

Installation of Domestic Water System HDPE, uPVC, Copper & PPR Pipes

This plumbing method of statement covers the installation of domestic water system piping and accessories.

The procedure defines the method to ensure the installation work as per contract requirements, specifications and best practices.

It gives details of how to carry out the work and what health and safety issues and controls are necessary.

The method statement covers all horizontal and vertical domestic water system installations in all areas of the project, using various types of material as per specifications and also as per the below table:

Material Name	Material Description	Location & Condition(s) of Use
HDPE	Smooth bore, single, solid-wall drain, waste, and vent bell and spigot with electro-heat fused fittings. To BSEN 1519	Underground incoming pipe work up to the main water meter
Upvc Class E	Upvc Class E Pipes to BS-3505, & fittings to BS 4346	Underground incoming pipe work between incoming water meter and RCC. Storage tanks and Emergency fill piping. Non-Potable water piping, and using solvent cement joints.
Copper	For DN65 & Larger Copper Pipes & Fittings to ASTM B-88 Type L	Pipe work from water tanks (at all levels) up to suction of the transfer pumps, fire pumps and fire pump test pipe.
	For DN50 & Smaller BSEN 1057, R250 plain	Rising mains from transfer pumps, and using mechanical joints. Cold and potable water riser pipework for all sizes, and using insulation for the cold water line. Hot water supply and return distribution risers for all sizes and using insulation.

PPR	Hot, PPR to DIN 16962	Cold and potable water distribution pipe work up to DIA 90mm. Hot water booster pump suction and discharge, and using insulation.
PEX	PEX to DIN 16892/93, WRC approved, ASTM F876, F877 with protective conduit. 95°C PN-10 blue for cold and red for hot & all fittings shall be bronze or DZR copper alloy.	All final equipment connections to sanitary ware shall be with pex pipes installed within flexible conduits chased in wall.
Steel Pipes	Steel Pipes to ASTM A 53/A 53M, Type S, Grade A, Schedule 40, galvanised. Include ends matching joining method or BS 1387, heavy weight pipe.	Steel piping to be used in pump rooms.

Below is list of reference documents that are applicable for the installation of domestic water supply system:

- Contract Specifications
- Approved shop drawings
- DIN 8077 / 1692
- BS-3505 class E
- Inspection and Test Plan
- Project Safety Plan
- Project Quality Plan
- Project Logistics Plan
- Job Safety & Environmental Analysis JSEA
- Related International standard (ASME, ASTM -A653A, 653M and ASHRAE standard).
- Local Authorities Regulations

Project Roles & Responsibilities for Domestic Water Piping Work

Project manager shall be responsible overall to complete all MEP works as per specifications, budget, time, & quality.

MEP Site Engineers shall be responsible for but not limited to the following important activities:

- To ensure that all the preparation and application works are carried out according to the contract specification and manufacturer’s data sheet(s).
- To ensure that the progressing of works is carried out according to the planned program, and as per the approved Method statement.

- To ensure that all the equipment's and materials required in executing the works are available according to the planned construction program.
- To coordinate with the main contractor's MEP coordinator and safety officer for all safe and proper execution of the work in accordance with the risk assessment.
- To coordinate with the civil team for any area preparation, access, clearance.

Site foreman shall be responsible for but not limited to the following important activities:

- To guide and control the tradesmen and charge-hands(s).
- To ensure that work is done as per the approved shop drawing(s).
- To report to the MEP site Engineer.

Health & Safety Officer shall be responsible for but not limited to the following important activities:

- Ensure health and safety of the site
- Ensuring PPE available with site personnel
- Good housekeeping on site
- Environmental concerns are addressed.
- Responsible for implementation and assurance of the safety and environmental requirements (JSEA).

Quality control QA/QC engineers shall be responsible for but not limited to the following important activities:

- Inspecting the materials on site as per approved materials submittal prior to installation on site.
- Inspection for the installation as per approved drawings and approved test plans and checklists.
- Preparing test forms for testing on site and updating results accomplished.
- Issuing inspection request within 24 hours before the actual inspection.
- Responsible for the assurance of Quality control, method statement and inspection test plan.
- Controlling the shop drawings flow on site.

Pipe Installation Activity Sequence & Methodology

Site domestic piping system work shall be executed in accordance with the following methodology and sequence;

Delivery, Handling and Storage

- The pipes and fittings material and its associated material supplied protect against damage during handling, transport, storage and installation

- The material to be delivered to the site store in self-supporting framed units.
- The pipes material will be stacked as loose with all material parallel (nested).
- Material will be stored in clean and closed store for protection and according to manufacturer's recommendations
- The height of the pipe stack should not exceed seven layers or two meters maximum height
- Stacks should be protected from sun & weather elements by means of placing tarpaulins or similar sheets over them secure fixed to the timber support post, in order to provide protection.

Inspection of Materials in Site Store

- Notify MEP Engineer upon delivery of material at site.
- All materials shall comply with the approved Material submittals.
- Upon the receipt of materials on site, these shall be inspected by the QC Engineer / Inspector to ensure correctness of material as the approved material submittals and quantities.
- Ensure that the materials are handled properly, and protected against dust, dirt and foreign matter.
- A material inspection report shall be prepared by QA/QC Engineer / Inspector for submission to the Consultant for review and acceptance
- Material not complying with the Material Submittal or unusable/damaged duct or fittings will be placed in a quarantined area and clearly labelled ready for manufacturer to replace.

Pre Installation Checks

A pre-start meeting prior to the commencement of the works will take place with the Site Engineer, H&S Officer, QC Engineer, Supervisor / Foreman in charge to address the following:

- Ensure that the notification to start activity has been issued.
- Ensure that the area has been surveyed as per approved drawings.
- Ensure that the installation area is clean from debris and foreign matters
- Ensure that materials are as per approved Material submittal.
- Ensure that adequate number of tradesmen and proper tools are available.
- Ensure that latest approved shop drawing(s) for this installation is present, and all personnel are working off the same drawing.
- Ensure that area is safe to carry out the work.
- Area for materials preparation installation has been identified and procedures will be in place.
- Eye wash area near in the fabrication areas in case of workers skin contamination with resin or other chemicals.

- Temporary DBs are provided and inspected regularly by the electrician prior to execution of the work.
- Ensure that the related mock-up is accepted/approved by the consultant.
- Plan well in advance for all fittings and accessories that will be installed to avoid giving any unnecessary/extra joints.

Marking and Installation of Supports

- Pipes supports, hangers, spacing as per approved shop drawings and specifications.
- Attachments to the roof slab will be by the means of expansion anchors.
- Drill into the concrete and place the expansion anchors.
- Threaded rods and channel sections will be prepared for installation in the workshop.
- Building attachments: insert the powder coated actuated fasteners or structural steel fasteners appropriate for building materials and all cutting edges shall be cut and painted with specified paint.

General Pipe Installation Considerations

- Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation. Select number of interlocking rubber links required to make installation watertight.
- Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight.
- Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance.
- Install water-pressure regulators downstream from shutoff valves.
- Install water-pressure regulators downstream from shutoff. Water-pressure regulators are specified in Plumbing Specialties.
- Install domestic water piping level with 25 percent slope downward toward drain and plumb. (Exceptions can be made case wise after full discussion with the Engineer in case of space insufficiency).
- Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- Die electric unions / flanges shall be installed for joining dissimilar metals.
- Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- Install PRV & all related accessories accordingly where ever needed.
- Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building diagonal runs are prohibited unless specifically indicated otherwise.
- Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

- Install piping to permit valve servicing.
- Install piping at indicated slopes.
- Install piping free of sags and bends.
- Install fittings for changes in direction and branch connections.
- Install piping to allow application of insulation.
- Select system components with pressure rating equal to or greater than system operating pressure.
- All the products intended to use for the project shall be seismic complaint as per authority regulation.

Installation of uPVC pipes

- Mark the location the routing of the pipes base on approved drawing.
- Pipe work must be installed as per approved drawing clearances clearly indicated make sure the minimum clearances.
- The pipes must be cut off at right the pipes must cut using only the pipe cutter.
- Joints for uPVC sections should be sealed using Solvent Cement.
- The spigot and socket to be jointed should be carefully examined for any damages which would impair the jointing procedure.
- Particular attention should be paid to the spigot chamber as for lac – ring jointing procedure.
- The spigot insertion depth should be measured as the depth from the mouth to the shoulder of the socket. The insertion depth should then mark on the spigot using marker.
- The mounting areas of the spigot and socket should be thoroughly cleaned with rag and absorbent paper until completely dry.
- Using a brush of the size recommended apply an even layer of solvent cement to the spigot and socket amounting surfaces. The cement should be applied in a lengthwise direction and not with circular motion. For joints of nominal diameter 3 and above the cement should be applied simultaneously to the spigot and socket.

Installation of Copper pipes (Solder joints)

- Cut the tube square with cutter or fine hack saw
- Clean outside end of copper tube thoroughly with sand cloth or sand paper equal to cup depth of fitting.
- Clean inside of the fitting carefully to tube stop with wire brush, sand cloth, sand paper may also be used.
- Using brush, apply light uniform coat as soldering flux to the outside of the tube and inside of the fittings.
- Position the fittings and solder once prepared so that they both will face down when the valves hung in solder them into position. Be a sure to let the pipes cool completely before putting it into place.
- Slip into lifting to tube stop. Turn back and forth once or twice to distribute flux evenly.

- Apply heat uniformly around the fitting with when solder melts upon contact with heated fitting the proper soldering temperature has been reached. Remove flame and feed solder slightly off centre at the bottom of the joint. Proceed across the bottom of the fitting and up to the top centre position. Return to the starting point and then proceed up the incomplete side to the top, again overlapping the solder metal. Wipe off surplus solder with a piece of cloth.
- Domestic vertical in riser hot water supply and return and cooled water supply shall be copper pipes with Cross – Linked closed cell polyolefin foam 25 mm insulation.

Concealed Installation of Pex pipe

- Installation of concealed piping, having a diameter below 25 mm should be with a conduit pipe.
- Pipes in the system should be installed in parallel (no crossing allowed).
- Each terminal point should be directly connected to the distributor, with no additional connectors.
- The conduit pipes should be of a flexible type, allowing threading of pipes and easy extraction.
- Conduit pipe will have uniform colours: blue conduit for cold water and red for hot water. Hot and cold droppers must be separated maintaining at least 150mm to minimize heat transfer.
- Size of conduit to be bigger than the pex pipe
- The radius of bending for the pipe and its conduit, when rising from the floor to the wall, should be [at least] 8 times the outer diameter of the conduit pipe ($R=8 D$) to allow free motion of the inner pipe, inside its conduit, including easy threading and extraction.
- To calculate the [bending] radius, select conduit pipe diameter and multiply it by 8.
- Rising from floor to wall with a pipe and conduit should always be performed in two bending.
- 30 cm before the transfer point and after it, the pipe should be fixed with concrete or by mechanical means.
- Conduit piping and water piping between terminal points and the distributor should be laid in one whole unit, with no branching or couplers.
- The conduit pipe and supply pipe should be laid in the shortest path and in a continuous way from the distributor to the terminal point.
- The pipe section between the distributor and the terminal should have no more than two transfers from one plane to a perpendicular plane: one descent from the distributor to the floor and one rise from the floor to the terminal point.
- On Gypsum walls, the pipe should be routed through existing/pre-made openings in the studs. The conduit pipe should be anchored to the stud every 60 cm and close to the terminal point.

- It is possible to route water piping and conduits underneath fixed accessories (bathtub, shower, etc.) in concealed installation.
- It is not obligatory to cover Pex piping with concrete along its entire span.
- The pipe should be fixed with concrete or by mechanical anchors.

Installation of PPR pipes

- Cut the pipe rectangular with pipe cutters. Take care that the pipe axis is free from burrs or cuttings debris and remove where necessary. Mark the welding depth at the end of the pipe according to the socket depth of fittings.
- Clean the socket and spigot with cleansing clothes.
- After the welding machine reaches the necessary operating temperature, push the end of the pipe and fittings, without turning, up to the welding depth onto the welding tool. Heat up the pipe's spigot and fittings' socket according to the following heating time.
- After the heating time, quickly remove the pipe and fittings from the welding tools, join them immediately without turning, until the marked welding depth is covered by the bead of PP-R from the fittings.
- The joint elements have to be fixed turning the specified assembly time. After the cooling period, the fused joint is ready for use.
- Domestic horizontal hot water supply and return shall be PPR pipes with Cross – Linked closed cell polyolefin foam 25 mm insulation.

Installation of Steel pipes

- Pipe work shall be installed in accordance with piping general arrangement with approved drawing and specifications and schedules.
- Determine the position of the pipe supports and mark in the location. Installed the hanger support as per approved drawing. Fix supports in position and ensure that all fixing is tight and secure.
- The steel galvanized steel pipe as per ASTM A53/A (or) ASTM A106 schedule 40 Galvanized, seamless steel pipe.
- Pipes from the pump room header going to the mainline distributed to mainline connection.
- Assemble the pipes using screwed fittings / bolting the flanges of pipes / grooved couplings for pipes above 2-1/2" groove fittings will be used while threaded fittings will be used to connect the pipes less than 2-1/2".
- Ensure appropriate sealing compound/gaskets/lubricant are used for assembling of the pipes.
- After installation of the pipe works, check for correct levelling, position and alignment.
- Install temporary cap to any open ends of pipes before leaving the work place.

Flexible Joints Procedure

- Ensuring that thermal movement at any joint does not exceed the allowable axial movement of the connector.
- Construction of flexible connectors shall be Neoprene inner tube and outer cover with multiply nylon tyre cord fabric reinforcement.
- Standard duty flexible connectors shall be rated for 1600 kPa working pressure and 2400 kPa test pressure, up to 105 °C. Manufacturer shall certify that each unit is individually pressure tested.
- Connectors for pipe size 65 mm and above shall be of spherical single bellow design with captive steel floating flanges to facilitate alignment. Flanges shall be epoxy powder coated. Bellows shall have steel wire reinforcement at the lips.
- Connectors for pipe size up to 50 mm shall be of double bellow design with threaded ends. End connections shall be triangular flanges made from forged steel and epoxy coated. MI unions will not be accepted.
- For copper piping up to 54 mm, provide double bellow flexible connectors with bronze sweet-end connections at both sides, suitable for brazing to copper pipe.
- For copper piping above 54 mm, provide standard spherical bellow connectors with steel floating flanges, bolted at both ends to bimetallic flanges brazed to copper pipe.
- Where flexible connectors are connected to unanchored piping or isolated equipment, provide control units when pressure exceeds the maximum recommended for this application by the manufacturer.

Installation of Air Vents

- Air Vents shall be installed on all coils, at all highpoints of piping inside and outside plant rooms, at the head of vertical rises and other high points required for efficient operation and venting of system.
- Air vents shall be provided at all high points in the pipe work, whether indicated on the drawings or not.
- Automatic air vents shall have full brass body construction with leak proof polypropylene float and non-corroding components. Air vents shall be complete with detachable isolation check valves to facilitate removal of the main body without draining the system. The air outlet shall be of brass and be suitable for direct flare connection to copper pipe. Unless otherwise stated, air vents shall be suitable for 1600 kPa working pressure and 2400 kPa test pressure, up to 110 °C.
- Air bottles shall be provided at all venting points.
- Air bottles shall be formed from pipe of equal bore to the pipe being vented and of length equal to the bore plus 150 mm. Automatic air vents shall be provided above all air bottles.
- Discharge from the air vent shall be a 6 mm copper drip pipe connected to the brass air outlet flare connection and terminating with an open discharge in a position to be agreed over a conveniently located drain, gully or sump.

- Vents on air separators shall be float actuated designed to purge free air from the system and provide positive shut-off at the working pressure at maximum working temperature. Vents shall be tightly sealed against loss of system water and prevent entrance of air in negative pressure situations.

Pressure Testing of Domestic Water System

The installation to be tested shall be inspected for compliance with the drawings and specifications.

- Prepare schematic diagrams of systems' "as-built" piping layouts.
- Open all manual valves for maximum flow.
- Cap and subject piping static water pressure of 1.5times of the operating pressure without exceeding pressure rating of piping system materials. Use the manual test pump to reach the working pressure requirement of the pipe.
- Fill domestic water piping, check components to determine that they are not air bound and that piping is full of water. The pipeline will be slowly and carefully filled with water so that the all air is expelled and then tested under pressure.
- Check air vents for a forceful liquid flow exiting from vents when manually operated.
- Isolate test source and allow standing for (4) four hours. Leaks and loss in the test pressure constitute defects that must be repaired.
- Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory result are obtained.
- Apply the required test pressure by pumping until pressure testing obtained. Reports for pressure test are required and to be recorded.
- The frequency criteria of pressure testing pressure in the system is less than 0.2 bars are acceptable.
- Keep always in mind checking the quality of the adjustments and of the finishes.
- This list is not exhaustive and the engineers may require additional tests to those specified initially in the test program if he considers it necessary.