Varming
Consulting Engineers Ltd.

Design Approach

Mechanical Service Specification
for
Templar Place SHD
Balbriggan,
Co Dublin

LINKED PRACTICES

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Mechanical Services

Executive Summary

The proposed development comprises a Build to Rent (BTR), Strategic Housing Development (SHD) as follows: Demolition of the existing buildings (former shopping centre and associated structures). Construction of 3 no. apartment blocks (Blocks A - C) ranging in height from 3 to 6 storeys (with Block B over 3 no. lower courtyard floors) providing a total of 101 units (19 no. studios, 41 no. 1-beds, 41 no. 2-beds). Provision of Resident Support Facilities/Resident Services and Amenities, 2 no. retail units, car parking (ground floor car park), cycle parking, ESB substation/switch room, plant, bin stores, open space, landscaping, boundary treatments, all associated site works and services provision

Objective

This report outlines the nature, scope and configuration of the various mechanical and electrical engineering services and systems.

The purpose of this report is to provide an overview of the proposed mechanical and electrical services to be installed in the new houses and to confirm the mechanical and electrical design strategies proposed maximise the Building Energy Rating (BER) while providing the most robust, durable and maintainable systems as possible.

Introduction

The site works associated with housing development include the provision of, 2 No. Telecoms Suppliers, Public Lighting, Electric Car Charging and ESB

All piped and ducted services work will be concealed were possible within stud partitions, floors and ceilings.

Varming Consulting Engineer's site inspector has met with the utility provider's on site to ascertain the spare capacity available within the local utility infrastructure.

Routes of proposed telecoms, mains water and ESB duct services have been reviewed and agreed on site with each provider.

The mechanical systems and electrical systems in each new apartment are designed to be cost efficient, energy efficient, flexible in use in order to minimise both energy consumption and associated CO2 production.

A full DEAP analysis for each apartment has been completed which verified that each apartment will achieve the A2/A3 Building Energy Rating required to achieve full compliance with NZEB.

The Environmental Strategy for the development of each apartment is to provide energy efficient systems and to employ a holistic approach to the integration of the building, its energy systems and its users. The design team recognises the need for this development to be designed and operated in a manner that reduces the environmental impact of the building, while achieving it in an economical manner and maintaining an internal environment that is comfortable and enjoyable for all occupants.

Varming Consulting Engineers are a member of the Templar apartment design team for this project.

Overview

The following is an overview of the compliance checks that have implemented for each apartment.

Internal Environment

The internal environment in each apartment has achieved specific compliance with the requirements of the Technical Guidance Document L - Conservation of Fuel and Energy – Dwellings, published in December 2020, and last updated April 2021, CIBSE Guidelines and the Works Requirements for naturally ventilated spaces.

BER Rating

The envelope of each apartment is designed with consideration to the integration of solar strategies in terms of glazing, daylight and architectural aesthetics and to ensure that an A2/A3 Building Energy Rating (BER) is achieved for each apartment in full compliance with NZEB.

Proposed Mechanical Services

Introduction

Each new apartment will conform to all relevant standards and codes of practice Each apartment has been designed in accordance with the Building Regulations and the requirements of the Building Control (Amendment) Regulations.

Each apartment will be certified as Building Regulation and Code of Practice compliant by the designers and installers of each system, in accordance with the relevant service providers Codes of Practice.

The development will be certified as fully compliant with all Building Regulations on completion of the development by the Assigned Certifier and the Builders team in accordance with the Building Control (Amendment) Regulations.

The following services will be required to be installed, tested, commissioned and operated fully for 6 hours prior to occupation of the Houses:

Within the Houses:

- Domestic Hot & Cold Water System
- Domestic Heating System
- Domestic Soils & Wastes Installation
- Constant Mechanical Extract Ventilation
- Controls & Miscellaneous Installations

Within the Site services:

- Drainage Services (within curtilage)
- Water Services (within curtilage)
- Protective services
- Controls & Miscellaneous Mechanical Installations.

Tenants Handbook:

A tenant handbook complete with a set of simple instructions for each apartment explaining both the mechanical and electrical services in a user friendly manner that allows the tenant to sufficiently understand the system operation and controls.

Copies of the relevant equipment operation manuals will be included with these instructions, such as Air Source Heat Pump details information and operational details, maintenance and operation information for Heating and Hot Water services, Extract ventilation fans, warranties, etc. which will be included with an overall Tenants Handbook for the House on completion of the works.

Exhaust Air Heat Pump System

Exhaust Air Heat Pumps work by drawing pre-heated, stale and humid air from each bathroom, utility room, kitchen and other wet areas of each apartment, passing it through a heat pump, which extracts the energy, and exhausting the cold stale air out of your home through a vent. The energy extracted by the heat pump is then used to heat your radiators, as well as your hot water cylinder, which is contained inside the all-in-one exhaust air unit.

An advantage of using an exhaust air heat pump is that you use the indoor air environment, which is always warm, as an energy source. The energy content of this indoor air is considerably higher than cold outdoor air. Another advantage is that the dwelling's extract ventilation is provided for within the heating system. The indoor air becomes comfortable and no separate ventilation fan is needed.

The design and integration of exhaust air heat pumps into any project requires a total building evaluation and carefully attention to detail.

The installation will be supplied, installed, inspected and tested in accordance with Technical Guidance Document L of the building regulations - "Conservation of Fuel & Energy – Dwellings". The heat pump system will comply with IS EN 15450:2007 "Heating Systems in Buildings – Design of Heat Pump Heating Systems".

As stated above, Low pressure hot water will be generated by extracting energy from the air within the apartment and transferring this energy to heat the water to serve radiators in each room via a pipework distribution system including integral pump, expansion vessel, 2-port domestic hot water priority valve, weather compensation, interlock, pipework, fittings, rubber mounting supports and insulation.

The system will provide hot water at ambient temperatures down to at least -15ºC. The heat pump will be capable of delivering a flow temperature of up to 55°C. Units will be tested to EN14825 for heating & tested in combination with cylinder to EN16147 for water heating in compliance with the eco design and energy labelling directives.

Capacity drop off: will be capable of meeting the following efficiency and output performances. The heat pump must be capable of achieving a COP of 4.41 under mid-range operating conditions at A+7/W35. The manufacturer must be able to supply a performance data from +20°C to -15°C.

The cylinder will be supplied, installed, tested, commissioned and certified

The domestic hot water cylinders will be of the vented type. All equipment will be positioned in accessible positions for ease of future maintenance. Cylinders must be 200 Litres, hard cased. The cylinder must incorporate an electric booster heater element. This is for legionella prevention and emergency backup modes. The cylinder will be pre plumbed for DHW and one or more heating zones as standard. The cylinder will be a floor standing pre plumbed & pre wired (including heat pump controls), incorporating 2-way DHW priority valve, pre insulated hot water cylinder in integrated casing suitable for heat pump applications. Cylinders to be manufactured from stainless steel and will have an operating temperature of 70°C and a max water pressure of 10 bar. The circulation pump and all controls are to be fitted pre delivery to site. Full account will be taken of accommodating thermal expansion and the final connections.

Proprietary condensate trays will be provided under heat pump units to collect condensate produced by the unit. A condensate drain will be installed from the condensate tray as indicated on the drawings. Condensate will be run in PVC pipe and will be clearly labelled.

The main controller will have the ability to store 7 day schedules for domestic hot water and set back temperatures for space heating. Precise control of any booster heater fitted will be available directly from the controller. Booster heater strategy will be edited in terms of maximum temperature, frequency, start time and duration of maximum temperature to ensure that the pasteurisation cycle consumes the minimum amount of electricity and to meet with the current legionnaire's prevention guide lines. The system will work on a hot water priority basis. Hot water mode will be controlled either by the time clock built into the main controller or will be started and stopped when a certain drop in cylinder temperature is detected. The installer can choose the setup that best suits their customer's needs.

The exhaust air heat pump has been selected as it has a 350% minimum seasonal performance factor which meets or exceeds the works requirements. The heat pump will use the outdoor air as its heat source. The system will provide hot water at ambient temperatures down to at least -15ºC. The heat pump will be capable of delivering a flow temperature of up to +60°C.

The domestic hot water cylinders will be of the vented type. The cylinder will incorporate an electric booster heater element. The cylinder is a floor standing pre plumbed & pre wired (including heat pump controls), incorporating 2-way DHW priority valve, pre insulated hot water cylinder in integrated casing suitable for heat pump applications. A proprietary condensate tray will be provided under each heat pump unit to collect condensate produced by the unit. A condensate drain is installed from the condensate tray as indicated on the drawings. Condensate will be run in PVC pipe and will be clearly labelled.

A proprietary protective cage for each unit will be provided for each apartment.

Exhaust Air Heat Pump Controls Section

The heating system via the Heat pump within each apartment will be split into three individually controlled zones including space heating , hot water heating circuit and ventilation.

The main controller will have the ability to store schedules for domestic hot water and set back temperatures for space heating

The heating programmer will have similar functionality as outlined above for ASHP controls.

The individual items of plant controlled are:

- Hot water cylinder 2-port valve (integral to hot water cylinder)
- Exhaust Air Heat Pump
- Temperature sensor in corridor
- Temperature stat on cylinder
- Tamper resistant stat on EAHP cylinder

The heating controls will benefit all occupants helping them to use the system efficiently and effectively reducing energy consumption and associated utility costs. The heating system will switch the EAHP off when no heat or domestic hot water is required and simple heating controls will enable all occupants to programme their heating and hot water requirements to suit their own needs.

The controller will be capable of the following functions / View and control heating and hot water / Holiday mode / Set up 7 day weekly schedule

Radiators

Radiators will be either single or double panel high output pressed steel convector type which will be installed in each room in the house, including the hall. All radiators will be adequately designed, sized, and selected to provide a maintainable room temperature, with an external design temperature of -3 degC:

All radiators will be of manufactured and tested in accordance with IS EN 442 : 2003.

All radiators will be wall hung distributing the weight evenly in their brackets and using any noise reducing devices supplied. The lowest radiator, or one of the radiators fitted on the ground floor will be fitted with a drain tail 15mm min outlet or similar suitably located to allow for flushing and future draining of the system.

Final dimensional details of all radiators will be determined on site prior to ordering. All radiators located below windows, will be sized to ensure that the radiators do not project above sill level. Radiators to be installed against walls will be fitted to give a manufacturer's minimum clearance from the wall. The numbers of bottom brackets and top stays will be in accordance with the manufacturer's recommendations.

Unless otherwise indicated, the minimum clearance between the finished floor and the underside of a radiator will be 100mm. connections. An air vent will be fitted at the top of each radiator.

All radiators will be manufactured and tested in accordance with EN 442, are of a steel panel type with low water content and with a minimum of 1.2mm steel thickness in each apartment.

Air vents will be fitted on high points on the heating system, must have a gradual rise and be accessible for maintenance purposes.

We have allowed for taking down radiators once after their initial erection for the convenience of other trades, and for re-erecting and reconnecting to pipework, including the associated draining down and refilling of the installation.

All radiators will be new and completely de-rusted prior to dispatch from the manufacturer's works and will be finished with a metallic primer. Where necessary, further treatment and priming will be carried out on site to prepare the surface for decorative painting.

We will supply and install a thermostatic radiator valve on each radiator.

General:

Heating Pipework & Fittings

Multilayer Pipework

Heating & domestic water pipework will be a pre-Insulated multilayer piping system. All fittings used should be certified as part of the piping system. The complete piping system will be certified suitable for potable water and general plumbing & heating applications.

This multilayer pipe will be constructed with an inner and outer layer of crosslinked polyethylene adhesively bound to an oxygen tight butt welded aluminium core. The pipework system will have KIWA, DVGW & WRAS certification.

Press fittings body will be manufactured using high-grade brass to DIN EN 12164 with pickled finish. Sleeves will be manufactured from 304 stainless steel. Fittings will have two EPDM O rings on each connection which deliver a water-tight seal. Press fittings will be designed for use in sanitary water supply and heating systems.

All necessary fittings, joints, adaptors, tees, elbows, reducers, couplers, manifolds and proprietary brackets will be supplied as part of the multilayer pipe system. Pipework will be complete with a 13mm flexible PE foam with high-resistance protective film. Multilayer pipework & press fittings will have a maximum operating pressure of 10 bar at 95oC.

The multilayer pipe system will be installed in accordance with manufacturer's instructions using manufacturer supplied tools & equipment suitable for use with the system.

Pipework Insulation

Multilayer Pipework will be provided for all heating, cold, mains and hot water services pipework (excluding open vent, as applicable) installed within the curtilage of each apartment

All heating services pipework will be insulated throughout all concealed runs as appropriate, to match the duty of the heating load in accordance with current good practice for the purposes of energy conservation and prevention of heat transfer and condensation. Pipework installations will be insulated with close cell insulation, standard BS: 3958 Part 4, Class O, or equivalent or the pipework will be pre-insulated in full compliance with Part L of the Building Regulation 2019.

All pipework in ducts will be properly lagged along their full length with approved flexible polyethylene pipe insulation in full compliance with Part L of the Building Regulation 2019, within the roof space/attic.

All piping in attic spaces are to be lagged with approved flexible polyethylene pipe insulation having a minimum wall thickness in full compliance with Part L of the Building Regulation 2019. Pipes, all joints fully sealed with a suitable insulating tape. Insulation should be neatly fitted with formed mitered joints at elbows and tees and should cover all valves and fittings. The manufacturer's approved adhesives should be used on all butt and seam joints.

Pipework Supports:

Pipework will be supported at a change in direction unless other agreed with the Engineer. Pipework supports will be arranged as near as possible to the joints, and the distance between pipe supports measured along straight runs will not exceed the following:

Constant Mechanical Extract Ventilation

The entire Constant Mechanical Extract Ventilation (CMEV) forms part of the EAHP system which will be supplied and installed in each apartment .

Mechanical extract ventilation is required in the Kitchen, Bathroom and downstairs toilet (where applicable) to comply with the Building Regulations 2019 Part F.

The Kitchen area requires a dedicated mechanical extract flow rate operating at 30 litres/second when a cooker hood is provided. Ductwork will be extended from the EAHP fan to each designated room. The kitchen canopy has local control, ducted to outside. Make up air to each occupied space will be provided by window permavent ..

The fans provide excellent indoor air quality whilst achieving energy savings.

<u>Features:EAHP Ventilation</u>

- Constant pressure fan
- Silent operation. The fan will not exceed 33dB
- Low energy consumption
- Easy to install. Slim design, to be installed in inhabited spaces, cupboards, ceiling voids, etc
- Low, easy maintenance with no specialist tools required

A means of isolating the unit for maintenance purposes has been provided and it is good practice to locate this near to the fan where practical. During normal running conditions.

Passive Inlet Ventilation

As a passive ventilation measure we will provide permavents within each window .

The Ventilation system in each apartment will be installed in accordance with all current Building Regulations.

Ductwork

The entire ductwork system will be supplied and installed within each apartment.

The ductwork will be competently installed to ensure minimum air resistance and leakage within each system. The entire ductwork installation will follow the plan as specified by the Engineer where possible. Where the direction of the duct run changes at a 90° angle, rigid components must be used. Rigid ducting should be correctly supported using either purpose made clips or metal banding. Workable duct lengths should be connected together at floor level before being supported, particularly around obstructions. This ensures that the duct can be suitably sealed. Flexible ducts should be similarly supported, although extra care must be taken when using banding, as it can crush the duct and cause restrictions to airflow. Purpose made clips are required throughout.

Fig 2:- UPVC Ducting

Lengths of rigid ducting will be connected using duct / straight pipe connectors or components, and sealed appropriately to ensure there is no leakage. Ducts will be sealed using tape, jubilee / speed clamps or sealant. Where sealant is used, a non-hardening variant will be mounted as there may be some slight movement in the system. All ducts must be sealed against leakage, and special care taken for duct lengths which pass through inaccessible areas, such as ceiling voids and partition walls. It is also advisable that a silicone sealant is used rather than duct tape, as this ensures longevity.

Where flexible duct is used it will be pulled taut to approximately 90% of its maximum length. If this is too taut it puts strain on fixings and can adversely affect duct bends, and if it is not taut enough it can cause airflow resistance through sagging. The tension applied should seek to strike a balance between these two extremes.

The discharge terminal is to be wall mounted. The free area of the terminal must be a minimum of 90% of the free area of the ducting being used. As the pressure loss through roof tile/slate vent is higher than louvres, a min. free area of a roof terminal should be 20,000mm2.

Domestic Water Services

The works covered in this section will include the following:

- Hot, cold, and mains water installation including water storage tanks, shower mixing valves, hot water cylinders etc.
- All workmanship, including plumbing work will comply with Irish Water Regulations.
- All domestic water service pipework will comply fully with the requirements and conditions of Irish Water / County Council Water Division.
- Domestic hot and cold water and above ground mains water pipework will be multilayer type pipework as detailed previously.

Multilayer Pipework will be provided for all heating, cold, mains and hot water services pipework installed within the curtilage of each apartment

Heating & domestic water pipework will be a pre-Insulated multilayer piping system. All fittings used should be certified as part of the piping system. The complete piping system will be certified suitable for potable water and general plumbing & heating applications.

This multilayer pipe will be constructed with an inner and outer layer of crosslinked polyethylene adhesively bound to an oxygen tight butt welded aluminium core. The pipework system will have KIWA, DVGW & WRAS certification.

Press fittings body will be manufactured using high-grade brass to DIN EN 12164 with pickled finish. Sleeves will be manufactured from 304 stainless steel. Fittings will have two EPDM O rings on each connection which deliver a water-tight seal. Press fittings will be designed for use in sanitary water supply and heating systems.

All necessary fittings, joints, adaptors, tees, elbows, reducers, couplers, manifolds and proprietary brackets will be supplied as part of the multilayer pipe system. Pipework will be complete with a 13mm flexible PE foam with high-resistance protective film. Multilayer pipework & press fittings will have a maximum operating pressure of 10 bar at 95oC.

The multilayer pipe system will be installed in accordance with manufacturer's instructions using manufacturer supplied tools & equipment suitable for use with the system.

Copper Pipework

Copper fittings will be lead-free solder ring capillary type to IS EN 1254 : 1998, though in locations where pipework up to and including 54mm is exposed, compression fittings to IS EN 1254 : 1998 may be permitted with the approval of the Engineer. Fittings will be resistant to dezincification and will be fully compatible with the copper tubing.

Suitable unions will be used for connection to valves and equipment and for dismantling of pipework up to and including 54mm. Over 54mm, flanges will be used to BS EN 1560-3.2 : 1989.

All Copper pipework will be supplied and installed in area's such as the hot water cylinder

Copper Pipework General

All pipework will be suitable for the operating conditions and will be installed in accordance with manufacturer's instructions.

All bends will be as far as possible made from the piping. Sizes up to 38mm bore will be made with spring bending tubes and in no case will the radius be less than 3 dia. of the tube. Compression fittings will only be permitted in connection to fixtures and in the immediate vicinity thereof.

All pipe supports, hangers and brackets required to support and control the movement of pipework will be supplied and erected, fixed to the valves will be resistant to dezincification and will be fully compatible with the pipework system of which they form part.

Saddles to copper pipe will be fabricated from 25mm copper pipe flattened on an anvil and bolted as before to the channels and brazed to the pipe.

Isolating valves up to and including 28mm will be ball valves with brass body, chrome plated ball, PTFE seat and compression ends. Isolating valves over 28mm and up to 54mm will be 3- piece bronze ball type with PTFE seat and solder ends.

Isolating valves over 54mm will be wafer type butterfly valves with cast iron body and EPDM seat, nylon coated ductile disc, lever or gear operated.

Pipework General

Stopcocks up to 54mm will be bronze to BS 1010 or equivalent with copper compression couplings. Stopcocks on underground mains pipework will be fully compliant with Irish water Requirements.

Float operated valves for cold water tanks & cisterns will be of a size and type to suit the duty, and formed in plastic to prevent corrosion. Floats will be to BS 1968 or BS 2456, as appropriate. Silent operation float valves to be used throughout.

Sanitary fittings (WC, WHB, Bath, etc) will be capable of being isolated so that they can be maintained / replaced with ease. Screwdriver operated ball valves in nickel plated forged brass will be provided at each individual item of sanitary ware for both Hot and Cold Water supplies.

In all places where pipes pass through walls or floors suitable sleeves will be provided and fitted at such points. Sleeves will be in one length and be fixed flush with surface or the finished floor or wall. Sleeves will be of ample diameter to allow for the free movement of mains and branches due to expansion and contraction.

The pipes passing through these sleeves will be fixed correctly to allow for this movement. This also applies to holes in floors and ceilings where it is not possible to fix sleeves. Gaps around pipes will be sealed using a suitable mastic for low temperature pipes or silicone rubber for higher temperature pipes.

responsible for any damage caused to the building or installation through leakage or otherwise due to neglect in this matter. All sleeves for hot and cold water piping will be light gauge copper of a diameter one size larger than the pipe regardless.

Control valves will be resistant to dezincification and will be fully compatible with the pipework system of which they form part.

Isolating valves up to and including 28mm will be ball valves with brass body, chrome plated ball, PTFE seat and compression ends. Isolating valves over 28mm and up to 54mm will be 3- piece bronze ball type with PTFE seat and solder ends.

Stopcocks up to 54mm will be bronze to BS 1010 – 2 : 1973 or equivalent with copper compression couplings. Stopcocks on underground mains pipework will be gunmetal construction to BS 1010 – 2 : 1973 or equivalent.

Float operated valves for cold water tanks will be to BS 1212 or equivalent of a size and type to suit the duty. Floats will be to BS 1968 or BS 2456, or equivalent as appropriate. Where required, silencers will be fitted on float valves.

Piping between the circulating piping and the various fixtures will be neatly run concealed as far as possible in adjoining wall partitions, in a manner approved of by the Engineers.

All sanitary fittings, etc. will be securely mounted to floors and walls in accordance with the Sanitary fitting manufacturer's requirements and recommendations.

Cold Water Storage

A metered branch from the existing external water main is extended to the cold water storage tank. A total of 24 hours cold water storage will be provided to satisfy the occupational density of the 101 apartments and amenity spaces. The storage tank will be a G.R.P. sectional type, insulated with heavy duty lid, insulation, screened overflow and breather pipe. The cold water storage tank will have a capacity of 25,000 litre's and will be located at ground floor car park level. The cold water will be pressurised by duty/standby/assist booster pumpset. A copper pipework distribution network will be extended from the water tankroom to serve each apartment

Mains Water Break Tank

A metered branch from the existing external water main is extended to the mains water storage tank. A mains water storage tank is provided to satisfy the occupational density of the 101 apartments and amenity spaces. The storage tank will be a G.R.P. sectional type, insulated with heavy duty lid, insulation, screened overflow and breather pipe. The mains water storage tank has a capacity of 5,000 litre's and will be located at ground floor car park level. The mains water will be pressurised by duty/standby/assist booster pumpset. A copper pipework distribution network will be extended from the water tankroom to serve each apartment sink.

Hot Water Cylinders

Each apartment will be provided with a stainless steel hot water cylinder which is an integral component of the exhaust air heat pump which will be tested, commissioned and certified, as specified hereafter and indicated on drawings.

The domestic hot water cylinders must be of the vented type All equipment must be positioned in accessible positions for ease of future maintenance. Cylinders must be 200 Litres, hard cased. The cylinder must incorporate an electric booster heater element. This is for legionella prevention and emergency backup modes. The cylinder should be pre plumbed for DHW and one or more heating zone as standard. The cylinder will be a floor standing pre plumbed & pre wired (including heat pump controls), incorporating 2-way DHW priority valve, pre insulated hot water cylinder in integrated casing suitable for heat pump applications. Cylinders to be manufactured from stainless steel and will have an operating temperature of 70°C and a max water pressure of 10 bar. The circulation pump and all controls are to be fitted pre delivery to site. Full account will be taken of accommodating thermal expansion and the final connections.

Proprietary condensate trays will be provided under heat pump units to collect condensate produced by the unit. A condensate drain will be installed from the condensate tray as indicated on the drawings. Condensate will be run in PVC pipe and will be clearly labelled

Domestic Soils and Wastes

The installation will consist of a complete soils and wastes system above ground, including traps, overflows, vents, access points, fire collars and acoustic insulation. All connections from rooms into drainage system will be trapped to prevent foul air from the drainage system entering the house.

All soil pipework and fittings will comply with BS 4514:2001 or equivalent, uPVC pipework. All waste pipework and fittings up to 55 mm dia. will comply with BS EN 1329- 1:2000, or equivalent MuPVC pipework, unless otherwise indicated. Unless otherwise indicated, soils and wastes pipework running through occupied spaces will be insulated for condensation and acoustic purposes.

All pipes and fittings will be installed in strict accordance with Manufacturer's instructions. All necessary pointing materials, fixings and accessories will be as recommended by the Manufacturer.

The minimum internal diameters of traps to various appliances are as follows:-

- Water Closet - 100mm
- Wash Hand Basin - 32mm
- Bath /Shower Tray - 40mm
- Sink - 40mm
- Washing Machine - 40mm
- Dishwasher - 40mm

Vent pipes will be installed to ensure adequate ventilation of appliances to atmosphere and vent stacks will extend 1,000mm above roof level and terminate cowl.

The Soils and Waste System will be installed in uPVC pipework to B.S. 4514 or equivalent and will be tested to the Local Authorities Requirements.

Intumescent Barrier to be installed in all pipework passing through fire compartments as necessary

Horizontal wastes will be bracketed every 750mm with adequate number of expansion couplings, suitably bracketed. The minimum slope on horizontal pipework is 1:100.

Adequate access will be provided throughout for cleaning.

All pipework 40mm and above passing through fire rated structures will be fitted with intumescent fire collars.

All uPVC pipework and fittings will have neoprene „O‟ ring joints. MuPVC waste pipework and fittings will have solvent welded joints except at expansion joints or boss connections to discharge stacks, which will be jointed using “O‟ rings.

Joints on socketless cast iron pipework will be flexible mechanical type to BS EN 877 : 1999. or equivalent

Jointing to WC pans will be made using proprietary flexible pan connectors. All jointing will comply with the manufacturer’s instructions. Where applicable on a single stack system a collar boss may be used on the vertical stack to take bath discharge pipes.

All traps will be constructed of polypropylene and will be of the deep seal type with a minimum seal depth of 75mm. In general tubular traps will be used on all sinks, wash hand basins and urinals. Bottle traps may be used on wash hand basins where the trap is

Fire Extinguishers

The following fire extinguishers will be provided in each apartment unit:

- 1 No. 2Kg aluminium carbon dioxide fire extinguisher in the Kitchen area.
- 1 no. 1m x 1m fire blanket in the Kitchen area

Standards and Codes

The following design codes, standards and guidance documents will be adhered to where applicable in the design, installation and commissioning of the Mechanical and Electrical Engineering Services including:-

- Procedures and Standards of C.I.B.S.E. Guides and Commissioning Codes of
- Practices.
- H.V.C.A. Specifications for Ventilation Ductwork.
- I.S.238 Copper Tubes
- B.S. 7291
- B.S.2871
- B.S. 5449
- S.I.291 Safety, Health & Welfare at Work (Construction) Regulations 2013

- EC0101:2008 ETCI National Wiring Rules for Electrical Installations
- B.S. E.N. 14336 Heating Systems in Buildings
- GPC 301 Controls for Domestic Heating and Hot Water
- Fire Safety Certificate
- Building Regulations
- Bye-Law Regulations, including compliance with Waterworks Department, Sanitary Services Department and the HSE Requirements.

CE Marking

The CE conformity marking is the manufacturer's declaration that the selected equipment meets the essential requirements of the relevant European health, safety and environmental protection legislation, that is in practice by many of the Product Directives and provides the end user/client the additional assurance that the selected product/equipment are based on a certified production quality system. For example, all electrical equipment detailed within our report where appropriate complies with the Low Voltage Directive and the EMC Directive.

All mechanical and electrical equipment detailed in this report have been selected on their proven track record in regard to durability, robustness and maintainability. In all cases, each item of equipment demonstrates full compliance with the CE conformity requirements and Local County Council's Work requirements.

Figure 3: CE Marking