional area (m ²)	NOX (mg/Nm ³)	CO (mg/Nm ³)	NOX (g/s)	Co (g/s)
B1	Typical	453	9.0	0.049	88	27	0.024	0.0072
B2	Typical	453	9.0	0.031	27	8.3	0.0046	0.0014
B1	Maximum	453	9.0	0.049	200	100	0.053	0.027
B2	Maximum	453	9.0	0.031	200	100	0.034	0.017

Table 2 Schlötter (Ireland) Ltd, Newbridge Stack Emission Details

Process Contributions

Ambient Ground Level Concentrations (GLCs) of NO₂ and CO have been predicted with the proposed facility in operation. NO_x is assumed to be emitted from two on-site boilers, which are located within the boiler room. The two boiler emission points are assumed to be housed adjacent to one another (as a worst-case). Maximum emissions of NO_x and CO from each of the two on-site boilers have been set at 200 mg/Nm₃ and 100 mg/Nm₃ respectively which is the requested IPPC License Limit. The modelling scenario and emission details for the proposed facility are detailed in Table 2.

NO_x Emissions

NO₂ modelling results indicate that the ambient ground level concentrations are below the relevant air quality standards for nitrogen dioxide under both typical and maximum operation of the proposed facility (see Table 3). Emissions at maximum operations equate to an ambient NO₂ concentration (including background concentration) which is 39% of the maximum ambient 1-hour limit value (measured as a 99.8th %ile) and 58% of the annual limit value at the worst-case receptor.

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Pollutant / Scenario	Annual Mean Background (g/m ³)	Averaging Period	Contribution (g/m ³)	Predicted Emission Concentration (g/Nm ³)	Standard (g/Nm ³) ^{Note 1}
NO ₂ / Typical Operation	15	Annual Mean ^{Note 2}	2.6	17.6	40
		99.8th%ile of 1-hr mean ^{Note 3}	14.4	44.4	200
NO ₂ / Maximum Operation	15	Annual Mean ^{Note 2}	8.1	23.1	40
		99.8th%ile of 1-hr mean ^{Note 3}	47.1	77.1	200

Note 1: Directive 1999/30/EC

Note 2: Conversion factor following guidance from USEPA (Tier 2 analysis, annual average) based on the default ratio of 0.75 (worst-case).

Note 3: Conversion factor, following guidance from USEPA (Tier 3 analysis), based on an existing facility of an empirically derived maximum 1-hour value for NO₂ / NO_x of 0.40.

Table 3 Dispersion Model Results – NO₂

CO Emissions

CO modelling results indicate that the ambient ground level concentrations are below the relevant air quality standards for carbon monoxide under both typical and maximum operation of the proposed facility (see Table 4). Emissions at maximum operations equate to an ambient CO concentration (including background concentration) which is 5% of the maximum ambient 8-hour limit value at the worst-case receptor.

Pollutant / Scenario	Annual Mean Background (g/m ³)	Averaging Period	Contribution (g/m ³)	Predicted Emission Concentration (g/Nm ³)	Standard (g/Nm ³) ^{Note 1}
CO / Typical Operation	500	Maximum 8-Hr	6.9	507	10,000
CO / Maximum Operation	500	Maximum 8-Hr	36.4	536	10,000

Note 1: Directive 2000/69/EC

Table 4 Dispersion Model Results – CO

The concentrations listed in Tables 3-4 are for the maximum concentrations to be predicted at any location off-site. All other locations are below these values. The concentration contours show where the maximum concentrations are predicted to occur and the reduction in concentration with distance away from the maximum.

The maximum concentrations are observed at or near the boundary of the site. The contour plots show a significant fall in concentrations with distance from the site. The south-westerly prevailing winds tend to lead to higher long-term concentrations to the north of the site.

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ATTACHMENT E.3. EMISSIONS TO SEWER

E.3.1 Introduction

The municipal sewer is designated emission point SE1. It receives:

- Treated water from the site effluent treatment tank
- Boiler blowdown
- Sanitary waste

E.3.2 Sources of Wastewater

Wastewater is segregated at source to increase the efficiency of downstream treatment, if it is required. The different streams are identified as follows.

E.3.2.1 Non-hazardous Effluent

This is the effluent from the plant that does not require treatment before emission from the site. It consists of discharges from the wastewater treatment plants, the cooling towers as discussed above.

E.3.3 Effluent

The weak effluent consists of streams such as floor washings, plant cleaning, boiler blowdown. The wastewater treatment plant biodegrades the chemical content of this weak effluent stream to levels acceptable for discharge.

Process Cleaning

Waste water from process plant cleaning come from the duties listed below. The stream is classified as weak effluent and passes directly to the effluent treatment plant.

Process Equipment Cleaning

The first rinse is an aqueous wash followed by subsequent solvent washes. A final water rinse may be used.

Boiler Blowdown

Boiler blowdown is based on the need to prevent excessive concentration of dissolved and suspended solids. Boiler feed water is from the demineralised water supply. Blowdown water is directed to the WWTP.

Sanitary Waste

Sanitary waste is collected in a dedicated underground system. The sanitary sewer is combined with the site process sewer only at the southern site boundary, prior to entry to the local sewer network.

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ATTACHMENT E.4 EMISSIONS TO GROUND

There will be no emissions to ground during normal operation or abnormal operation. Therefore, Tables E4 associated with this attachment of the IPPC Licence application are not applicable.

It is intended that all surface water, process liquids, rain water, spillages, fire water or other liquids released to an outside surface on the site where hazardous materials will be stored or be in transit (except road tankers arriving on site), will be collected in the surface water or effluent systems. They will therefore all be treated for contaminants before allowed off site.

As groundwater is a natural resource of the utmost importance, Schlötter will take every precaution to prevent the contamination of this source. The main potential sources of contamination are spillages or leakage of raw materials, intermediates, final product, process wastes or fuels. It is however likely that the proposed development will have little or no impact on either geology or groundwater. Therefore mitigation measures will primarily comprise of regular monitoring of groundwater beneath the site to confirm that the proposed development is not impacting on groundwater.

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E.5 Noise Emissions

An environmental noise survey was conducted in support of an application for an Integrated Pollution Prevention and Control Licence for Schlötter Ireland for their premises at Tougher Business Park, Lewinstown, Naas, Co. Kildare. This document reviews the survey data and presents it in a form suitable for submittal to the Environmental Protection Agency (EPA).

A four-hour environmental noise survey has been carried out in and around noise sensitive locations close to the proposed site in order to quantify the current ambient noise climate in the absence of the Schlötter industrial facility. The survey data has been analysed and the results are presented in the format required for submission to the EPA.

The EPA Publication Guidance Note for Noise in Relation to Schedule Activities gives a guideline value for daytime site noise emissions of 55dB LAeq and night time noise emissions of 45dB LAeq at noise sensitive properties. The site is only operational during daytime periods. Given that the predicted contribution of site operations associated with the measured levels do not exceed these values, it may be concluded that noise emissions from the Schlötter site are within acceptable limits.

Please refer to Attachment I.7 for the complete details of the environmental noise survey.

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TABLE E.1(i) BOILER EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point:

Emission Point Ref. N ^o :	Heating Boiler
Location :	Boilerhouse
Grid Ref. (12 digit, 6E,6N):	E284090, N216830
Vent Details	
Diameter:	250 mm
Height above Ground(m):	12 m
Date of commencement of emission:	

Characteristics of Emission :

Boiler rating	
Steam Output:	650 kW
Thermal Input:	
Boiler fuel	
Type:	Natural Gas
Maximum rate at which fuel is burned	
% sulphur content:	
NOx	< 130 mg/kWh 0°C, 3% O ₂ (Liquid or Gas), 6% O ₂ (Solid Fuel)
Maximum volume of emission	0.0235 g/s
Temperature	180 °C(max) 180 °C(max) 180 °C(max)

(i) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up/shutdown to be included*):

Periods of Emission (avg)	60 min/hr 24hr/day 365day/yr
---------------------------	------------------------------

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. N ^o :	Process Boiler
Source of Emission:	Boilerhouse
Location :	
Grid Ref. (12 digit, 6E,6N):	E284090, N216830
Vent Details	
Diameter:	250mm
Height above Ground(m):	12 m
Date of commencement:	

Characteristics of Emission :

Boiler rating		
Boiler Output:		200 kW
Thermal Input:		
Boiler fuel		
Type:		Natural Gas
Maximum rate at which fuel is burned		
% sulphur content:		
NOx		< 130 mg/kWh 0°C. 3% O ₂ (Liquid or Gas), 6% O ₂ (Solid Fuel)
Maximum volume of emission		0.0072 g/s
Temperature	180 °C(max)	°C(min) °C(avg)

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included*):

Periods of Emission (avg)	60 min/hr 24hr/day 365day/yr
---------------------------	------------------------------

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: Heating Boiler

Parameter	Prior to treatment ⁽¹⁾				Brief description of treatment	As discharged ⁽¹⁾					
	mg/Nm ³		kg/h			mg/Nm ³		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
Carbon Monoxide	n/a	n/a	n/a	n/a	For inspection purposes only. Consent of copyright owner required for any other use.	27	100	0.0072	0.0267	63	234
Nitrogen Oxides	n/a	n/a	n/a	n/a		88	200	0.0235	0.0533	206	467

- Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0°C, 101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

Emission Point Reference Number: Process Boiler

Parameter	Prior to treatment ⁽¹⁾			As discharged ⁽¹⁾						
	mg/Nm ³		kg/h	mg/Nm ³		kg/h.		kg/year		
	Avg	Max	Avg	Max	Avg	Max	Avg	Max		
Carbon Monoxide					8.3	100	0.0022	0.0267	19	234
Nitrogen Oxides					27	200	0.0072	0.0533	63	467

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1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0°C, 101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

NOTES



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REV.	DATE	DESCRIPTION	CHKD	APPD
C	24.04.06	LAYOUT REVISED		
B	05.03.06	ISSUED FOR BASIS OF DESIGN		
A	18.01.06	ISSUED FOR CLIENT COMMENT		

Callaghan Engineering
Consulting Engineers • Project Managers

100/101, 102/103, 104/105, 106/107, 108/109, 110/111, 112/113, 114/115, 116/117, 118/119, 120/121, 122/123, 124/125, 126/127, 128/129, 130/131, 132/133, 134/135, 136/137, 138/139, 140/141, 142/143, 144/145, 146/147, 148/149, 150/151, 152/153, 154/155, 156/157, 158/159, 160/161, 162/163, 164/165, 166/167, 168/169, 170/171, 172/173, 174/175, 176/177, 178/179, 180/181, 182/183, 184/185, 186/187, 188/189, 190/191, 192/193, 194/195, 196/197, 198/199, 200/201, 202/203, 204/205, 206/207, 208/209, 210/211, 212/213, 214/215, 216/217, 218/219, 220/221, 222/223, 224/225, 226/227, 228/229, 230/231, 232/233, 234/235, 236/237, 238/239, 240/241, 242/243, 244/245, 246/247, 248/249, 250/251, 252/253, 254/255, 256/257, 258/259, 260/261, 262/263, 264/265, 266/267, 268/269, 270/271, 272/273, 274/275, 276/277, 278/279, 280/281, 282/283, 284/285, 286/287, 288/289, 290/291, 292/293, 294/295, 296/297, 298/299, 300/301, 302/303, 304/305, 306/307, 308/309, 310/311, 312/313, 314/315, 316/317, 318/319, 320/321, 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NOTES

- GREY CONCRETE SEALER
- ATB-300 H-10
- ATB-300 RC (1mm)
- ATB-300 H-10 CONDUCTIVE

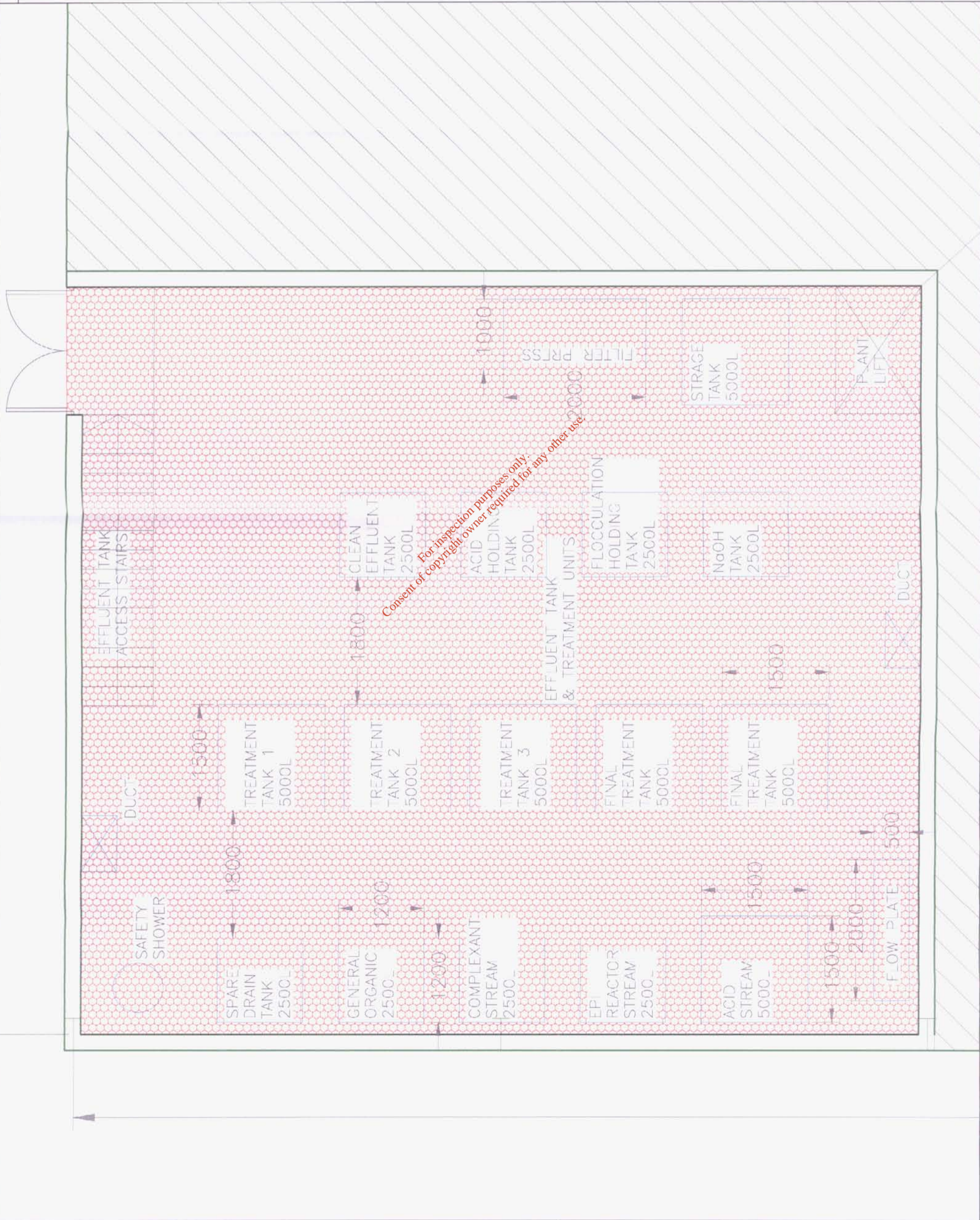
ALL NON SLIP FINISHES (EXCEPT EFFLUENT AREA)

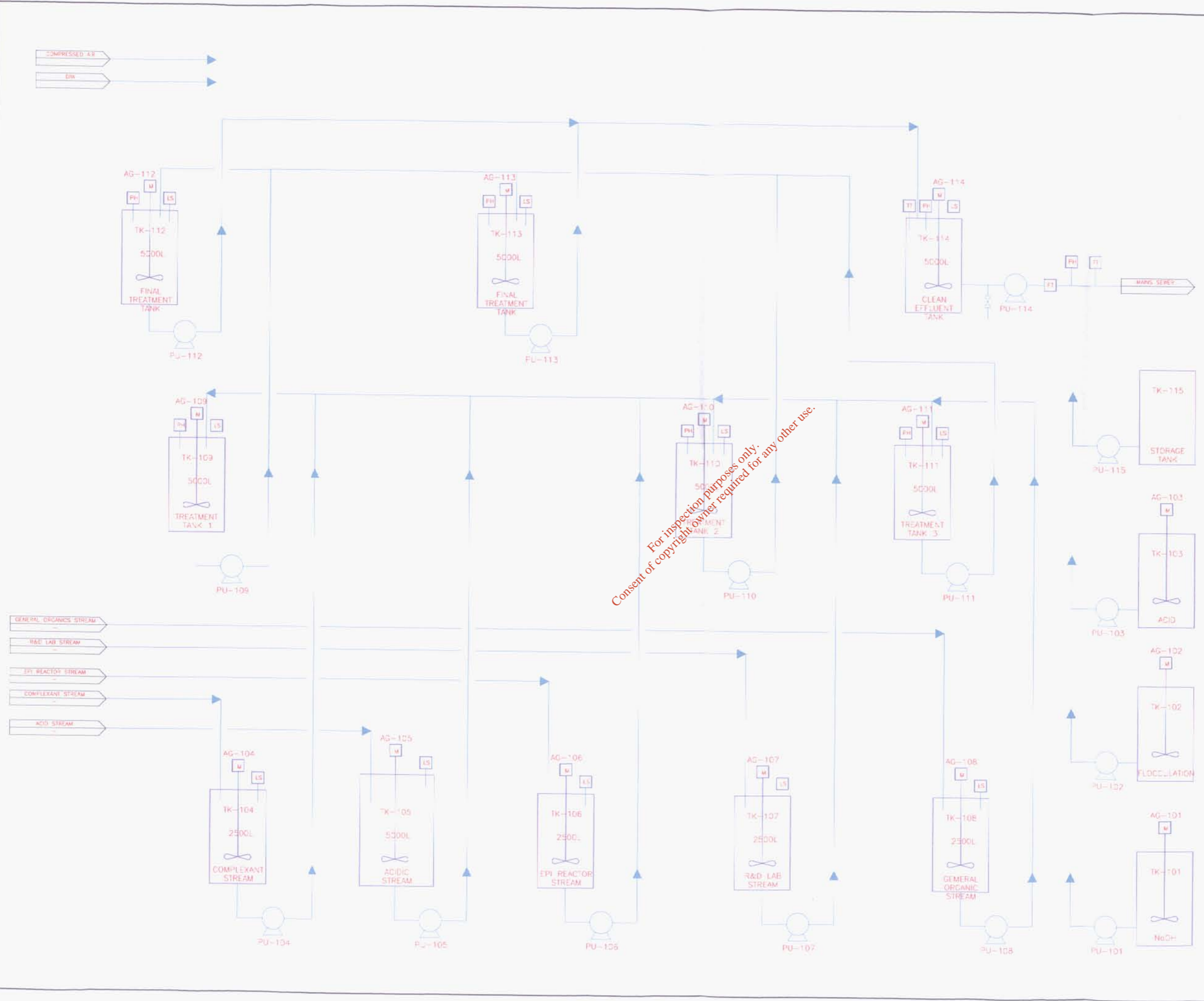
REV	DATE	DESCRIPTION	CHK'D	APP'D
A	18/07/06	ISSUED FOR CLIENT COMMENT		

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Consulting Engineers • Project Managers

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 PH: 01 861 4521
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CLIENT: _____
 PROJECT: RELOCATION PROJECT
 TITLE: EFFLUENT TREATMENT AREA FLOOR FINISHES
 DATE: PER 06 DESIGNED: H.H. DRAWN: S.H.
 SCALE: 1:100 PROJECT NO: 06-104 DRAWING NO: GA-004 REV: A
 CLIENT APPROVAL: _____
 DATE: _____
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NOTES

TABLE 1

Stream	Room Name	Room No.
Complexant Stream	EN Blending Area	P15
Acid Stream	General Stores	W6
	Boston Scientific Room	P4
	EPI Scrubber	S9
	HP Blending & Pack Off Room	P10
	Pharma Room	P11
	Tin FS Electrolysis Room	P13
	M&A Room	P1
	FS Final room	P12
R&D Stream	Ammonia Scrubber	S8
	DI Area	S6
	Laboratory	L1
	Hall South of Blending Area	P15
	R&D Lab	L3
EPI Reactor Stream	EPI Reactor Room	P3
General Organic Stream	Zinc Address room	P5

NOTE 1
REFER TO TABLE 1 ABOVE FOR INFORMATION RE STREAM MAKE UP

REV	DATE	DESCRIPTION	CHK'D	APP'D
A	18.01.06	ISSUED FOR CLIENT COMMENT		

Callaghan Engineering
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 Tel: +353 1 4551 344
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Schreiber

CLIENT: **Schreiber**

PROJECT: **RELOCATION PROJECT**

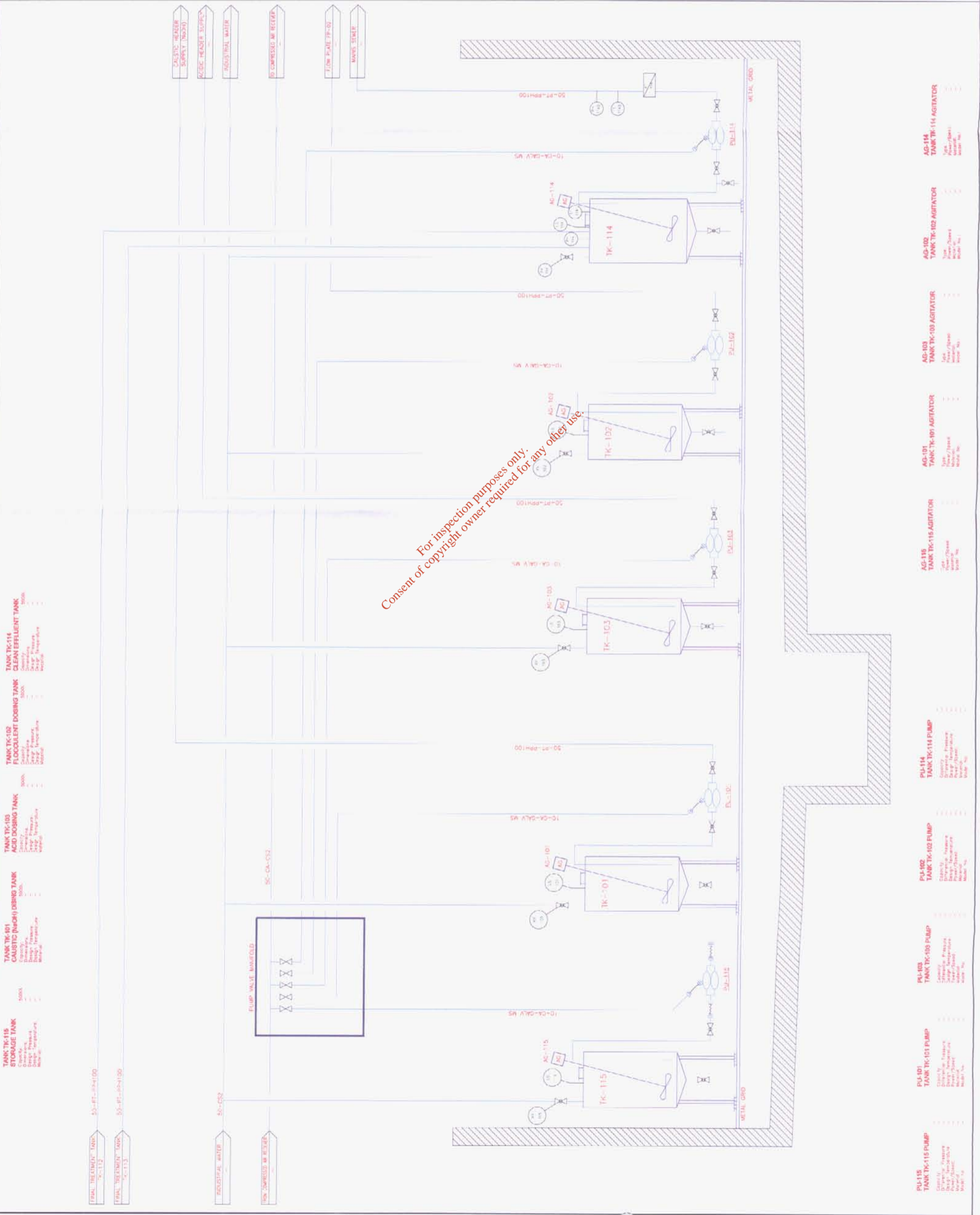
TITLE: **WASTE TREATMENT PROCESS PFD**

DATE: JAN 06 | DESIGNED: H.H. | DRAWN: S.H.

SCALE: N.T.S. | PROJECT NO.: 05-134 | DRAWING NO.: PFD-002 | REV: A

CLIENT APPROVAL: **Callaghan Engineering** Copyright © 2005

NOTES



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REV	DATE	DESCRIPTION	E.S.	CHECKED	APP'D
A	08/27/05	ISSUED FOR CLIENT COMMENT	E.S.		

TANK/TANK	Capacity	Dimensions	Material	Temp. Range	Notes
TANK TK-115 STORAGE TANK	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
TANK TK-101 CAUSTIC (NaOH) DOSING TANK	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
TANK TK-102 ACID DOSING TANK	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
TANK TK-103 COCCULANT DOSING TANK	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
TANK TK-114 CLEAN EFFLUENT TANK	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	

AGITATOR	Capacity	Dimensions	Material	Temp. Range	Notes
AG-115	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
AG-101	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
AG-102	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
AG-103	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
AG-114	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	

PUMP	Capacity	Dimensions	Material	Temp. Range	Notes
PU-115	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
PU-101	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
PU-102	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
PU-103	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	
PU-114	5000	10'-0" Dia x 10'-0" H	304 SS	50-100 F	

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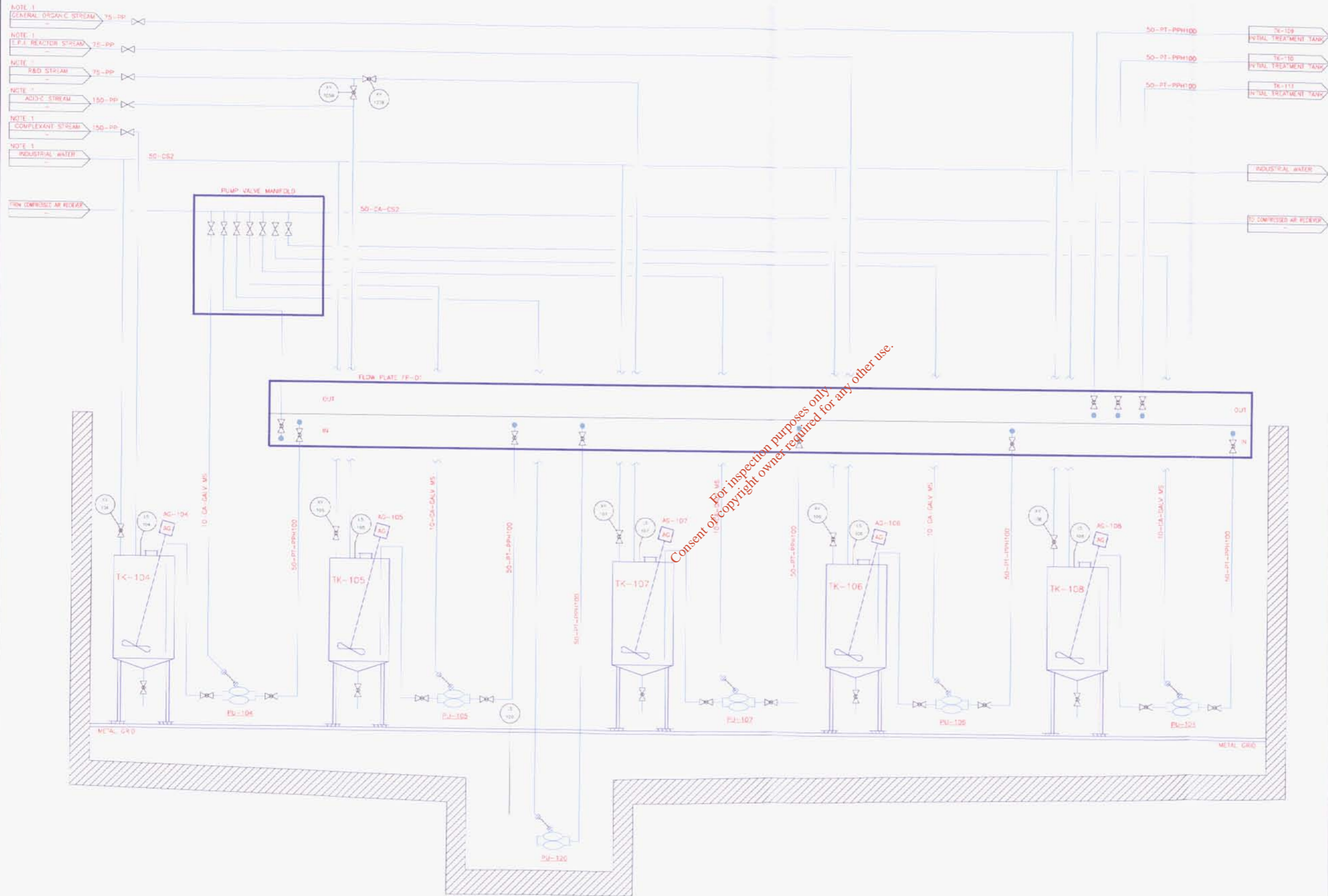
Schloetter
 Schloetter Engineering, Inc.
 14100 E. 15th Ave.
 Denver, CO 80231
 303.477.4747
 www.schloetter.com

PROJECT: RELOCATION PROJECT
 TITLE: EFFLUENT TREATMENT AREA
 TANKS 115, 101, 103, 102 & 114

DATE: _____ DESIGNED: _____
 FEB. 05: _____ A.K.A.: _____
 SCALE: N.T.S. PROJECT NO.: 05-104 DRAWING NO.: KD-012
 CLIENT APPROVAL: _____ DATE: _____

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TANK TK-104 COMPLEXANT TANK	TANK TK-105 ACIDIC TANK	TANK TK-107 R&D LAB TANK	TANK TK-106 EPI REACTOR TANK	TANK TK-108 GENERAL ORGANIC TANK
Capacity: 3500L	Capacity: 5000L	Capacity: 2500L	Capacity: 2500L	Capacity: 2500L
Dimensions: -	Dimensions: -	Dimensions: -	Dimensions: -	Dimensions: -
Design Pressure: -	Design Pressure: -	Design Pressure: -	Design Pressure: -	Design Pressure: -
Design Temperature: -	Design Temperature: -	Design Temperature: -	Design Temperature: -	Design Temperature: -
Material: -	Material: -	Material: -	Material: -	Material: -



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NOTES

TABLE 1

Stream	Room Name	Room No.
Complexant Stream	EN Blending Area	P15
Acidic Stream	General Stores	W6
	Basin Scientific Room	P4
	EPI Scrubber	S9
	HP Blending & Fack Of Room	P10
	Pharma Room	P11
	TIN FS Electrolysis Room	P13
	MSA Room	P1
R&D Stream	FS Final room	P12
	Ammonia Scrubber	S8
	Laboratory	S6
EPI Reactor Stream	Hall South of Blending Area	L1
		P15
R&D Stream	R&D Lab	L2
EPI Reactor Stream	EPI Reactor Room	P3
General Organic Stream	Zinc Additive room	P5

NOTE 1:
REFER TO TABLE 1 ABOVE FOR INFORMATION RE STREAM MAKE UP

REV	DATE	DESCRIPTION	CHK'D	APP'D
A	07-02-06	ISSUED FOR CLIENT COMMENT	E.B.	H.H.

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 Web: www.calleng.ie
 Int. Code: +353

CLIENT: **Scholar**

PROJECT: **RELOCATION PROJECT**

TITLE: **EFFLUENT TREATMENT AREA
TANKS 104, 105, 106, 107 & 108**

DATE: FEB 06 DESIGNED: A.E. DRAWN: S.J.

SCALE: N.T.S. PROJECT NO: 05-134 DRAWING NO: KD-010 REV: A

CLIENT APPROVAL: _____ Callaghan Engineering Copyright © 2005

PU-104 TANK TK-104 PUMP	PU-105 TANK TK-105 PUMP	PU-107 TANK TK-107 PUMP	PU-106 TANK TK-106 PUMP	PU-108 TANK TK-108 PUMP	PU-120 SUMP PUMP	AG-104 TANK TK-104 AGITATOR	AG-105 TANK TK-105 AGITATOR	AG-107 TANK TK-107 AGITATOR	AG-106 TANK TK-106 AGITATOR	AG-108 TANK TK-108 AGITATOR
Capacity: -	Capacity: -	Capacity: -	Capacity: -	Capacity: -	Capacity: -	Type: -	Type: -	Type: -	Type: -	Type: -
Design Pressure: -	Design Pressure: -	Design Pressure: -	Design Pressure: -	Design Pressure: -	Design Pressure: -	Power/Speed: -	Power/Speed: -	Power/Speed: -	Power/Speed: -	Power/Speed: -
Design Temperature: -	Design Temperature: -	Design Temperature: -	Design Temperature: -	Design Temperature: -	Design Temperature: -	Material: -	Material: -	Material: -	Material: -	Material: -
Power/Speed: -	Power/Speed: -	Power/Speed: -	Power/Speed: -	Power/Speed: -	Power/Speed: -	Model No.: -	Model No.: -	Model No.: -	Model No.: -	Model No.: -
Material: -	Material: -	Material: -	Material: -	Material: -	Material: -					
Model No.: -	Model No.: -	Model No.: -	Model No.: -	Model No.: -	Model No.: -					

NOTES

PPHO MATERIALS/SERVICE/ABBREVIATION & SPECIFICATION No. CHART		PPH/MATERIAL
FLUIDSERVICE	ABBREVIATION	PPH/MATERIAL
D WATER	Dis	ABS
HCl D WATER	HClW	ABS CLASS C
COLD D WATER	CDW	ABS CLASS C
COMPRESSED AIR	CA	CS D.A.C (S3)
PRODUCT/PROCESS TRANSFER	PT	PPH (D.N. 8077/79)
EXTRACTION	E	PK-1

- TANK TK-109 INITIAL TREATMENT TANK
- TANK TK-110 INITIAL TREATMENT TANK
- TANK TK-111 INITIAL TREATMENT TANK
- TANK TK-112 FINAL TREATMENT TANK
- TANK TK-113 FINAL TREATMENT TANK



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RELOCATION PROJECT

TITLE EFFLUENT TREATMENT AREA
TANKS 109, 110, 111, 112 & 113

DATE: FEB 06
DESIGNED: A.K.
SCALE: R.T.S.
PROJECT NO.: 05-134
CLIENT APPROVAL:

DATE: FEB 06
DESIGNED: S.H.
SCALE: KD-011
CLIENT APPROVAL:

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REV	DATE	ISSUED FOR CLIENT COMMENT	DESCRIPTION	BY	CHK'D	APP'D
A	07-23-06					

TABLE E.2(i): EMISSIONS TO SURFACE WATERS
(One page for each emission)

Emission Point:

Emission Point Ref. N ^o :	SW1
Source of Emission:	
Location:	Western boundary of site
Grid Ref. (10 digit, 5E,5N):	
Name of receiving waters:	River Liffey
Flow rate in receiving waters:	_____ m ³ .sec ⁻¹ Dry Weather Flow _____ m ³ .sec ⁻¹ 95%ile flow
Available waste assimilative capacity:	_____ kg/day

Emission Details:

(i) Volume to be emitted			
Normal/day	m ³	Maximum/day	m ³
Maximum rate/hour	m ³		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included*):

Periods of Emission (avg)	_____ min/hr _____ hr/day _____ day/yr
---------------------------	--

TABLE E.2(ii): EMISSIONS TO SURFACE WATERS - Characteristics of the emission (1 table per emission point)

Emission point reference number : SW1

Parameter	Prior to treatment				As discharged				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	
pH COD									

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TABLE E.3(i): EMISSIONS TO SEWER(One page for each emission)

Emission Point:

Emission Point Ref. N ^o :	SE1
Location of connection to sewer :	Northern boundary of site
Grid Ref. (10 digit, 5E,5N):	
Name of sewage undertaker:	Kildare County Council

Emission Details:

(i) Volume to be emitted			
Normal/day	4.0m ³	Maximum/day	4.0m ³
Maximum rate/hour	1.0m ³		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included*):

Periods of Emission (avg)	<u>60</u> min/hr	<u>8</u> hr/day	<u>230</u> day/yr
---------------------------	------------------	-----------------	-------------------

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TABLE E.3(ii): EMISSIONS TO SEWER - Characteristics of the emission (1 table per emission point)

Emission point reference number : SEI

Parameter	Prior to treatment				As discharged				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	
Copper					5	5	0.02	4.8	
Nikel					5	5	0.02	4.8	
Zinc					5	5	0.02	4.8	
Silver					1	1	0.004	0.96	
Chromium					1	1	0.004	0.96	
Tin					5	5	0.02	4.8	
Lead					5	5	0.02	4.8	
Total Metal concentration not to be exceeded					10	10	0.04	9.6	
BOD					100	100	0.4	96	
COD					300	300	1.2	288	
Suspended Solids					150	150	0.6	144	
Sulphates (SO ₄)					1000	1000	4	240000	
Cyanide					0.2	0.2	0.0008	0.192	

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Table E.5(i): NOISE EMISSIONS - Noise sources summary sheet

Source	Emission point Ref No	Coordinates		Overall A-weighted Sound Pressure Level, L_{pA} (dB re. 2×10^{-5} Pa) and measurement distance (m)		Sound Pressure Level (dB re. 2×10^{-5} Pa) per Octave Band Centre Frequency (Hz)								Impulsive or Tonal Qualities	Periods of Emission	Other Comments
		Eastings	Northings			63	125	250	500	1k	2k	4k	8k			
Ambient Store Room	N1	2391206	2729976	58	Rev ¹	52	50	46	52	46	51	38	29	None	Daytime	Internal
Fork lift Pass by At 5m	N2	2385623	2726719	70	5m	58	62	58	63	58	58	53	49	None	Daytime	Internal
Blending Area Ambient	N3	2366507	2714880	74	Rev ¹	66	65	67	71	71	65	60	55	None	Daytime	Internal
Scrubber at 1m	N4	2373060	2722376	94	1m	65	69	85	82	91	88	82	74	None	Daytime	Internal
Shredder At 1m	N5	2397410	2713536	80	1m	79	67	76	71	70	73	75	68	Tonal and Impulsive	Daytime	Internal

Note 1 Reverberant noise level

Note 2 All sources are located internally.

Note 3 There are no significant external noise sources associated with the site.

1. For items of plant sound power levels may be used.

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SECTION F. CONTROL & MONITORING

Describe the proposed technology and other techniques for preventing or, where this is not possible, reducing emissions from the installation/facility.

F.1: Treatment, Abatement and Control Systems

Details of treatment/abatement systems (air and effluent emissions) should be included, together with schematics as appropriate.

For each Emission Point identified complete Table F.1(i) and include detailed descriptions and schematics of all abatement systems.

Attachment N^o F.1 should contain any supporting information.

F.2: EMISSIONS MONITORING AND SAMPLING POINTS

Identify monitoring and sampling points and outline proposals for monitoring **emissions**. Table F.2(i) should be completed (where relevant) for air emissions, for emissions to surface waters, for emissions to sewers, for emissions to ground, and for waste emissions. Where **ambient** environment monitoring is carried out or proposed, Table F.2(ii) should be completed as relevant for each environmental medium.

Include details of monitoring/sampling locations and methods.

Attachment N^o F.2 should contain any supporting information.

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ATTACHMENT F.2 EMISSIONS MONITORING AND SAMPLING POINTS

In order to determine compliance with the licence limits stipulated in the IPPC licence it will be necessary to implement an emission sampling and monitoring programme. All emission monitoring on site will be in accordance with EPA requirements. These procedures define the point of sampling, the frequency of sampling, the sampling procedure and the required analytical procedures.

A standard condition included in all IPPC licenses, requires the licensee to provide safe and permanent access to all sampling and monitoring points. All sampling and monitoring points were determined in accordance with the EPA's guidance notes on sampling facilities for the effective monitoring of emissions to atmosphere and to sewer and waters. As required by the EPA, sampling points have been chosen to provide the most representative sample possible.

In order to demonstrate compliance with the IPPC licence, a system for the collection, identification, storage and maintenance of environmental sampling and monitoring records will be put in place. Environmental records must be legible, identifiable and traceable to the activity, product or service involved and will be maintained and stored in such a way that they are readily retrievable and protected against damage, deterioration or loss. Monitoring equipment will be calibrated and maintained as appropriate, and all associated records will be retained.

The following is a list of the sampling and monitoring points proposed for the facility.

Air Emission Monitoring Point

- B1 Heating Boiler Stack
- B2 Process Boiler

Surface Water Monitoring Point

- SW1 Attenuation Pond

Sewer Discharge Monitoring Point

- SE1 Discharge to sewer

Monitoring of Emissions to Atmosphere

Emission Point Reference Nos.: B1 and B2

Locations: Heating Boiler (B1) and Process Boiler (B2)

Parameter	Monitoring Frequency	Analysis Method/Technique
Combustion Efficiency	Annually	Flue Gas Analyser

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Emissions to Sewer

Emission Point Reference No.:

W1

Name of Receiving Sewer:

Sanitary Authority Sewer

Volume to be emitted:

Maximum in any one day : 4 m³

Maximum rate per hour : 1 m³

Parameter	Emission Limit Value
Temperature	23°C (max.)
pH	6-9
BOD	100 mg/l
COD	300 mg/l
Suspended Solids	150 mg/l
Sulphates (as SO ₄)	1000 mg/l
Cyanide	0.2 mg/l
Copper	5 mg/l
Nickel	5 mg/l
Zinc	5 mg/l
Silver	1 mg/l
Chromium	1 mg/l
Tin	5 mg/l
Lead	5 mg/l
Total Heavy Metals, (including those listed above.)	10 mg/l

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Monitoring of Emissions to Sewer

Emission Point Reference No.: W1

Sampling Point Reference No.: SE 1

Parameter	Monitoring Frequency	Analysis Method/Technique
Flow	Continuous (when a discharge is occurring)	On-line flow meter with recorder
Temperature	Daily (when a discharge is occurring)	Temperature probe with recorder
pH	Continuous (when a discharge is occurring)	On line pH meter and recorder
Biochemical Oxygen Demand	Note 2	Standard Method (Note 1)
Chemical Oxygen Demand	Note 2	Standard Method (Note 1)
Suspended Solids	Note 2	Gravimetric
Sulphates (as SO ₄)	Note 2	Turbidimetric
Cyanide	Note 2	Colourimetric
Copper	Note 2	Atomic Absorption Spectrometry
Nickel	Note 2	Atomic Absorption Spectrometry
Zinc	Note 2	Atomic Absorption Spectrometry
Silver	Note 2	Atomic Absorption Spectrometry
Chromium	Note 2	Atomic Absorption Spectrometry
Tin	Note 2	Atomic Absorption Spectrometry
Lead	Note 2	Atomic Absorption Spectrometry
Total Heavy Metals	Quarterly (flow proportional composite)	Atomic Absorption Spectrometry

Note 1: "Standard Methods for the Examination of Water and Wastewater", (prepared and published jointly by A.P.H.A., A.W.W.A & W.E.F) 19th Ed. 1995, American Public Health Association, 1015 Fifteenth Street, N.W., Washington DC 20005, USA.

Note 2: Flow proportional composite sample per batch discharge.

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Surface Water Discharge Monitoring

Parameter	Monitoring Frequency	Analysis Method/Technique
Visual Inspection	Weekly (when surface water is flowing)	Sample and examine for coloration and odour
pH	Monthly	pH electrode/meter
COD	Monthly	Standard Method Note 1

Note 1: "Standard Methods for the Examination of Water and Wastewater", (prepared and published jointly by A.P.H.A., A.W.W.A & W.E.F) 19th Ed. 1995, American Public Health Association, 1015 Fifteenth Street, N.W., Washington DC 20005, USA.

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TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number : SE1

Control ¹ parameter	Equipment ²	Equipment maintenance	Equipment calibration	Equipment back-up
pH	Caustic/Acid dosing unit	As per procedure ⁴	Checked before discharge	None
Maximum Flow	Tank volume pump & pipe size	As per procedure ⁴	Checked before discharge	None
Metal contents	Precipitation Tank 200	As per procedure ⁴	Not applicable	Not applicable
BOD	Aeration	As per procedure ⁴	Checked before discharge	None
COD	Aeration	As per procedure ⁴	Checked before discharge	None

Control ¹ parameter	Monitoring to be carried out ³	Monitoring equipment	Monitoring equipment calibration
pH	pH meter with chart recorder	pH meter	As per procedure ⁴
Maximum Flow	Flow meter with chart recorder	Flow meter	As per procedure ⁴
Metal Contents	Prior to discharge	Meckoquant strips	
BOD	As per procedure ⁴	Chemical analysis	As per procedure ⁴
COD	As per procedure ⁴	Chemical analysis	As per procedure ⁴

- ¹ List the operating parameters of the treatment / abatement system which control its function.
² List the equipment necessary for the proper function of the abatement / treatment system.
³ List the monitoring of the control parameter to be carried out.

TABLE F.2(i) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per monitoring point)

Emission Point Reference No. : SE1

Parameter	Monitoring frequency	Accessibility of Sampling Points	Sampling method	Analysis method/ technique
Copper	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Nikel	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Zinc	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Silver	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Chromium	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Tin	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Lead	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Cadmium	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Cyanide	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
BOD	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
COD	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Suspended Solids	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Sulphates (SO ₄)	Before discharge	Readily accessible	A representative sample is drawn automatically during discharge	Merckoquant strips
Total metal concentration not to exceed 10mg/l	Before discharge	Readily accessible		Merckoquant strips
pH	Before discharge	Readily accessible	Continuous measurement	
Flow	Before discharge	Readily accessible	Continuous measurement	
Temperature	Before discharge	Readily accessible	Continuous measurement	



TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS(1 table per monitoring point)

Monitoring Point Reference No : _____

Parameter	Monitoring frequency	Accessibility of Sampling point	Sampling method	Analysis method / technique
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SECTION G RESOURCE USE AND ENERGY EFFICIENCY

G.1 Give a list of the raw and ancillary materials, substances, preparations, fuels and energy which will be produced by or utilised in the activity.

The list(s) given should be very comprehensive, all materials used, fuels, intermediates, laboratory chemicals and product should be included.

Particular attention should be paid to materials and product consisting of, or containing, dangerous substances as described in the EU (Classification, Packaging, Labelling and Notification of Dangerous Substances) Regulations 1994 [SI 77/94]. The list must classify these materials in accordance with Article 2 of these Regulations, and must specify the designated Risk Phrases (R-Phrases) of each substance in accordance with Schedule 2 of the Regulations

Tables G.1(i) and G.1(ii) must be completed. Copy as required.

Supporting information should be given in **Attachment N^o G**.

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ATTACHMENT G.1 RAW MATERIALS – EXPLANATION OF PHRASES

R10	Flammable
R11	Highly Flammable
R20/22	Harmful by inhalation and if swallowed
R22	Harmful if swallowed
R23/24/25	Toxic by inhalation, in contact with skin and if swallowed
R23/25	Toxic by inhalation and if swallowed
R33	Danger of cumulative effects
R34	Causes burns
R36/38	Irritating to eyes and skin
R37	Irritating to the respiratory system
R38	Irritating to skin
R39	Danger to very serious irreversible effects
R40	Possibilities of irreversible effects
R41	Risk of serious damage to eyes
R43	May cause sensitisation in contact with skin
R48/20/22	Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed
R60	May cause adverse reproductive effects
R61	May cause harm to unborn child

Explanation of S-Phrases

S7	Keep container tightly closed
S9	Keep container in a well ventilated place
S16	Keep away from sources of ignition – No smoking
S20/21	When using do not eat, drink or smoke
S22	Do not breathe dust
S23	Do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by the supplier)
S24	Avoid contact with the skin
S25	Avoid contact with the eyes
S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S28	After contact with the skin, wash immediately with plenty soap and water
S30	Never add water to this product
S3/9/14	Keep in a cool, well ventilated place away from alkalis (strong bases)
S36/37/39	Wear suitable protective clothing, eye/face protection and gloves
S36/39	Wear suitable protective clothing and eye/face protection
S45	In case of accident or if you feel unwell seek immediately medical advice (if possible show this label)
S46	If swallowed seek immediately medical attention and show this label or packing
S53	Avoid exposure – obtain special instructions before use
S57	Use appropriate containment to avoid environmental contamination
S61	Prevent from entering the environment. Before use obtain special instructions and the material safety data

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LD₅₀

(Lethal Dose Fifty) a calculated dose of a chemical substance which is expected to kill 50% of a population of experimental animals exposed through a route other than respiration, dose concentration is expressed in milligrams per kilogram of body weight.

TD L₀

Toxic Dose Low – the lowest dose of a substance introduced by any route other than inhalation

TC L₀

Toxic concentration low – the lowest concentration of a substance in air to which humans or animals can be exposed for any period of time which has produced any toxic effect.

100% Odour Recognition Concentration

The 100% recognition level is the concentration at which all members of an odour panel recognises the odour.

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Products purchased in 2005

Products purchased in 2005										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
191540	140R REPLENISHER	7446-18-6	Harmful	0	0.5	Blending	inorganic	22	20/21, 60								N
66-270490-2.5L	2-PROPANOL	67-63-0	Highly Flammable, Irritant	2	24	Blending	inorganic	11, 36, 67	7, 16, 24/25, 26								N
600301	3 (DIMETHYLAMINOPRO) PYLAMINE PURE	109-55-7	Corrosive	261	3,135	Blending	Organic / Inorganic	10, 34, 21/22, 43	36/37/39, 26, 23.3, 45	122 mg/l 96h	leuciscus idus	59.5	1640	Rat			N
199013	3 MICRON DIAMOND SLURRY	107-21-1	Harmful	5	64	Blending	Organic / Inorganic	22	60								N
070132	3672 ENGOLD 2010C(HS) REPLENISHER BRIGHT	10026-24-1, 6487-48-5	Toxic / Env haz	10	115	Blending	Organic / Inorganic	42/43	23				>200	Rat			N
070127	3841 ENGOLD 2010 C(VBS)REP BRI	10026-24-1, 6487-48-5	Toxic / Env haz	0	1	Blending	Organic / Inorganic	42/43	23				4046	Rat			N
600042	ACETALDEYDE	75-07-0	Extremely Flammable,	1	49,140	Blending	Organic / Inorganic	12, 36/37, 40	16, 33, 36/37, 47B								N
600001-DEP	ACETIC ACID GLACIAL	64-19-7	Corrosive	813	9,756	Blending	inorganic	10, 35	1/2, 23, 26, 45				3100	Rat			N
65-8001.2500	ACETONE	67-64-1	Highly Flammable / Irritant	256	3,075	Blending	Organic	11, 36, 66, 67	2, 9, 16, 26				5800	Rat			N
65-9012.9010	ACETONITRILE (9012.9010) 10L RETURNABLE	75-05-8	Highly Flammable, Harmful	85	1,020	Blending	Organic / Inorganic	11, 20/21/22, 36	16, 36/37	1650 mg/l 96h	Fish	1810	2730 - 3800	Rat			N
600013	ACTIVATED CARBON POWDER	7440-44-0	Not Classified	0	3	Blending	inorganic	None	None								N
180110	ACTIVATOR CONCENTRATE PDI 11	7664-93-9	Corrosive	3	40	Blending	inorganic	35	26, 27, 28.2, 45,	200 mg/l 48h	Fish		5000	Rat			N
019005	ACTIVATOR SALT S2	7664-39-3, 1333-83-1, 7681-38-1	Toxic / Corrosive	1	10	Blending	inorganic	25, 32, 34, 37, 20/21	7/9, 26, 36/37/39, 45, 38, 27/28E								N
060204	ADDITIVE ALTRIX SPZ PART 1	1310-58-3	Corrosive	1	10	Blending	inorganic	35	24/25, 26, 28.3, 36/37/39, 45				1400	Rat			N
060205	ADDITIVE ALTRIX SPZ PART 2	7783-56-1, 7664-39-3	Toxic / Corrosive	4	50	Blending	inorganic	23/24/25, 36/38	7, 24/25, 26, 28.2, 36/37/39, 45				4000	Rat			N
191528	AMM HYDROGEN DIFLUORIDE BDH/260135	1341-49-7	Toxic / Corrosive	4	50	Blending	inorganic	25, 34	22, 26, 37, 45								N
600019	AMMONIUM ACETATE SALT	631-61-8	Not Classified	7	83	Blending	inorganic	None	None	238 mg/l 96h	Fish						N
65-0014.9025	AMMONIUM BIFLUORIDE	1341-49-7	Toxic / Corrosive	4	50	Blending	inorganic	25, 34	22, 26, 37, 45								N
199006	AMMONIUM BROMIDE	12124-97-9	Not Classified	17	200	Blending	inorganic	None	None				2700	Rat			N
604052	AMMONIUM CHLORIDE 0019.9050	12125-02-9	Harmful	1646	19,750	Blending	inorganic	22, 36	22				1650	Rat			N
65-0024.9050	AMMONIUM HEPTAMOLYBDATE TETRAHYDRATE	12054-85-2	Not Classified	40	480	Blending	inorganic	None	None	420 mg/l 96h	Fish	140	3883	Rat			N
65-C3256-46	AMMONIUM HYDROXIDE 27%	1336-21-6	Corrosive / Env haz	2233	26,790	Blending	inorganic	34, 50	7, 26, 36/37/39, 45, 61, 2								N

Products purchased in 2005

										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
190525	AMMONIUM PERSULPHATE	7727-54-0	Oxidising / Harmful	166	1,990	Blending	inorganic	8, 22,	22, 24, 26,	103	Fish	120	820	Rat			N
600009-200-DEP	AMMONIUM SOLUTION 33%	1336-21-6	Corrosive / Env haz	1927	23,121	Blending	inorganic	34, 50	7, 26, 36/37/39, 45, 61, 2								N
65-0032.1000	AMMONIUM SULPHATE	7727-54-0	Not Classified	3	32	Blending	inorganic	None	None				3000	Rat			N
100510	ANTI-FOAM SN	78-83-1	Irritant	2	25	Blending	inorganic	10, 37/38, 47, 67	16, 26, 28.2, 37/39								N
500004	AP300 ADHESION PROMOTER	67-63-0, 17927-72-9	Highly Flammable, Irritant	0	1	Blending	inorganic	11, 36, 67	9, 16, 25, 26, 51, 60				5272	Rat			N
500005	AP310 ADHESION PROMOTER	2031-67-6, 67-63-0	Highly Flammable, Irritant	60	723	Blending	inorganic	11, 36, 68	9, 16, 25, 26, 51, 61				5045	Rat			N
368012	AQUAPEL 3350-016	64742-46-7	Not Classified	25	300	Blending	inorganic	None	None								N
600006	AS 2230 LUTINSIT		Irritant	2	24	Blending	inorganic	36/38		1-10mg/l 96hr	leuciscus idus						N
070505	AURUNA 8100 BRIGHTENER 1		Not Classified	1	10	Blending	inorganic	None	None								N
070508	AURUNA 8100 COBALT CORRECTION SOLN 1	866-81-9	Harmful	0	5	Blending	inorganic	22, 40, 43	23, 53, 24/25, 45								N
070507	AURUNA 8100 DENSITY CORRECTION SALT 6		Not Classified	17	200	Blending	inorganic	None	None								N
070503	AURUNA 8100 REPLENISHER SOLN	866-81-9	Harmful	229	2,750	Blending	inorganic	40, 43	23, 53, 24, 45								N
600102	BAYHIBIT		Not Classified	100	1,200	Blending	inorganic	None	None	>1000 mg/l	Rainbow trout	>300	>6500	Rat			N
600101	BENZAL ACETONE	122-57-6	Irritant	402	4,820	Blending	inorganic	36/38, 43	24/25, 26, 28, 37/39				>5000	Rat			N
65-0055.9050	BORIC ACID 0055	10043-35-3	Not Classified	292	3,500	Blending	Inorganic	None	None	74 mg B/l	Dab		3500 - 4500	Rat			N
060202	BRIGHTENER ALTRIX	7783-56-4	Harmful	2	25	Blending	inorganic	20/21/22, 36/38	7, 24/25, 26, 28.2, 36/37/39, 45	2000 mg/l	Daphnia magna		10000	Rat			N
060700	BRIGHTENER LE	1310-58-3	Corrosive	75	900	Blending	inorganic	34	24/25, 26, 36/37/39, 45	20000	Daphnia magna		5000	Rat			N
65-5651.1000	BUFFER SOLUTION PH 10 BLUE		Not Classified	6	68	Testing	inorganic	None	None								N
191523	BUFFER SOLUTION PH 2 BDH/190324W		Not Classified	6	76	Testing	inorganic	None	None								N
191532	BUFFER SOLUTION PH 7 BDH/192405X		Not Classified	4	48	Testing	inorganic	None	None								N
65-5653.1000	BUFFER SOLUTION PH 7 GREEN		Not Classified	6	72	Testing	inorganic	None	None								N
191531	BUFFER SOLUTION PH4 BDH/192395W		Not Classified	4	48	Testing	inorganic	None	None								N
65-5654.1000	BUFFER SOLUTION PH4 RED		Not Classified	93	1,116	Testing	inorganic	None	None								N
600103	BUTOL GLYCOL ETHER	111-76-2	Harmful	4	50	Blending	Organic	20/21/22, 36/38	2, 36/37, 46	1700 mg/l 96h	Bluegill	1490					N
600219	CALCIUM CHLORIDE DI-HYDRATE	10035-04-8	Irritant	13	150	Blending	inorganic		36	22, 24	L.macrochirus	144	1000	Rat			N

Products purchased in 2005										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
65-1395.05	CALCIUM NITRATE (2.5 KG PACK)	13477-34-4	Irritant / Oxidising	171	2,050	Blending	inorganic	8, 36	7, 15, 17, 24				3090	Rat			
600201	CATHECOL P.S651/90 PRODUCT 0031	120-80-9	Harmful	967	11,600	Blending	Organic	21/22, 36/38	22, 26, 36/37/39	3.5 mg/l 96h	minno		260	Rat			N
600212-200-DEP	CAUSTIC SODA 30 %	1310-73-2	Corrosive	3214	38,569	Blending	inorganic		35 26, 37/39, 45								N
600202	CAUSTIC SODA PEARL	1310-73-2	Corrosive	225	2,700	Blending	inorganic		35 26, 37/39, 45	189 mg/l	Golden orfe						N
65-1050.0500	CERIC AMMONIUM NITRATE	16774-21-3	Irritant / Oxidising	1	8	Blending	inorganic	8, 41	17, 26, 39								N
65-7114.1000	CERIUM SULPHATE 0,1 MOL/L-CERIC SULPHATE	7664-93-9	Not Classified	10	125	Blending	inorganic	None	None								N
600203	CHROMIC ACID FLAKES	1333-82-0	Toxic/Corrosive/Oxidising/Env haz	10	120	Blending	inorganic	8, 25, 35, 43, 49, 50/53	45, 53, 60, 61				52	Rat			N
66-27080.0250	CHROMIUM NITRATE	08/02/7789	Irritant / Oxidising	0	3	Blending	inorganic	8, 20/21/22, 36/37/38	17, 26, 27, 36/37/39				3250	Rat			N
600210	CITRA SAFE CLEANER	5989-27-5	Irritant / Env haz	58	700	Blending	inorganic	10, 38, 43, 50/53	24, 37, 51, 57, 60, 61								N
600206	CITRIC ACID	77-92-9	Irritant	144	1,725	Blending	inorganic	36	24/25				11700	Rat			N
131257	COBALT (II) CHLORIDE 6-HYD PA-ACS-ISO	7791-13-1	Toxic / Env haz	35	419	Blending	inorganic	49, 22, 42/43, 50/53	53, 22, 45, 60, 61								N
190526-250	COBALT CHLORIDE	7791-13-1	Toxic / Env haz	1	9	Blending	inorganic	49, 22, 42/43, 50/53	53, 22, 45, 60, 61								N
600800	COBALT SULPHATE C0504 7H2O	10026-24-1	Toxic / Env haz	7	85	Blending	inorganic	49, 22, 42/43, 50/53	53, 22, 45, 60, 61				582	Rat			N
070133	CODE 10746 ENGOLD 2010C(HS)REPLENISHER	144-62-7, 1310-58-3, 1126-74-5	Irritant	13	150	Blending	inorganic	36/38	24/25				7200	Rat			N
200037	CODE 3615 ORMEX KITS	13967-50-5, 60-00-04, 151-50-8	Harmful	3	30	Plating	inorganic	20/21/22, 32, 36	36/37				(GPC) 25	Rat			N
200031	CODE 3632 68.3% G.P.C. AT MFG COST	13967-50-5	Toxic	83	1,000	Plating	inorganic	23/24/25, 32, 36		28			(GPC) 25	Rat			N
070123	CODE 3678 ENGOLD 2010C(VR) REP. ADDITIVE	1310-58-3	Irritant	0	4	Blending	inorganic	36/38	24/25				7200	Rat			N
200070	CODE 3756 PALLADIUM CHLORIDE 60%	7647 10 1	Corrosive	0	5	Blending	inorganic		34	26			2704	Rat			N
074014	CODE 3799 PALLNIC PALLADIUM REP		Irritant	0	4	Blending	inorganic	36/37/38	22, 24/25								N
070118	CODE 3842 ENGOLD 2010N (VBS) REPL BRIGTN	12124-97-9	Irritant	1	10	Blending	inorganic	36/37/38	24/25, 26, 60				2942	Rat			N
070115	CODE 4209 ENGOLD SALT BALANCE	6487-48-5	Harmful	1	8	Blending	inorganic	21/22	36/37				200	Rat			N
070141	CODE 4304 PALLNIC BRIGHTENER NO 1	2495-39-8	Not Classified	2	20	Blending	inorganic	None	None				2211	Rat			N
070142	CODE 4305 PALLNIC CONDUCTING SALTS	7783-20-2	Irritant	2	18	Blending	inorganic	36/37/38		22			667	Mouse			N
070143	CODE 4306 PALLNIC ADDITIVE SOLUT 1LT	1336-21-6	Harmful	7	80	Blending	inorganic	40, 36/37/38	36/37				4244	Rat			N
070134	CODE 4917 2010C MAINTENANCE BRIGHTENER	10026-24-1	Toxic / Env haz	0	1	Blending	inorganic	42/43, 49, 50/53	23, 24, 37, 45, 53, 57, 61				3216	Rat			N

Products purchased in 2005

Products purchased in 2005										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
074020	CODE 4959CROWNCLAD 2000 NICKEL REPL 100M	7786-81-4	Harmful	0	4	Blending	inorganic	40, 42/43	23, 24, 36/37				3520	Rat			N
68-CSKC10M	CONDUCTIVITY STANDARD SOLUTION 10000 US/		Not Classified	2	25	Testing	inorganic	None	None								N
P02SL1305AQ	CONFORMAL COATING SL1305AQ	872-10-4	Not Classified	4	50	Blending	inorganic	None	None								N
030320	COPPER ADDITIVE PC81		Not Classified	2	25	Blending	inorganic	None	None								N
030611	COPPER BATH ADDITIVE TB 11	7664-93-9	Not Classified	2	25	Blending	inorganic	None	25								N
030612	COPPER BATH ADDITIVE TB 12	7664-93-9	Not Classified	3	35	Blending	inorganic	None	25								N
030613	COPPER BATH ADDITIVE TB 13	83968-31-4	Not Classified	8	100	Blending	inorganic	None	25, 26								N
600204	COPPER CYANIDE	554-92-3	Very Toxic	4	50	Blending	inorganic	26/27/28, 32, 50, 53	7, 28, 29, 45, 60, 61								N
074022	CROWN CLAD 2000 BASE REPL EC4956		Not Classified	183	2,200	Blending	inorganic	None	None								N
092301	CRYSTALITE R-130H	94-40-0, 20368-76-7	Not Classified	67	800	Blending	inorganic	None	None								N
083036	CYANIDE ZINC PURIFIER	1313-82-2, 7704-34-9, 1310-73-2	Corrosive	250	3,000	Blending	inorganic	34	1/2, 14, 24/25, 26								N
020003-25	DCG CLEANER	1310-73-2, 6834-92-0	Corrosive	8	100	Blending	inorganic	35	36/37/39 45				500	Rabbit			N
020200	DEGREASER SALT SLOTCLEAN AK F.S.A.	497-19-8, 6834-92-0	Corrosive	8	100	Blending	inorganic	34, 36	24, 25, 26, 36/37/39, 45				2000	Rat			N
65-9315.1000	DICHLOROMETHANE HPLC GRADE	75-09-2	Harmful	10	120	Blending	Organic	40	23, 24/25, 36/37	2270 mg/l	Daphnia magna		2136	Rat			N
65-J372.0500	DIMETHYLACETAMIDE	127-19-5	Toxic	8	100	Blending	Organic	61, 20/21	53, 45	>500 mg/l	Daphnia magna		4300	Rat			N
600900	DIVOSAN ACTIV (7722-84-1, 64-19-7, 79-21-0	Corrosive / Oxidising	8	100	Blending	inorganic	7, 34, 37	3/7, 14, 23, 26, 28, 36/37/38, 45				200-2000				N
190516-1	DODECYL SODIUM SULPHATE 2811.100	151-21-3	Harmful	8	100	Blending	inorganic	21/22, 36/38	22, 24/25, 26, 36/37, 60				1288	Rat			N
600024	DREWFL0C 2224	64742-47-8, 26635-93-8, 68002-97-1, 68551-12-2	Irritant	21	248	Blending	Organic	38	36	>100 mg/l 98h	B. rerio	>100	>5000	Rat			>
353021	DURODUR 3067-042P BLACK SEMI GLOSS	123-86-4, 1330-20-7, 123-42-2, 64742-95-6, 546-93-0, 872-50-4, 7030-30-6	Harmful	2	21	Blending	Organic	10, 20/21	36/37, 60								N
370206	DURODUR HARDNER HA 5410	882-06-0, 123-86-4, 28182-81-2	Irritant	1	7	for resale	Organic	10, 43, 66, 67	24, 37, 38, 51, 23								N
600043	DYNASOLVE 750	107-98-2, 872-50-4, 770-35-4, 67-56-1, 1310-58-3	Irritant / Flammable	12	140	Blending	inorganic	10, 36/38	16, 36/37, 45								N
65-7124-20	EDTA 20L POLY CUBE	139-33-3	Not Classified	40	480	Blending	inorganic	None	None								N
65-4040.5000	EDTA DISODIUM SALT BAKER ULTRAPURE	6381-92-9	Harmful	7	80	Blending	inorganic	20/21/22	9, 36/37	>500 mg/l	leuciscus idus	>100	2000	Rat			N
65-L693-09	EDTA TETRASODIUM SALT ACS GRADE	10378-23-1	Irritant	167	2,000	Blending	inorganic	36/37/38	26								N
020007	EL 31 CLEANER	1310-73-2, 6834-92-0	Corrosive	8	100	Blending	inorganic	35	36/37/39, 45	189	leuciscus idus		500	Rabbit			N

Products purchased in 2005										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
020005	ELECTROLYLIC CLEANER	497-19-8, 6834-92-0, 1310-73-2	Corrosive	1	10	Blending	inorganic	35	36/37/39, 45	189	leuciscus idus		500	Rabbit			N
070137	ENGOLD 2010C (VBS) SOL CONC. EC10509	144-32-7, 10026-24-1	Toxic/ Env haz	9	106	Blending	inorganic	49, 52/53	45, 53, 57, 61				1400	Rat			N
010230	ENTREAT 100 GOLD STRIPPER	151-50-8	Very Toxic	400	4,800	Blending	inorganic	26/27/28, 32	28, 36/37, 45				6	Rat			N
600401	EPICHLOROHYDRIN	106-89-8	Toxic	2083	25,000	Blending	inorganic	45, 10, 23/24/25, 34, 43	53, 45	10-30 mg/l	Fish	30-40	90	Rat	154	Rat	N
609016	ETHYLENE DIAMINE TETRA ACETETIC ACID		Not Classified	2	25	Blending	inorganic	None	None								N
600032	FDP ANTIFOAM		Not Classified	4	50	Treatment	inorganic	None	None								N
65-2024-07	FERRIC OXIDE	10025-77-1	Harmful	118	1,416	Blending	inorganic	22, 38, 41	13, 26, 39				900	Rat			N
65-1996-12	FERRIC(IRON III)CHLORIDE HEXAHYDR	10025-77-1	Harmful	346	4,152	Blending	inorganic	22, 38, 41	13, 26, 39				900	Rat			N
190514-250	FERROUS CHLORIDE (JTB20641)	13478-10-9	Harmful	250	3,000	Blending	inorganic	22, 38, 41	26, 39				984	Rat			N
180013	FIDELITY 9002A	7786-81-4	Harmful / Env haz	152	1,820	for resale	inorganic	22, 40, 42/43, 50/53	22, 36/37, 60, 61			435	275	Rat			N
180014	FIDELITY 9002B	64-19-7	Not Classified	395	4,738	for resale	inorganic	None	None								N
180015	FIDELITY 9002CM	1336-21-6	Irritant	1	15	for resale	inorganic	36/37/38	24, 36/37								N
600502	FORMALDEHYDE	50-00-0, 67-56-1	Toxic	5	65	Blending	organic	23/24/25, 34, 39/23/24/25, 40, 43	26, 36/37/39, 45, 51				Formaldehyde 100	Rat			N
65-2136-08	GLYCEROL ACS GRADE	56-81-5	Not Classified	377	4,523	Blending	inorganic	None	None				12600	Rat			N
200033	GOLD POTASSIUM CYANIDE 68%	13967-50-5	Very Toxic / Env haz	269	3,234	Blending	inorganic	26/27/28, 32, 50/53	7, 28, 29, 45, 60, 61				29	Rat			N
600603	GOLPANOL ALS		Not Classified	195	2,340	Blending	inorganic	None	None	>100 mg/l 96h	leuciscus idus		>2000	Rat			N
600602	GOLPANOL BOZ CRYSTAL	110-65-6	Toxic	33	390	Blending	inorganic	21, 23/25, 34, 48/22	26, 36/37/38, 45	46.4 - 100	leuciscus idus	26.8	100	Rat			N
8500-4907	HPR 504	97-64-3, 27029-76-1, 68510-93-0	Imitant	2	27	for resale	organic	10, 37, 41	23, 26, 39	100-100 ppm			>5000	Rat			N
370196	HS 001 HARDENER	108-65-6, 100-41-4, 1330-20-7, 822-06-0, 28182-81-2	Harmful	2	22	for resale	organic	10, 20, 43	P4, 51, 7/9, 24/25, 37/39, 23B				>5000	Rat			N
600740-2.5	HYDRO PEROXIDE CMOS 30%	7722-84-1	Harmful	0	5	Blending	inorganic	22, 41	25, 26, 39, 60								N
68-19072.2.5LTR	HYDROCHLORIC ACID 0.02 MOL	7647-01-0	Not Classified	3	30	Blending	inorganic	None	None								N
65-7038-10	HYDROCHLORIC ACID 0.1MOL JTB - 7038	7647-01-0	Not Classified	3	32	Blending	inorganic	None	None								N
65-7088.1000	HYDROCHLORIC ACID 1 MOL/L	7647-01-0	Not Classified	354	4,250	Blending	inorganic	None	None								N
600708-DEP	HYDROCHLORIC ACID 28%	7647-01-0	Corrosive	1259	15,105	Blending	inorganic	34, 37	2, 26, 45								N

Products purchased in 2005

										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50 mg/l	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
65-9544-05	HYDROCHLORIC ACID 36.5-38%	7647-01-0	Corrosive	2821	33,854	Blending	inorganic	34, 38	2, 26, 46	862 mg/l	leuciscus idus						N
65-9564-06	HYDROFLUORIC ACID 49% CMOS GRADE	7664-39-3	Very Toxic / Corrosive	8671	104,055	Blending	inorganic	35, 26/27/28	24/25, 26, 28, 36/37/39, 38, 45, 60								N
65-7047.1000	HYDROGEN PEROXIDE 30%	7722-84-1	Corrosive	4204	50,450	Blending	inorganic	34	3, 28, 36/39, 45			341.5					N
178001	I.P.A	67-63-0	Highly Flammable, Imitant	158	1,900	Blending	Organic	11, 36, 67	7, 16, 24/25, 26								N
600801	IMIDAZOLE-LUGALVAN IMZ	288-32-4	Corrosive	479	5,750	Blending	inorganic	34, 22	22, 26, 36/37/39, 45			341.5					N
65-1118.0250	IODINE	7553-56-2	Harmful / Env haz	100	1,200	testing	inorganic	20/21, 50	23, 25, 61	28.5 mg/l	Fish						N
090371	IRIDITE 71 - 20	7697-37-2, 1333-82-0	Toxic / Corrosive / Env haz	1	15	Blending	inorganic	25, 33, 43, 49, 50/53, 8	P11, 26, 36/37/39, 38, 45, 53, 60								N
600802-1	IRON II SULPHATE HEPTAHYDRATE	7720-78-7	Harmful	5422	65,060	Blending	inorganic	22, 36/37/38	26, 36				300 - 560	Rat			N
609002	KLEBOSOL 3050		Not Classified	833	10,000	Blending	inorganic	None	None								N
65-0194.01	LACTIC ACID	79-33-4	Irritant	726	8,710	Blending	inorganic	41, 38	24, 26, 37	320 mg/l 48h	Fish	240	3730	Rat			N
110108-30	LEAD CONCENTRATE FP	17570-76-2, 75-75-2	Toxic / Env haz	3	35	Blending	inorganic	61, 62, 20/22, 33, 38, 41, 48/20/22, 58	53, 45, 57, 61				>2500	Rat			N
600220	LPN 9 - LAN 20 ADDITIVE		Not Classified	100	1,200	Blending	inorganic	None	None								N
601401	LUTENSOL ON 70		Harmful	1750	21,000	Blending	inorganic	22, 41	26, 39	10-100 mg/l 96h	leuciscus idus	48	1140	Rat			N
601402	LUTENSOL TO 12		Harmful	867	10,400	Blending	inorganic	22, 41	26, 39	10-100 mg/l 96h	leuciscus idus	48	1140	Rat			N
601403	LUTENSOL XL 140		Harmful	2	20	Blending	inorganic	22, 36				10-100	200-2000	Rat			N
65-5712.2500	MAGNESIUM STEARATE	557-04-0	Not Classified	297	3,565	Blending	inorganic	None	None								N
601191	MALIC ACID(KGS) 2918199900	6915-15-7	Not Classified	27	325	Blending	inorganic	None	None				4730	Rat			N
65-1125.1000	MANNITOL ACS GRADE	69-65-8	Not Classified	501	6,006	Blending	inorganic	None	None				13500	Rat			N
020058	MECO DEFLASH 100 CONCENTRATE		Irritant	145	1,740	Blending	inorganic	36/37/38	24/25								N
010350	MECOSTRIP EPL-4 MAKE-UP		Corrosive	130	1,560	Blending	inorganic	34	26, 36/37/39, 45				1450	Rat			N

Products purchased in 2005										Ecological			Toxicological				
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010351	MECOSTRIP EPL-4 REPLENISHER		Corrosive	8	100	Blending	inorganic	34	26, 36/37/39, 45				1450	Rat			N
090305	METAPAS SALT B BLACK		Irritant	33	400	Blending	inorganic	36	26								N
199010	METEX FA	1336-21-6	Corrosive	36	428	Blending	inorganic	34, 37	24/25, 26, 27, 36/37/39, 45, 60				350	Rat			N
199011	METEX FB	7758-19-2	Harmful	22	265	Blending	inorganic	20/21/21, 8	17, 36/37, 60				350	Rat			N
65-8404.9010	METHANOL - (8404.9010)	67-56-1	Toxic / Highly flammable	1338	16,055	Blending	Organic	11, 23/24/25, 39/23/24/25	1/2, 7, 16, 24, 36/37, 45, 56	1000mg / l 48h	Gold orfe	10000	5628	Rat			N
601202-1	MIRANOL C2M AA (AS PER SPECIFICATION)	79-10-7	Corrosive	0	3	Blending	inorganic	35	24, 26, 36/37/39, 45				>5000	Rat			N
200017	MIXTURE A (54% SILVER SALT) (FMPEDAG)	506-61-6	Very Toxic	7158	85,900	Blending	inorganic	26/27/28, 32, 36	7, 28, 29, 45				21	Rat			N
609900	MONOMETHYL AMINE ANHYDROUS 100%	74-89-5	Extremely Flammable, Harmful	8	100	Blending	Organic	12, 20, 37/38, 41	16, 26, 39				339	Rat			N
142020	MOUNTING HARDENER (PINT)	140-31-8	Not Classified	2	25	For resale											N
142010	MOUNTING RESIN (GALLON)	25085-99-8, 95-48-7	Not Classified	7300	87,600	For resale											N
601204	MSA 70% Electronic Grade	75-75-2	Corrosive	111	1,328	Blending	inorganic	34	26, 36	73 mg/l 96h	Oncorhynchus	1.7	1158	Rat			N
199040	NANO EBR PG	646-06-0, 107-98-2	Flammable	24	284	Blending	Organic	11	2, 16, 24				3000	Rat			N
199030-4	NANO PMGI SFG FAST SERIES RESIST	120-92-3, 107-98-2, 102322-80-5	Harmful	449	5,382	Blending	Organic	10, 36/37/38, 20/21/22	23, 24	20800 mg/l 96h	Minnow	23000	1180	Rat			N
601299	NANOSTRIP	7664-93-9, 7722-84-1	Corrosive	4	45	For resale	inorganic	35	23, 26, 36/37/39, 45, 47				2140	Rat			N
66-N720-6	NEOPENTYL ALCOHOL 99%	75-84-3	Irritant	0	1	For resale	Organic	10, 36/37	16, 26, 36/37								N
129003	NEUTRALISER ADDITIVE PT11		Irritant	3	30	Blending	inorganic	36	25								N
601311	NICKEL CARBONATE 49%	12607-70-4	Harmful / Env haz	3	30	Blending	inorganic	20/22, 40, 43, 50/53	22, 36/37, 60/61				1044	Rat			N
601315	NICKEL CARBONATE PASTE 35% NI	12607-70-4	Harmful / Env haz	29	347	Blending	inorganic	20/22, 40, 43, 50/53	22, 36/37, 60/61				1044	Rat			N
190533	NICKEL CHLORIDE	7791-20-0	Toxic / Env haz	10000	120,000	Blending	inorganic	20, 25, 36/37/38, 40, 42/43, 50	22, 26, 36/37, 57				425	Rat			N
601310	NICKEL SULPHAMATE 65%	13770-89-3	Harmful / Env haz	4	53	Blending	inorganic	22, 40, 42/43, 50/53	23, 36/37, 45, 57, 60								N
600801-1	NICKEL SULPHATE	10101-97-0	Harmful / Env haz	2909	34,905	Blending	inorganic	22, 40, 42/43, 50/53	22, 36/37, 60, 61				275	Rat			N

Products purchased in 2005

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65-6080.2500	NITRIC ACID 65%	7697-37-2	Corrosive	820	9,841	Blending	inorganic	35	23, 26, 36, 45	72 mg/l 96h	Fish						N
8500-8321	PALLA DEX ADDITIVE I (8530780A)	112-00-5	Not Classified	8	100	For resale	inorganic	None	None								N
8500-8322	PALLA DEX ADDITIVE II (8530790A)	112-00-5, 16212-05-8	Not Classified	23	276	For resale	inorganic	None	None								N
8500-8320	PALLADEX TD REPLENISHER (8530760A)	1336-21-6	Irritant	1	11	For resale	inorganic	36/37/38				350	Rat				N
208209	PALLADIUM 2000 B ELECTROLYTE SOLUTION		Not Classified	0	5	Blending	inorganic	None	None				640	Rat			N
200040	PALLNIC 11 HS PALLAD MAKE UP EC4932	13601-06-4	Harmful	1	6	Blending	inorganic	42/43	23, 24, 37								N
070166	PALLNIC III BALANCER SOLUTION - EC40051	1310-73-2	Corrosive	35	420	Blending	inorganic	35	26, 36/37/38, 45				1053	Rat			N
070162	PALLNIC III BASE ELECTROLYTE CONCENTRATE	7786-81-4	Harmful / Env haz	1	6	Blending	inorganic	40, 42/43, 51/53	23, 24, 36/37, 57, 61				264	Rat			N
070168	PALLNIC III COMPLEXING SOLUTION-EC40053	107-15-3	Corrosive	1	6	Blending	inorganic	34, 42/43	23, 24, 26, 36/37/39, 45				500	Rat			N
070167	PALLNIC III CONDUCTING SALT - EC40050		Not Classified	1	6	Blending	inorganic	None	None								N
070165	PALLNIC III HS REP. BRIGHTENER EC 40047	1310-73-2	Irritant	2	18	Blending	inorganic	36/38	26, 27				28571	Rabbit			N
070164	PALLNIC III NICKEL REP. SALT EC 40049	3333-67-3	Harmful / Env haz	4	50	Blending	inorganic	22, 40, 42/43, 50/53	22, 37, 61				1344	Rat			N
070163	PALLNIC III PALLADIUM SALTS 40% SALT		Harmful	4	50	Blending	inorganic	21/22, 42/43	23, 24, 45								N
200040-5	PALLNIC Pd REPLEN-SEAGATE/SCH METAL ACC.	13601-06-4	Harmful	0	7	Blending	inorganic	42/43	23, 24, 37								N
601502	PDV SALT		Not Classified	167	2,000	Blending	inorganic	None	None	6040 mg/l 96h	Fish	2024	3000	Rat			N
65-8243.5000	PETROLEUM ETHER 100-140 DEG	9032-32-4	Harmful / Env haz / Highly flammable	4	44	Blending	Organic	11, 51/53, 65	9, 16, 23, 24				>6000	Rat			N
191546	PH 10 BUFFER BHD190434E		Not Classified	1	6	Testing	inorganic	None	None								N
601516	PH 4 BUFFER		Not Classified	1	6	Testing	inorganic	None	None								N
601517	PH 7 BUFFER		Not Classified	5	58	Testing	inorganic	None	None								N
601526	PH ELECTRODE STORAGE SOLUTION		Not Classified	14	170	Testing	inorganic	None	None								N
190522-2.5	PHOSPHORIC ACID 2.5L MOS GRADE	7764-38-2	Corrosive	1462	17,540	Blending	inorganic	34	26, 45, 24/25, 36/37/39, 60				1350	Rat			N
142030	POLISHING SUSPENSION 0.05 MICRON (QUART)	1344-28-1	Not Classified	0	4	For resale	inorganic	None	None								N
142040	POLYCRYSTALLINE DIAMOND SUSPENSION 9 MIC	107-21-1, 56-81-5, 7782-40-1	Not Classified	25	300	For resale	Organic	None	None								N
601511	POTASSIUM CHLORIDE (PURE)	7447-40-7	Not Classified	334	4,008	Blending	inorganic	None	None								N
65-3080-05	POTASSIUM CYANIDE ACS GRADE	151-50-8	Very Toxic / Env haz	35	420	Blending	inorganic	26/27/28, 32, 50/53	7, 28, 29, 45, 60, 61	0.45 mg/l 48h	Fish	2	5	Rat			N

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										LC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	
604050	POTASSIUM DIHYDR PHOS (0240.7100)	7778-77-0	Not Classified	4	45	Blending	inorganic	None	None							N
601512	POTASSIUM HYDROXIDE Pharmacopoeia BP 93	1310-58-3	Corrosive	388	4,661	Blending	inorganic	22,35	26, 36/37/39, 45	80-85 mg/l 96h	Fish		365	Rat		N
191535	POTASSIUM IODIDE BDH 102125D	7681 11 1	Not Classified	1	15	Blending	inorganic	None	None			40				N
65-3252-07	POTASSIUM PHOSPHATE	7758 11 4	Harmful	9	106	Blending	inorganic	22	20, 45, 46, 60							N
608010	PROPYL GLYCOL	2807-30-9	Harmful	1535	18,414	Blending	Organic	10, 21, 36	24/25, 36/37, 60	>100 mg/l 96h	Minnow		3089	Rat		N
PSD2962P	PSD2962 PEELABLE SOLDER MASK GREEN	64742-95-6	Not Classified	7	85	For resale		None	None							N
190536	PYR-AU-BOND 140 CONDUCTING SALTS		Not Classified	3	40	Blending	inorganic	None	None							N
362215-500	RENGOLUX 3203-015 CLEAR	42978-66-5	Irritant / Env haz	253	3,030	For resale	Organic	36/37/38, 43, 51/53	24, 26, 37, 38, 51, 61, 23							N
362218	RENGOLUX 3203-029	42978-66-5	Irritant / Env haz	275	3,300	For resale	Organic	36/37/38, 43, 51/53	24, 26, 37, 57, 60							N
071117	RHODIUM SX2-20 PLATING SOLN	7764-93-9	Not Classified	1	10	Blending			24/25				2140	Rat		N
601750	ROCHELLE SALT		Not Classified	167	2,000	Blending	inorganic	None	None							N
370195	SCT 014 THINNER	1330-20-7, 123-42-2, 123-86-4, 108-65-6	Harmful	1	9	For resale	Organic	10, 20/21, 36/38	26, 36/37/39, 51, 7/9, 23B,							N
090512	SEALING CONCENTRATE SLOTOFIN 11		Not Classified	29	350	Blending	inorganic	None	None							N
199026-4	SEPR 1032 - 3 MICRON	108-65-6, 138529-81-4, 24979-70-2, 102-71-6, 165967-96-4	Irritant	6	76	For resale	Organic	36, 10	25, 26, 51, 60, 16, 7/9				8532	Rat		N
199035-4	SEPR I039 -4M	108-65-6, 138529-81-4, 24979-70-2, 165967-96-4	Irritant	5	66	For resale	Organic	10, 2, 36	25, 26, 51, 60,							N
199026-0.8	SEPR I302 0.8UM	108-65-6, 138529-81-4, 24979-70-2, 102-71-6, 165967-96-4	Irritant	0	4	For resale	Organic	36, 10	25, 26, 51, 60, 16, 7/9				8532	Rat		N
199039	SEPR-I302-1.5	108-65-6, 138529-81-4, 24979-70-2, 102-71-6, 165967-96-4	Irritant	1	12	For resale	Organic	36, 10	25, 26, 51, 60, 16, 7/9				8532	Rat		N
8500-2295	SILQUEST A11001KG (REF: SIA0610SCH)	919-30-2	Corrosive	8	96	Blending	inorganic	22/34	26, 36/37/39, 45				3500	Rat		N
199050	SILVER NITRATE BDH191265J	7761-88-8	Env haz	2	20	For resale	inorganic	52/53		61						N
199024-4	SIPR 974M RESIST 3MICRON	97-64-3, 123-86-4	Irritant	33	396	For resale	Organic	36, 10	25, 26, 51, 60, 16, 7/9							N
199002-4	SIPR 974M RESIST 6 MICRON	97-64-3, 123-86-4	Irritant	22	260	For resale	Organic	36, 10	25, 26, 51, 60, 16, 7/9							N
199025	SIPR-PR1	67-63-0, 31001-77-1	Highly Flammable, Irritant	35	416	For resale	Organic	11, 36, 67	16, 25, 36, 51, 60, 9, 45				5045	Rat		N
080475	SLOTANIT OT 15N ADDITIVE	67-63-0, 122-57-6	Irritant	531	6,375	Blending	inorganic	10, 43	7, 16, 24/25, 28.2, 36/39,	70 mg/l 96h	leuciscus idus		>2000	Rat		N
080460	SLOTANIT OT STARTER		Not Classified	167	2,000	Blending	inorganic	None	None	<100 mg/l 96h	leuciscus idus		>5000	Rat		N

Products purchased in 2005

Products purchased in 2005										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
080470	SLOTANIT ZINC BRIGHTENER UF 12	107-98-2	Irritant	42	500	Blending	inorganic	43	24, 27, 37	<100 mg/l 96h	leuciscus idus		>5000	Rat			N
140140	SLOTETCH CA-92R (REPLENISHER)	7722-84-1, 7664-93-9	Irritant	133	1,600	Blending	inorganic	36/38	24, 26, 36/37/39								N
020181	SLOTOCLEAN AK - 181		Not Classified	41	490	Blending	inorganic	None		26							N
020161	SLOTOCLEAN AK 161	1310-73-2, 6834-92-0	Corrosive	155	1,860	Blending	inorganic	35	45, 36/37/39	189 mg/l	leuciscus idus		500	Rat			N
020131	SLOTOCLEAN EL 131	1310-73-2, 6834-92-0, 497-19-8	Corrosive	20	240	Blending	inorganic	35	45, 36/37/39	189 mg/l	leuciscus idus		500	Rat			N
020100	SLOTOCLEAN VF 100	68411-30-3	Irritant	50	600	Blending	inorganic	36/38	24/25, 26 28.2	2-20 mg/l 48h	leuciscus idus		4000	Rat			N
020105	SLOTOCLEAN VF200 ADDITIVE	68411-30-3, 68154-99-4	Irritant	2	25	Blending	inorganic	36/38, 41	24/25, 26 28.2, 39	10mg/l	leuciscus idus		2000	Rat			N
030415	SLOTOCOUP CU 41 STARTER		Not Classified	17	200	Blending	inorganic	None	None				75000	Rat			N
030417	SLOTOCOUP CU 45	7764-93-9	Not Classified	21	250	Blending	inorganic	None		26	1200mg/l 48h	leuciscus idus	>10000	Rat			N
030418	SLOTOCOUP CU 45 4 - X CONCENTRATED	7764-93-9	Not Classified	2	20	Blending	inorganic	None		26	1200mg/l 48h	leuciscus idus	>10000	Rat			N
039002	SLOTOCOUP CU 45 4 - X CONCENTRATED	7764-93-9	Not Classified	0	5	Blending	inorganic	None		26	1200mg/l 48h	leuciscus idus	>10000	Rat			N
110161	SLOTOLET G 21 STARTER	67-56-1, 37205-87-1	Toxic	8	100	Blending	inorganic	10, 23/24/25, 39/23/24/25, 41, 53	7, 16, 26, 36/27/39, 45, 61	5-20 mg/l 48h	leuciscus idus		4000	Rat			N
110195	SLOTOLET G51 ADDITIVE	109-56-1	Harmful	21	250	Blending	inorganic	20/21, 36	24/25, 26, 45	5-50 mg/l 48h	leuciscus idus		5000	Rat			N
110196	SLOTOLET G52 BRIGHTENER	109-56-1, 75-75-2	Corrosive	25	305	Blending	inorganic	20/21, 34	24/25, 26, 28.2, 36/37, 45	270 mg/l 24h	Fish		1300	Rat			N
119106	SLOTOLET KB 31/1 ADDITIVE	67-56-1	Harmful	29	350	Blending	inorganic	20/22, 10	7, 16, 24, 45	300 mg/l 24h	Fish		30000	Rat			N
110120	SLOTOLET KB 31/2 ADDITIVE	29086-67-7	Not Classified	129	1,550	Blending	inorganic	None		25	10000 mg/l 96h	leuciscus idus		8000	Rat		N
110500	SLOTOLoy SNB11 ADDITIVE	75-75-2	Corrosive	20	240	Blending	inorganic	34	26, 36, 45	3.5 mg/l 24h	Daphnia magna		850	Rat			N
110503	SLOTOLoy SNB12 MAKE UP CONCENTRATE	75-75-2	Corrosive	33	390	Blending	inorganic	34	26, 36, 45				740	Rat			N
110502	SLOTOLoy SNB14 ADDITIVE	67-56-1	Toxic / Highly flammable	8	100	Blending	Organic	11, 23/24/25, 39, 23/24/25	7/9, 16, 36/37/39, 38, 45, 6027/28E								N
113031	SLOTOLoy SNB31 ADDITIVE		Not Classified	23	275	Blending	inorganic	None		25	275 mg/l	leuciscus idus		5000	Rat		N
041207	SLOTONIK 22		Not Classified	10	125	Blending	inorganic	None		26	>308 mg/l 96h	leuciscus idus		2000	Rat		N
041204	SLOTONIK L		Not Classified	6	75	Blending	inorganic	None		25	>2500 mg/l 96h	leuciscus idus		10000	Rat		N

Products purchased in 2005										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
180400	SLOTONIP 31 STARTER		Not Classified	0	2	Blending	inorganic	None	26								N
180402	SLOTONIP 33 REPLENISHER ADDITIVE	7786-81-4	Harmful / Env haz	0	2	Blending	inorganic	40, 42/43, 51/53	23, 36/37, 45, 57, 60								N
180433	SLOTONIP 71-1 BASIC SOLUTION		Not Classified	30	360	Blending	inorganic	None	26								N
180454	SLOTONIP 94 STABILISER	7764-93-9	Not Classified	1	10	Blending	inorganic	None	26				>10000	Rat			N
180404	SLOTONIP STABILISER 36		Irritant	1	10	Blending	inorganic	36	26				>10000	Rat			N
090424	SLOTOPAS G11	7681-49-4, 10124-43-3	Toxic / Env haz	175	2,100	Blending	inorganic	49, 22, 36/38, 42/43, 51/53	23.4, 24/25, 36, 53, 45, 61	250 mg/l	leuciscus idus		1200	Rat			N
090421	SLOTOPAS Z21 BLUE CONCENTRATE	7681-49-4, 10124-43-4	Toxic / Env haz	413	4,950	Blending	inorganic	49, 22, 36/38, 42/43, 51/53	23.4, 24/25, 36, 53, 45, 61	250 mg/l	leuciscus idus		1200	Rat			N
090420	SLOTOPAS ZB INHIBITOR	96-45-7	Toxic	19	225	Blending	inorganic	61, 22	53, 45	>4000 mg/l	Fish		20000	Rat			N
160135	SLOTOPPOSIT N16 WETTING AGENT	67-63-0	Irritant	1	10	Blending	inorganic	36, 10	7, 16	550 mg/l 96h	Fish		>10000	Rat			N
100102	SLOTOTIN 32 BRIGHTENER	109-56-1, 122-57-6	Harmful	4	50	Blending	inorganic	10, 20/21, 36, 43	24/25, 26, 27, 28.2, 36/37/39				6000	Rat			N
100103	SLOTOTIN 41 ADDITIVE	67-63-0, 67-56-1	Highly flammable / Harmful	8	100	Blending	Organic	11, 20/22	7, 16, 24, 45	300 mg/l 24h	Fish		6000	Rat			N
100104	SLOTOTIN 51 ADDITIVE		Not Classified	0	5	Blending	inorganic	None	25	5-50 mg/l 96h	leuciscus idus		5000	Rat			N
100105	SLOTOTIN 52 ADDITIVE	67-56-1	Toxic / Highly flammable	0	5	Blending	Organic	11, 23/24/25, 39, 23/24/25	7/9, 16, 36/37/39, 38, 45	>10000 mg/l	Fish		5000	Rat			N
65-3627-07	SOD CHLORIDE MULTICOMPENDIAL	7647-14-5	Not Classified	2	24	Blending	inorganic	None	None								N
65-3470.0500	SODIUM ACETATE	127-09-3	Not Classified	1	6	Blending	inorganic	None	None	>1000 mg/l 24h	leuciscus idus		3530	Rat			N
65-3461-07	SODIUM ACETATE TRIHYD MULTICOM	6131-90-4	Not Classified	11	130	Blending	inorganic	None	None								N
65-3506-07	SODIUM BICARBONATE	144-55-8	Not Classified	61	734	Blending	inorganic	None	None				4220	Rat			N
65-0268	SODIUM BORATE	1303-96-4	Harmful	118	1,420	Blending	inorganic	36/37/38, 62, 63	22, 26, 36/37/39, 45	807 mg/l	Fish		5660	Rat			N
65-7521.0500	SODIUM CARBONATE ANHYDROUS	497-1-8	Irritant	1	9	Blending	inorganic	36	22, 26	740 mg/l	Fish	200-227	4090	Rat			N
65-0277.5000	SODIUM CHLORIDE 0277.5000	7647-14-5	Not Classified	417	5,000	Blending	inorganic	None	None								N
601824	SODIUM CYANIDE (CYANOIDS)CW-CN-IS	143-33-9	Very Toxic / Env haz	67	800	Blending	inorganic	26/27/28, 32, 50/53	7, 28, 29, 45, 60, 61				5	Rat			N
65-0305.7100	SODIUM HYDROGEN PHOSPHATE HEPTAHYD	7782-85-6	Not Classified	105	1,260	Blending	inorganic	None	None								N

Products purchased in 2005

Products purchased in 2005										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
65-0266.1000	SODIUM HYDROGEN SULFITE ACS	7631-90-5	Harmful	6	77	Blending	inorganic	22, 31	25, 46								N
191537	SODIUM HYDROXIDE 1 MOL ANAL BDH/191393Q	1310-73-2	Corrosive	13	150	Blending	inorganic		34, 26, 36/37/39, 45								N
601813	SODIUM HYDROXIDE BP 93 PELLETS (SN122/39)	1310-73-2	Corrosive	523	6,275	Blending	inorganic		35, 24/25, 26, 36/37/39, 45, 60								N
601843-200	SODIUM HYPOCHLORITE 14/15%	7681-52-9	Corrosive	385	4,623	Blending	inorganic	31, 34	1/2, 28, 45, 50								N
601820	SODIUM HYPOPHOSPHITE		Not Classified	1029	12,350	Blending	inorganic	None	None								N
601827	SODIUM METABISULPHITE	7681-57-4	Harmful	21	250	Blending	inorganic	22, 31, 41	26, 39, 46	100-200 mg/l 96h	Rainbow trout		1540	Rat			N
191804	SODIUM SACCHARIN 450CC	128-44-9	Toxic	580	6,955	Blending	inorganic	45, 46, 20/21/22	53, 36								N
65-8012-06	SODIUM SULFATE DECAHYDRATE	7727-73-3	Not Classified	0	5	Blending	inorganic	None	None								N
65-7101.5000	SODIUM THIOSULFATE 0.1 MOL/L	7732-18-5	Not Classified	3	40	Blending	inorganic	None	None								N
600112	SPAN 80V PHARMA		Not Classified	100	1,200	Blending	Organic	None	None	>1000 mg/l 96h	Rainbow trout		39800	Rat			N
600090	SPECTRA 0-120		Not Classified	67	800	Blending	inorganic	None	None								N
600092	SPECTRA 311	68876-97-1, 1606-85-5	Not Classified	9	105	Blending	inorganic	None	None								N
600093	SPECTRA N-200		Not Classified	21	255	Blending	inorganic	None	None								N
600094	SPECTRA NAW-4	2373-38-8	Not Classified	11	135	Blending	inorganic	None	None								N
8500-8370	SSFD-238 - DEVELOPER		Not Classified	2	20	Blending	inorganic	None	None								N
060201	STARTER ALTRIX	7783-56-1	Harmful	8	100	Blending	inorganic	20/21/22, 36/38	7, 24, 25/26, 28.2, 36/37/39, 45	2000 mg/l	Daphnia Magna		10000	Rat			N
100017	STARTER CULMO 21		Irritant	2	25	Blending	inorganic		38, 26, 28.2	5 mg/l 96h	leuciscus idus		4000	Rat			N
030300	STARTER SG1	67-56-1	Harmful	5	55	Blending	inorganic	20/22	16, 23.4, 24, 25, 26, 28.2				>10000	Rat			N
010208	STRIPPER ADDITIVE N 10	107-15-3	Corrosive	44	525	Blending	inorganic	21/22, 34, 43	9, 26, 36/37/39, 45	1300 mg/l	leuciscus idus		3500	Rat			N
010209	STRIPPER SALT N		Harmful	6	70	Blending	inorganic	20/22, 36/37	22, 36				1450	Rat			N
010210	STRIPPER SALT N11	137-26-8	Harmful	1	10	Blending	inorganic	20/22, 36/37, 40, 43	36/37				500	Rat			N
601857	SU-8 10 RESIST SERIES # Y131259-2	96-48-0, 84952-37-9, 71449-78-0, 10832-7, 28906-96-9	Irritant / Harmful / Env haz	0	1	Blending	Organic	22, 36, 43, 50/53	2, 24, 37, 60, 61,				1540	Rat			N
601858	SU-8 5 RESIST SERIES # Y131252-2	96-48-0, 84952-37-9, 71449-78-0, 10832-7, 28906-96-9	Irritant / Harmful / Env haz	0	1	Blending	Organic	22, 36, 43, 50/53	2, 24, 37, 60, 61,				1540	Rat			N

Products purchased in 2005										Ecological			Toxicological				
Product	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual input KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	EC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
179395	SUCINNIC ACID		Not Classified	7	80	Blending	inorganic	None	None								N
65-6057.9200	SULFURIC ACID 95-97% BAKER ANALYZED	7664-93-9	Corrosive	360	4,320	Blending	inorganic		35 26, 27, 36/37/39, 45, 24/25, 60								N
601847	SULFUROUS ACID	7782-99-2	Not Classified	1	18	Blending	inorganic	None	None								N
042003	SULPHAMIC ACID	5329-14-6	Irritant / Env haz	40	475	Blending	inorganic	36/38, 52/53	2, 26, 28, 61				3160	Rat			N
601833-1000-DEP	SULPHURIC ACID 30% PURE	7664-93-9	Corrosive	1667	20,000	Blending	inorganic		35 26, 27, 36/37/39, 45, 24/25, 60								N
601831	SULPHURIC ACID 35% PURE	7664-93-9	Corrosive	167	2,000	Blending	inorganic		35 26, 27, 36/37/39, 45, 24/25, 60								N
190524-2.5	SULPHURIC ACID 96% MOS (YELLOW) 2.5 LTR	7664-93-9	Corrosive	7190	86,284	Blending	inorganic		35 26, 27, 36/37/39, 45, 24/25, 60								N
020050	SURCLEAN 201		Irritant	438	5,250	Blending	inorganic		36 22, 26								N
020051-05	SURCLEAN 203		Irritant	8	90	Blending	inorganic	36/38	24/25								N
601855	TAMOL NN 4501		Not Classified	11	130	Blending	inorganic	None	None	100-500 mg/l 96h	B. rerio	>5000	>2000	Rat			N
601856	TARTARIC ACID	87-69-4	Not Classified	158	1,900	Blending	inorganic	None	None				5000	Rat			N
65-V362-05	TBA HYDROXIDE IN METHANOL, 25%	67-56-1, 2052-49-5	Toxic / Highly flammable	0	4	Blending	Organic	11, 34, 39/23/24/25	16, 26, 36/37/39, 45	8000 mg/l	Fish	6600	5628	Rat			N
65-2843.0500	TETRABUTYLAMMONIUM HYDROXIDE	2052 49 5	Corrosive	1	12	Blending	inorganic		34 20,26, 36/37/39, 45								N
600506	TETRAFLUOROBORIC ACID 50%	16872-11-0	Corrosive	450	5,400	Blending	inorganic		34 26, 36/37/39, 45								N
66-T12653	TETRAHYDRAFURFURYL ALCOHOL	97-99-4	Irritant	3	30	Blending	inorganic		36 39				1600	Rat			N
65-8498-02	TETRAHYDROFURAN (1LT PACK)	109-99-9	Irritant / Highly flammable	2	25	Blending	Organic	11, 19, 36/37	16, 29, 33	2160 mg/l	Fish	>580	3000	Rat			N
600453	TIN BATH CONCENTRATE VP11-195 (190453)		Irritant	25	300	Blending	inorganic		36 25				>10000	Rat			N
100000	TIN SALT SU (STANNOUS SULPHATE)		Not Classified	42	500	Blending	inorganic	None	26, 7/8				2200	Rat			N
65-9460-03	TOLUENE ACS GRADE	108-88-3	Harmful / Highly flammable	8	100	Blending	Organic	11, 20	16, 25, 29, 33				636	Rat			N
600111-1000	TWEEN 80 V PHARMA		Not Classified	158	1,900	Blending	inorganic	None	None	471 mg/l 96h	Rainbow trout		42200	Rat			N
8500-8379	UNIVERSAL PROTECTION COATING - RED	67-63-0	Irritant	77	928	Blending	Organic	10, 36, 67	25, 37/39				5045	Rat			N

Products purchased in 2005										Ecological			Toxicological				
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8500-6414	UNIVERSAL PROTECTION COATING	67-63-0	Irritant	217	2,604	Blending	Organic	10, 36, 67	25, 37/39				5045	Rat			N
370198	URACRYL SC2402 B6129 SILVER	112-07-2, 108-65-6, 123-42-2, 64-19-7, 123-86-4, 141-78-6, 872-50-4, 1330-20-7	Irritant	16	195	Blending	Organic	10, 36, 66, 67	7/9, 23, 26, 36/37/39, 51, 60								N
370197	URACRYL SC2402 B6142 SILVER	112-07-2, 108-65-6, 123-42-2, 64-19-7, 123-86-4, 141-78-6, 872-50-4, 1330-20-7	Irritant	1	10	Blending	Organic	10, 36, 66, 67	7/9, 23, 26, 36/37/39, 51, 60								N
65-8802-4L	XYLENE, LOW TRACE METAL GRADE	1330-20-7	Harmful	127	1,524	Blending	Organic	10, 20/21, 38	25				4300	Rat			N
65-4344.05	ZINC NITRATE (2.5 KG PACK)	10196-18-6	Harmful / Oxidising	2	27	Blending	inorganic	8, 22, 36/37/38	24/25, 26				1190	Rat			N

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Quantities Produced from 01/01/2005 to 31/12/2005

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Manufacture	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual output KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	LC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
041010	ADDITIVE BFL		Not Classified	800	9,600	Reagent	Inorganic	None	26								N
147032-1000	AK 160 READY TO USE-V3		Irritant	129	1,550	Reagent	Inorganic	36/38	26, 37, 24/25, 60								N
199060	AMMONIUM HYDROXIDE 20%	1336-21-6	Irritant	125	1,500	Reagent	Inorganic	36/37/38	26, 37, 51, 24/25, 60								N
619002	CAUSTIC POTASH 50% SOLUTION	1310-58-3	Harmful /Corrosive	64	762	Reagent	Inorganic	22, 35	26, 27, 24/25, 36/37/39, 45, 60								N
8500-6892	CAUSTIC SODA 30%	1310-73-2	Corrosive	167	2,000	Reagent	inorganic	35	26, 37/39, 45								N
020011	CLEANER CONCENTRATE S 20	7664-93-9	Corrosive	248	2,976	Reagent	inorganic	35	20, 23, 26, 36/37/39, 45, 60								N
600215	COBALT SULPHATE SOLN	10026-24-1	Toxic / Env haz	2	25	Reagent	Inorganic	22, 42/43, 49, 50/53	P12, 23, 24, 37, 38, 45, 57, 60, 61								N
101506	CULMO AN 11-1	26183-52-8	Irritant	152	1,825	Reagent	Organic	36	23, 26, 60				5628	Rat			N
100003	CULMO BRIGHTENER	122-57-6, 67-56-1, 9016-45-9	Toxic / Highly flammable	121	1,450	Reagent	Organic	11, 23/24/25, 39/23/24/25, 41, 43	4, 7/9, 16, 26, 36/37/39, 45, 61				5628	Rat			N
101502	CULMO BRIGHTENER-2	122-57-6, 2807-30-9, 26183-52-8	Harmful	123	1,475	Reagent	Organic	21, 36, 48	23, 25, 26, 36/37, 60								N
100001	CULMO STARTER	9016-45-9, 67-56-1	Toxic	252	3,025	Reagent	Organic	10, 20/21/22, 39/23/24/25, 41	7/9, 16, 26, 36/37/39, 45, 60								N
110615	DILUTE ACID FOR FS UNITS	75-75-2	Corrosive	2209	26,509	Reagent	inorganic	34	24/25, 26, 36/37/39, 45, 60								N
100208	DSN 3	67-56-1	Toxic / Highly flammable	97	1,160	Reagent	Organic	11, 23/24/25, 39/23/24/25	4, 7/9, 16, 36/37/39, 45, 60								N
8500-8436	ETHYLENE GLYCOL	107-21-1	Harmful	1	11	Reagent	Organic	22	60								N
190515-5	FERRIC CHLORIDE SOLUTION	10025-77-10, 7647-01-0	Harmful	5	58	Reagent	Inorganic	22, 41, 37/38	26, 51, 24/25, 37/39, 60				5628	Rat			N
199062	HYDROCHLORIC 1:30	7647-01-0	Not Classified	20	237	Reagent	Inorganic	None	None								N
8500-8236	HYDROCHLORIC/SULPHURIC ACID MIX	7647-01-0, 7664-93-9	Irritant	42	500	Reagent	Inorganic	36/38	24/25, 26, 60				200-2000	Rat			N
178001	I.P.A SHELL GRADE	67-63-0	Highly Flammable, Irritant	67	800	Reagent	Organic	11, 36, 67	7, 16, 24/25, 26								N
199005	KLEBOSOL 1:1 READY TO USE SOLN		Not Classified	10	116	Reagent	Inorganic										N
600218	LAN 20	10043-52-4, 7664-38-2	Irritant	31	375	Reagent	Inorganic	36/38	24/25, 26, 60								N
042006	LIQUID SULPHAMIC ACID	5329-14-6	Irritant / Env haz	41	490	Reagent	inorganic										N
8500-8443	LITHO STRIPPER	7722-84-1, 7664-93-9	Corrosive	71	851	Reagent	Inorganic	35	14, 15, 18, 21, 26, 30, 41, 45, 49, 24/25, 36/37/39, 60								N
147075	MEDTRONIC EP SOLN.	7664-38-2, 7664-93-9, 7786-81-4	Corrosive	33	400	Reagent	Inorganic	35, 52/53	P14, 60, 26, 45, 24/25, 36/37/39								N

Ecological Toxicological

Manufacture	Description - Substance / Preparation	CAS of substance / ingredients	Danger Category	Amount Stored KG	Annual output KG	Nature of Use	Organic / Inorganic	R Phrase	S Phrase	LC50	Species	EC50 mg/l	Oral LD50 mg/kg	Species	IV LD50 mg/kg	Species	Radioactive Y/N
8500-1080	NICKEL CHLORIDE 180GRM/L	7791-20-0	Toxic	65	780	Reagent	inorganic	23/24/25, 42/43, 45, 53	11, 23, 27, 36/37, 38, 45, 53, 60								N
7220-0086	NICKEL S PELLETS	7440-02-0	Harmful	17	200	Anode	Inorganic	40, 43	36/37, 60								N
180426-30	Nickel solution SLOTONIP 72	7786-81-4	Harmful / Env haz	1108	13,300	Reagent	Inorganic	22, 40, 42/43, 50/53	22, 36/37, 45, 57, 60								N
180452-25	Nickel solution SLOTONIP 92	7786-81-4	Harmful / Env haz	468	5,614	Reagent	Inorganic	22, 40, 42/43, 50/53	22, 36/37, 45, 57, 60								N
040304-35	Nickel Sulphamate 60%	13770-89-3	Harmful / Env haz	598	7,170	Reagent	inorganic	22, 40, 42/43, 50/53	23, 36/37, 45, 57, 60								N
8500-1013	NICKEL SULPHATE 135G/L NICKEL	7786-81-4	Harmful / Env haz	66	793	Reagent	Inorganic	22, 40, 42/43, 50/53	23, 36/37, 38, 45, 57, 60, 61								N
147022-1000	NITRIC BLEND-V3	7697-37-2	Corrosive	633	7,592	Reagent	Inorganic	35	24/25, 26, 36/37/39, 45, 60								N
147052-1000	NITRIC/AMMONIUM BIFLUORIDE BLEND-V3	7697-37-2, 1341-49-7	Corrosive / Harmful	547	6,560	Reagent	Inorganic	22, 35	26, 45, 24/25, 36/37/39, 60								N
147042-1000	NITRIC/FLUOBORIC BLEND-V3	7697-37-2, 16872-11-0	Corrosive	1924	23,085	Reagent	Inorganic	35	24/25, 26, 36/37/39, 45, 60								N
010201	PICKEL AID BEF 30	71243-46-4, 110-65-6	Irritant	2031	24,375	Reagent	Inorganic	38, 41, 43	23, 24, 26, 37/39, 60								N
8500-0670	POTASSIUM HYDROXIDE 45%	1310-58-3	Harmful /Corrosive	29	350	Reagent	Inorganic	22, 35	26, 27, 24/25, 36/37/39, 45, 60								N
042002	PURIFIED NICKEL CHLORIDE 660 GL	7791-20-0	Toxic / Env haz	50	600	Reagent	inorganic	20, 25, 36/37/38, 40, 42/43, 50	23, 25, 26, 38, 45, 36/37/39, 57, 60, 61								N
042001	PURIFIED NICKEL SULPHATE 550 GL	10101-97-0	Harmful / Env haz	58	700	Reagent	inorganic	22, 40, 42/43, 50/53	23, 38, 36/37, 45, 60, 61								N
180424-25	REPLENISHER Slotonip 73A	1336-21-6, 28300-74-5	Harmful	506	6,076	Reagent	Inorganic	20/22, 36/37/38	9, 23, 26, 36/37/39, 45, 60								N
180465	REPLENISHER SNI	7786-81-4	Harmful / Env haz	569	6,825	Reagent	inorganic	40, 42/43, 51/53	23, 36/37, 45, 57, 60								N
041201	SLOTONIK 11		Not Classified	102	1,225	Reagent	Inorganic	None	20/21, 24/25								N
041205	SLOTONIK 25B		Not Classified	6	70	Reagent	Inorganic	None	None								N
041203	SLOTONIK M		Not Classified	33	400	Reagent	Inorganic	None	25								N
180400-25	SLOTONIP 31		Not Classified	41	496	Reagent	Inorganic	None	None								N
180433-30	SLOTONIP 71-1		Not Classified	12	146	Reagent	Inorganic	None	26								N
180434-90	SLOTONIP 73AE REPLENISHER	1336-21-6, 28300-74-5	Not Classified	292	3,500	Reagent	Inorganic	None	None								N
174713	SOLDEX 711/3B FLUX	8050 09 7	Highly flammable / Irritant	96	1,150	Reagent	Organic	11, 36, 43, 67	9, 16, 24/25, 37, 51, 60								N
8500-4139	SPECTRA 0-120		Not Classified	1	15	Reagent	Inorganic	None	None								N
199061	SULPHURIC ACID 1:30	7664-93-9	Not Classified	8	96	Reagent	Inorganic	None	None								N
601838	SULPHURIC ACID 33 % DILUTE	7664-93-9	Corrosive	173	2,075	Reagent	inorganic	35	26, 27, 36/37/39, 45, 24/25, 60								N
147012-1000	SULPHURIC BLEND-V3	7664-93-9	Corrosive	1250	15,000	Reagent	Inorganic	35	26, 27, 36/37/39, 45, 24/25, 60								N
147085	SYNERGY CCS	97-99-4, 5989-27-5	Irritant / Env haz	1	15	Reagent	Organic	10, 43, 36/38, 50/53	26, 37, 51, 24/25, 60, 61								N
100020	TIN CONCENTRATE FS 10	53408-94-9, 75-75-2	Corrosive	2068	24,810	Reagent	Organic	22, 34, 43	20, 23, 26, 36/37/39, 45, 60								N
100030	TIN CONCENTRATE FS 20	53408-94-9, 75-75-2	Corrosive	1786	21,430	Reagent	Organic	22, 34, 43	20, 23, 26, 36/37/39, 45, 60								N
100031	TIN CONCENTRATE FS200	53408-94-9, 75-75-2	Corrosive	245	2,940	Reagent	Organic	22, 34, 43	20, 23, 26, 36/37/39, 45, 60								N
600120	VISTAKON BLENDED SURFACTANT		Not Classified	13	160	Reagent	Inorganic	None	None								N
080108	Zinc Bath Add H.S.B.		Irritant	104	1,250	Reagent	Inorganic	36/38	24/25, 37/39								N

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ATTACHMENT G.2 ENERGY EFFICIENCY

Energy efficiency improvements result in reductions in the energy consumed by a given energy service or level of activity. Audits will be implemented regularly to ensure the energy usage on site is controlled in an efficient manner. The results from an energy audit can be used to identify recommendations for energy efficiency improvements at a site. This includes the setting of realistic energy efficiency targets for the site. Once the system of energy management is in place any slippage can be easily identified and acted upon.

A description of the proposed energy used and generated is provided in the in Table G2. Measures taken to ensure that energy is used efficiently are shown in Table G3.

Proposed Site Energy Usage

Period: Annual estimate			
Energy Stream	Projected Annual Quantity	Units	Comments
Electricity consumed onsite	700,000	kWh	Based on the electricity consumption at the existing facility
Electricity imported	700,000	kWh	Based on the electricity consumption at the existing facility
Natural Gas Total	120,000	kWh(Gross CV)	Based on the electricity consumption at the existing facility

Site Energy Recommendations

A number of recommendations have been incorporated into the design of the facility to ensure that energy is used efficiently. These are as follows:

- The switchboard will be fitted with energy meters to provide digital indication of phase and line voltages, phase currents and real, apparent and reactive power and max demand. Meters will be provided with pulsed outputs for monitoring by the building energy management system.
- All main and sub-main breakers in the switchboards will be provided with duplicate volt-free contacts to provide 'open', 'closed' and 'trip' status signal to the building energy management system and a remote mimic panel.
- All fluorescent luminaries will generally be complete with radio interference suppression equipment and individual cartridge fuses complying with BS 1362. Fluorescent lamps will be high frequency T5 type with low energy input.
- All pipework and plant, with the exception of the final water services connections to the various fixtures, shall be insulated in accordance, with the following:-
 - All supply air ductwork within the plant rooms shall be insulated with 50mm thick rigid insulation and finished with Aluzinc

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- All other supply air ductwork including the low velocity ductwork to and from the air reheat terminals shall be insulated with 25mm thick rigid insulation Class "O" white aluminium 40 foil faced, and applied strictly in accordance with the manufacturer's instructions
 - All lap joints and insulation terminations shall be properly taped to prevent fibre migration
 - All Insulated Pipework not exposed to the atmosphere or exposed within the building
 - All insulated pipework shall be covered with Class "O" white Allu 40 foil faced sheet with a 50mm overlap along the longitudinal seam. The overlap should be sealed with CHIL-STIX CP85 adhesive, or equal and approved.
-
- All air handling units will be of the packaged, sectional type suitable for indoor installation. Air handling units will be 60mm double skin construction using 75mm heavy-duty penta post construction.
 - The computer room will be served by an independent wall mounted split type system (10kW heating / cooling Toshiba).
 - The rooms in the offices will be heated by LPHW radiator system.
 - Office Photocopiers and computers will be switched off at night. This cuts energy usage by 50% for each.
 - Staff will be encouraged to select double-sided printing each time they print a document. The energy saving mode will be activated in each photocopier after each use, which will allow the machine to automatically power down after a set time period.
 - 7-day time controls will be installed in all vending machines to ensure that the machines are powered off when not in use. Water coolers will be placed in a suitable location for maximum efficiency.

SECTION H MATERIALS HANDLING**H.1 Raw Materials, Intermediates and Product Handling**

All materials should be listed in Tables G.1(i) and G.(ii) of **Section G**.

Details of the storage conditions, location within the site, segregation system used and transport systems within the site should be outlined here. In addition, information relating to the integrity, impermeability and recent testing of pipes, tanks and bund areas should be outlined.

H.2 Describe the arrangements for the recovery or disposal of solid and liquid wastes accepted into or generated by the installation/facility.

For each waste material, give full particulars of ;

- (a) Name
- (b) Description & nature of waste
- (c) Source
- (d) Where stored and integrity/impermeability of storage areas
- (e) Amount (m³) and tonnage
- (f) Period or Periods of generation
- (g) Analysis (include test methods and Q.C.)
- (h) European Waste Catalogue Code
- (i) Waste Category per EC Reg 1774/2002/EC where relevant

Where any waste would be classified as Hazardous Waste as defined in the Waste Management Acts, 1996 to 2003, this should be made clear in the information provided.

Summary Tables H.1(i) and H.1(ii) should also be completed, as appropriate, for each waste. The licence/permit register number of the waste collection agent or disposal/recovery operator should be supplied as well as the expiry date of the relevant permits.

Supporting information should form **Attachment N^o H.1**

H.2 Waste disposal by on-site landfilling.

For wastes to be disposed of by landfilling on-site, full details of the disposal site should be submitted (to include *inter alia*, site selection procedures, location maps, (no larger than A3) geology, hydrogeology, operational plan, containment, gas and leachate management, post-closure care).

Supporting information should form **Attachment N^o H.2.**

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TABLE H.1(i): WASTE - Hazardous Waste Recovery/Disposal

Waste material	EWC Code	Main source ¹	Quantity		On-site Recovery/Disposal (Method & Location)	Off-site Recovery, reuse or recycling (Method, Location & Undertaker)	Off-site Disposal (Method, Location & Undertaker)
			Tonnes / month	m ³ / month			
Effluent Precipitate	060405	Wastewater treatment plant	10 tonnes / year	30 m ³ / year			Shannon Environmental Services Ltd
Cupric ammonium chloride							Alchemia Ltd.
Non conforming products							Minichem
Used COD vials							AVR Safeway
Solvents							Soltec
Filter boards		Production and storage area					Ecosafe
Bulbs and batteries		Entire facility					Irish Lamps

¹ A reference should be made to the main activity / process for each waste

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TABLE H.1(ii) WASTE - Other Waste Recovery/Disposal

Waste material	EWC Code	Main source ¹	Quantity		On-site recovery/disposal ² (Method & Location)	Off-site Recovery, reuse or recycling (Method, Location & Undertaker)	Off-site Disposal (Method, Location & Undertaker)
			Tonnes / month	m ³ / month			
Metal Drums							
Cardboard/paper							MSM Recycling
Glass							Kildare County Council
Miscellaneous non recyclables							Kildare County Council
Plastics							AES
							Recyclenet

- 1 A reference should be made to the main activity/ process for each waste.
- 2 The method of disposal or recovery should be clearly described and referenced to Attachment H.1.

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Attachment No. H Materials Handling

Please find attached the following:

- H1 List of Waste Contractors
- H2 Waste permits - AES
- H3 Waste permits - Alchemia
- H4 Waste permits - AVR Safeway
- H5 Waste permits - Ecosafe
- H6 Waste permits - Irish Lamps
- H7 Waste permits - Kildare County Council
- H8 Waste permits - Minichem
- H9 Waste permits - Schlotter
- H10 Waste permits - Shannon Environmental
- H11 Waste permits - Soltec

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H1 List of Waste Contractors

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Name	Material	Treatment / Disposal	Waste / IPC licence / Permit	Collection permit
AES/ T/A Yellow bins Mondello Naas Co. Kildare	Municiple - Non haz waste	Disposal	Waste Licence 114-1 Yellow Bins	WCP/KE/008C/02B - Yellow Bins
Alchemia Limited East ord Ind. Est Berwick upon tweed Northumberland TD15 2XF	Cupric ammonium chloride	Recovery	AP1590 - Licenced by EA - UK	TFS - (100151 is current TFS)
Shannon Env Services Smithstown Ind Est Shannon Co. Clare	Hazardous waste	Disposal	Waste Licence 41-1	WCP/KE/018C/02B
Minchem Env Services 4 Haddington terrace Dun Laoighaire Co. Dublin	Non conforming product / Material for reclaim	Disposal / Recovery	Waste Licence 36/1	WCP/KE/020C/2001
AVR Safeway / Reagecon Corrin / Shannon free zone Fermoy / Shannon Co. Cork / Co. Clare	Used COD vials	Disposal	Waste Licence 50/1	WCP/KE/11C/03B
Irish Lamps Athy Co. Kildare	Batteries and Light bulbs	Recycling	Waste Permit - 02/2000A	WCP/KE/61C/02B
Soltec (Ireland) Ltd Mullingar Business Park Mullingar Co. Westmeath	Recycling of solvents	Recycling	Waste Licence - 115/1	Do not collect themselves in the Kildare area
Kildare Co. Coucil Waste Transfer Station Silliot Hill, Kilcullen Co. Kildare	Specified materials / recycables	Recycling	Waste Licence - 14/1	Schlotter deliver under WCP/137C/03B
M.S.M. Recycling Ltd, Mounthmellick, Co. Laois	Metals	Recycling	Waste Licence - WMP005B	Schlotter deliver under WCP/137C/03B M.S.M. - 093C/03B
Ecosafe Systems Unit 1a Allied Industrial Estate Kylmore Road Dublin 10	Hazardous waste	Disposal	Waste License - 54/2	WCP/KE/082C/02B
RecycleNet Rathangan Co. kildare 087 1323771 John Sheridan	Recycling of plastics	Recycling	Waste Permit - 109/2003	WCP/KE/084C/06B

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H2 Waste permits - AES

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Headquarters,
P.O. Box 3000,
Johnstown Castle Estate
County Wexford, Ireland

WASTE TRANSFER STATION

Waste Licence 114-1
Register Number:
Licensee: Yellow Bins (Waste Disposal) Limited
Location of Facility: Donore, Caragh, County Kildare

Schlötter (Ireland) Ltd.

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H3 Waste permits - Alchemia

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ENVIRONMENT
AGENCY

ENVIRONMENTAL PROTECTION ACT 1990

VARIATION NOTICE

Authorisation Number BE8741

Variation Notice Number BG8475

The Environment Agency in exercise of its powers under Section 11 of the Environmental Protection Act 1990 ("the 1990 Act") hereby varies the Authorisation, Number, BE8741, held by

ALCHEMA LTD
("the Operator")

whose Registered Office is

38 King Street
Chester
CH1 2AH

which relates to the Authorised Process carried on at the premises occupied by the Operator at

East Ord Industrial Estate
Berwick upon Tweed
Northumberland
TD15 2XF

subject to the conditions in this Notice.

This Notice shall have effect from 17 December 1999

Signed A J Harrison
A J Harrison - Authorised to sign on behalf of the Environment Agency

Dated the 15.12.99

Permit

Pollution Prevention and Control
Regulations 2000



**ENVIRONMENT
AGENCY**

Permit

Permit number
BM1997

The Environment Agency (the Agency) in exercise of its powers under
Regulation 10 of the Pollution Prevention and Control Regulations 2000 (S.I.
2000 No. 1973), hereby authorises

Alchemia Limited
("the Operator"),
whose Registered Office is

**38 King Street
Chester
CH1 2AH**

Company registration number **2030557**

to operate an installation at

**East Ord Industrial Estate
Berwick upon Tweed
Northumberland
TD15 2XF**

to the extent authorised by and subject to the conditions of this Permit.

Signed

A rectangular box containing a handwritten signature in black ink, which appears to be "W V Miller".

W V Miller

Authorised to sign on behalf of the Environment Agency

Date

13 August 2002

H4 Waste permits - AVR Safeway

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Comhairle
Chondae
Chill Dara
Naomh Mhuire
An Nás



Kildare
County
Council
St. Mary's
Naas

E-mail: secretar@kildarecoco.ie
Main Switch
Phone: (045) 873800
Fax: (045) 876875

This matter is being dealt with by:

Date:

Your Ref:

Our Ref:

WASTE MANAGEMENT ACT 1996
and
WASTE MANAGEMENT (COLLECTION PERMIT) REGULATIONS 2001

Waste Collection Permit Register Number: WCP/KE/011C/05C

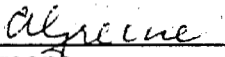
Applicant:

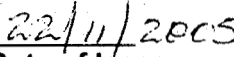
Southcoast Transport Limited,
Corrin,
Fermoy,
Co. Cork.

In pursuance of the powers conferred on it by the Waste Management Act 1996 and the Waste Management (Collection Permit) Regulations 2001, Kildare County Council hereby notifies you that a waste collection permit has been granted to you to collect

Waste types as specified in application form only

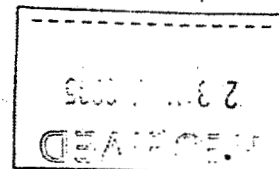
in the functional area of Kildare County Council subject to the conditions as set out in the collection permit.


A Greene
A/Senior Executive Officer


Date of Issue

NOTE

The permit holder may appeal the decision to grant this permit, in accordance with Section 34(9)(a) of the Waste Management Act, 1996, to the Judge of the Naas District Court, being the District Court in which the principal office of Kildare County Council is situate, within one month of notice.



Beidh fáilte roimh gnó tré Ghaeilge
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Headquarters,
P.O. Box 3000,
Johnstown Castle Estate
County Wexford, Ireland

WASTE LICENCE

Waste Licence Register Number: 50-1
Applicant: Safeway Warehousing Limited
Location of Facility: Corrin, Fermoy, Co. Cork

Schlötter (Ireland) Ltd.

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H5 Waste permits – Ecosafe

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Headquarters,
P.O. Box 3000,
Johnstown Castle Estate
County Wexford, Ireland

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WASTE LICENCE

Waste Licence Register No: 54-2

Applicant: Eco-Safe Systems Limited

Location of Facility: Unit 1A, Allied Industrial Estate, Kylemore Road, Ballyfermot, Dublin 10

Comhairle
Chondae
Chill Dara
Naomh Mhuire
An Nás



Kildare
County
Council
St. Mary's
Naas

E-mail: secretar@kildarecoco.ie
Main Switch
Phone: (045) 873800
Fax: (045) 876875

This matter is being dealt with by:

Date:

Your Ref:

Our Ref:

WASTE MANAGEMENT ACT 1996
and
WASTE MANAGEMENT (COLLECTION PERMIT) REGULATIONS 2001

Waste Collection Permit Register Number: WCP/KE/082C/02b

Applicant:

Eco-Safe Systems
Unit 1A
Allied Industrial Estate
Kylemore Rd
Dublin 10

In pursuance of the powers conferred on it by the Waste Management Act 1996 and the Waste Management (Collection Permit) Regulations 2001, Kildare County Council hereby notifies you that a waste collection permit has been granted to you to collect

- (i) Non-hazardous wastes
- (ii) Hazardous waste types

in the functional area of Kildare County Council subject to the conditions as set out in the collection permit.


L Dunne
Acting County Secretary

12/9/06
Date of Issue

NOTE

The permit holder may appeal the decision to grant this permit, in accordance with Section 34(9)(a) of the Waste Management Act, 1996, to the Judge of the Naas District Court, being the District Court in which the principal office of Kildare County Council is situate, within one month of the date of this notice.

APPROVED

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H6 Waste permits - Irish Lamps

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WASTE MANAGEMENT ACT 1996
and
WASTE MANAGEMENT (COLLECTION PERMIT) REGULATIONS 2001

Waste Collection Permit Register Number: WCP/KE/61C/02b

Applicant:

Irish Lamp Recycling Co Ltd
Kilkenny Rd
Athy
Co Kildare

In pursuance of the powers conferred on it by the Waste Management Act 1996 and the Waste Management (Collection Permit) Regulations 2001, Kildare County Council hereby notifies you that a waste collection permit has been granted to you to collect

200121 fluorescent tubes and other mercury containing waste
200135 discarded electrical and electronic equipment containing hazardous components

in the functional area of Kildare County Council subject to the conditions as set out in the collection permit.


L Dunne
Acting County Secretary

4/9/02
Date of Issue

NOTE

The permit holder may appeal the decision to grant this permit, in accordance with Section 34(9)(a) of the Waste Management Act, 1996, to the Judge of the Naas District Court, being the District Court in which the principal office of Kildare County Council is situate, within one month of the date of this notice.

WASTE MANAGEMENT ACT 1996
and
WASTE MANAGEMENT (PERMIT) REGULATIONS 1998

Waste Permit Register Number: 02/2000A

Irish Lamp Recycling Ltd.,
Blackpark,
Kilkenny Road,
Athy,
Co. Kildare.

In pursuance of the powers conferred on it by the Waste Management Act 1996 and the Waste Management (Permit) Regulations 1998, Kildare County Council hereby grants a waste permit under article 5(1) of the said regulations to Irish Lamp Recycling Ltd., Blackpark, Kilkenny Road, Athy, Co. Kildare to carry on the waste activity listed below at Blackpark, Kilkenny Road, Athy, subject to nine conditions, with the reasons therefor set out in the permit.

Permitted Waste Activity, in accordance with Part 1 of the First Schedule of the Waste Management (Permit) Regulations, 1998

- Activity 2 The recovery of scrap metal or other metal waste.
- Activity 4 The recovery of waste which is composed of or contains mercury or its compounds (including electric lamps, light bulbs and fluorescent tubes).

NOTE

THE GRANTING OF THIS PERMIT, AND ANY CONDITION IMPOSED BY IT, DOES NOT EXEMPT THE HOLDER OF THE PERMIT FROM COMPLYING WITH THE STATUTORY OBLIGATIONS OF ANY RELEVANT LEGISLATION, INCLUDING WATER POLLUTION, AIR POLLUTION, WASTE, LITTER AND PLANNING LEGISLATION.

Schlötter (Ireland) Ltd.

Plating Technology

H7 Waste permits - Kildare County Council

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Headquarters,
P.O. Box 3000,
Johnstown Castle Estate
County Wexford, Ireland

WASTE LICENCE

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INTEGRATED WASTE MANAGEMENT FACILITY & LANDFILL CLOSURE

Waste Licence	14-1
Register Number:	
Licensee:	Kildare County Council
Location of Facility:	Silliot Hill Landfill, Silliot Hill and Brownstown, County Kildare.

Schlötter (Ireland) Ltd.

Plating Technology

H8 Waste permits – Minichem

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Johnstown Castle Estate
County Wexford
Ireland

**WASTE LICENCE
TRANSFER STATION**

**Waste Licence
Register Number:** 36-2

Licensee: Indaver Ireland Limited

Location of Facility: Tolka Quay Road
Dublin Port
Dublin 1

**Comhairle
Chondae
Chill Dara
Naomh Mhuire
An Nás**



**Kildare
County
Council
St. Mary's
Naas**

E-mail: secretar@kildarecoco.ie
Main Switch
Phone: (045) 873800
Fax: (045) 876875

This matter is being dealt with by:

Date:

Your Ref:

Our Ref:

WASTE MANAGEMENT ACT 1996
and
WASTE MANAGEMENT (COLLECTION PERMIT) REGULATIONS 2001

Waste Collection Permit Register Number: WCP/KE/020C/2001

Applicant:

MinChem Environmental Services Ltd
4 Haddington Terrace
Dun Laoghaire
Co Dublin

In pursuance of the powers conferred on it by the Waste Management Act 1996 and the Waste Management (Collection Permit) Regulations 2001, Kildare County Council hereby notifies you that a waste collection permit has been granted to you to collect

- (i) Non-hazardous waste
- (ii) Hazardous waste

in the functional area of Kildare County Council subject to the conditions as set out in the collection permit.


L Dunne
Acting County Secretary

28/08/02
Date of Issue

NOTE

The permit holder may appeal the decision to grant this permit, in accordance with Section 34(9)(a) of the Waste Management Act, 1996, to the Judge of the Naas District Court, being the District Court in which the principal office of Kildare County Council is situate, within one month of the date of this notice.

H9 Waste permits – Schlotter

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Chondae
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An Nás



Kildare
County
Council
St. Mary's
Naas

E-mail: secretar@kildarecoco.ie
Main Switch
Phone: (045) 873800
Fax: (045) 876875

This matter is being dealt with by:

Date:

Your Ref:

Our Ref:

WASTE MANAGEMENT ACT 1996
and
WASTE MANAGEMENT (COLLECTION PERMIT) REGULATIONS 2001

Waste Collection Permit Register Number: WCP/KE/ 137C/03b

Applicant:

Schlotter Ireland Ltd
Newbridge Ind Estate
Newbridge
Co Kildare

In pursuance of the powers conferred on it by the Waste Management Act 1996 and the Waste Management (Collection Permit) Regulations 2001, Kildare County Council hereby notifies you that a waste collection permit has been granted to you to collect

Waste types as specified in the application form only

in the functional area of Kildare County Council subject to the conditions as set out in the collection permit.


T. Maddock
Senior Executive Officer


Date of Issue

NOTE

The permit holder may appeal the decision to grant this permit, in accordance with Section 34(9)(a) of the Waste Management Act, 1996, to the Judge of the Naas District Court, being the District Court in which the principal office of Kildare County Council is situate, within one month of notice.

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An Nás



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County
Council
St. Mary's
Naas

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Main Switch
Phone: (045) 873800
Fax: (045) 876875

This matter is being dealt with by:

Date:

Your Ref:

Our Ref:

WASTE MANAGEMENT ACT 1996
and
WASTE MANAGEMENT (COLLECTION PERMIT) REGULATIONS 2001

Waste Collection Permit Register Number: WCP/KE/137C/05C

Applicant:

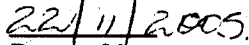
Schlotter (Ireland) Limited,
Newbridge Industrial Estate,
Newbridge,
Co. Kildare.

In pursuance of the powers conferred on it by the Waste Management Act 1996 and the Waste Management (Collection Permit) Regulations 2001, Kildare County Council hereby notifies you that a waste collection permit has been granted to you to collect

Waste types as specified in application form only

in the functional area of Kildare County Council subject to the conditions as set out in the collection permit.


A Greene
A/Senior Executive Officer


Date of Issue

NOTE

The permit holder may appeal the decision to grant this permit, in accordance with Section 34(9)(a) of the Waste Management Act, 1996, to the Judge of the Naas District Court, being the District Court in which the principal office of Kildare County Council is situate, within one month of notice.

Beidh fáilte roimh gnó tré Ghaeilge
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H10 Waste permits - Shannon Environmental

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Headquarters,
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County Wexford, Ireland

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WASTE LICENCE

LICENCE

Waste Licence Register Number: 41-1

Licensee: Shannon Environmental Services Limited

Location of Facility: Smithstown Industrial Estate,
Shannon, County Clare.

Schlötter (Ireland) Ltd.

Plating Technology

H11 Waste permits – Soltec

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Headquarters,
P.O. Box 3000,
Johnstown Castle Estate
County Wexford, Ireland

WASTE LICENCE

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Waste Licence

Register Number: 115-1

Licensee: Soltec (Ireland) Limited

Location of Facility: Mullingar Business Park,
Mullingar, Co. Westmeath

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Chill Dara
Coimh Mhuire
n Nás



Kildare
County
Council
St. Mary's
Naas

E-mail: secretar@kildarecoco.ie

Main Switch

Phone: (045) 873800

Fax: (045) 876875

This matter is being dealt with t

me:

Your Ref:

Our Ref:

WASTE MANAGEMENT ACT 1996
and
WASTE MANAGEMENT (COLLECTION PERMIT) REGULATIONS 2001

Waste Collection Permit Register Number: WCP/KE/ 228C/04b

Applicant:

Michael Corcoran
Soltec (Ireland) Ltd
Zone A
Mullingar Business Park
Mullingar

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In pursuance of the powers conferred on it by the Waste Management Act 1996 and the Waste Management (Collection Permit) Regulations 2001, Kildare County Council hereby notifies you that a waste collection permit has been granted to you to collect

Waste types as specified in application form only

In the functional area of Kildare County Council subject to the conditions as set out in the collection permit.


T. Maddock
Senior Executive Officer


Date of Issue

NOTE

The permit holder may appeal the decision to grant this permit, in accordance with Section 34(9)(a) of the Waste Management Act, 1996, to the Judge of the Naas District Court, being the District Court in which the principal office of Kildare County Council is situate, within one month of notice.

SECTION I EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY**Describe the conditions of the site of the installation**

Provide an assessment of the effects of any emissions on the environment, including on an environmental medium other than that into which the emissions are made.

Describe, where appropriate, measures for minimising pollution over long distances or in the territory of other states.

I.1. Assessment of atmospheric emissions

Describe the existing environment in terms of air quality with particular reference to ambient air quality standards.

Provide a statement whether or not emissions of main polluting substances (as defined in the Schedule of S.I. 394 of 2004) to the atmosphere are likely to impair the environment.

Give summary details and an assessment of the impacts of any existing or proposed emissions on the environment, including environmental media other than those into which the emissions are to be made.

Attachment N^o I.1 should also contain full details of any dispersion modelling of atmospheric emissions from the activity, where required.

I.2. Assessment of Impact on Receiving Surface Water

Describe the existing environment in terms of water quality with particular reference to environmental quality standards or other legislative standards. Table I.2(i) should be completed

Provide a statement whether or not emissions of main polluting substances (as defined in the Schedule of S.I. 394 of 2004) to water are likely to impair the environment.

Give summary details and an assessment of the impacts of any existing or proposed emissions on the environment, including environmental media other than those into which the emissions are to be made.

Full details of the assessment and any other relevant information on the receiving environment should be submitted as **Attachment N^o I.2.**

I.3. Assessment of Impact of Sewage Discharge.

Give summary details and an assessment of the impacts of any existing or proposed emissions on the environment, including environmental media other than those into which the emissions are to be made.

Full details of the assessment and any other supporting information should form **Attachment N^o I.3.**

I.4 Assessment of impact of ground/groundwater emissions

Describe the existing groundwater quality. Tables I.4(i) should be completed. Give summary details and an assessment of the impacts of any existing or proposed emissions on the ground (aquifers, soils, sub-soils and rock environment), including any impact on environmental media other than those into which the emissions are to be made. This includes landspreading, land injection etc.

Full details of the assessment as well as a hydrogeological report (to include meteorological data and water quality, and aquifer classification, vulnerability, source and resource identification and zonation should be included in **Attachment N^o I.4**. A soils survey must also be included where emissions are directly onto or into soils. All vulnerable (as a result of ground emissions) surface water bodies must be identified.

Landspreading of Agricultural/Non Agricultural Wastes

Tables I.4(ii) and I.4.(iii) should be complete where applicable. Further information is available in the Application Guidance Document.

I.5 Ground and/or groundwater contamination

Summary details of known ground and/or groundwater contamination, historical or current, on or under the site must be given.

Full details including all relevant investigative studies, assessments, or reports, monitoring results, location and design of monitoring installations, plans, drawings, documentation, including containment engineering, remedial works, and any other supporting information should be included in **Attachment N^o I.5**.

I.6 Assessment of the environmental impact of on-site waste recovery and/or disposal.

Describe the arrangements for the prevention and recovery of waste generated by the activity.

Give details, and an assessment of the impact of any existing or proposed on-site waste recovery/disposal on the environment, including environmental media other than those into which the emissions are to be made.

This information should form **Attachment N^o I.6**.

I.7 Noise Impact.

Give details and an assessment of the impacts of any existing or proposed emissions on the environment, including environmental media other than those into which the emissions are to be made.

Ambient noise measurements

Complete Table I.7(i) in relation to the information required below:

- (i) State the maximum Sound Pressure Levels which will be experienced at typical points on the boundary of the operation. (State sampling interval and duration)
- (ii) State the maximum Sound Pressure Levels which will be experienced at typical noise sensitive locations, outside the boundary of the operation.
- (iii) Give details of the background noise levels experienced at the site in the absence of noise from this operation.

Prediction models, maps (no larger than A3), diagrams and supporting documents, including details of noise attenuation and noise proposed control measures to be employed, should form **Attachment N^o I.7**.

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I.8 Environmental Considerations and BAT

Describe in outline the main alternatives, if any, to the proposals contained in the application.

Describe any environmental considerations which have been made with respect to the use of cleaner technologies, waste minimisation and raw material substitution.

Describe the measures proposed or in place to ensure that:

- (a) The best available techniques are or will be used to prevent or eliminate or, where that is not practicable, generally reduce an emission from the activity;
- (b) no significant pollution is caused;
- (c) waste production is avoided in accordance with Council Directive 75/442/EEC of 15 July 1975 on waste; where waste is produced, it is recovered or, where that is technically and economically impossible, it is disposed of while avoiding or reducing any impact on the environment;
- (d) energy is used efficiently;
- (e) the necessary measures are taken to prevent accidents and limit their consequences;
- (f) the necessary measures are taken upon definitive cessation of activities to avoid any pollution risk and return the site of operation to a satisfactory state.

Supporting information should form **Attachment N° I.8.**

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Attachment No. I Existing Environment & Impact of the Activity

Please find attached the following reports:

- | | |
|-----------------|---|
| Attachment I.1 | Assessment of Atmospheric Emissions |
| Attachment I.2 | Assessment of Impact on Receiving Surface Waters,
Sewerage Discharge and groundwater emissions |
| Attachment I. 7 | Noise Impact |
| Attachment 1.8 | Environmental Impact Statement |

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Attachment I.1 Assessment of Atmospheric Emissions

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