

METHOD STATEMENT FOR INSTALLATION OF CHILLED WATER PIPING SYSTEM

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1. PURPOSE AND SCOPE

The purpose of this Method Statement is to outline the methodology to be implemented for Chilled water piping (Above/Ground) system activities of Worker Hospital & Integrated Health Centre at Mesaieed Industrial city and to ensure that all works are carried out in accordance with the approved construction drawings and project specification.

This Method Statement covers all related Chilled water piping (Above/Ground) system installations activities which include:

- a) Chilled water piping(Supply/Return)
- b) Valves,Fittings,Accessories
- c) Pressure Testing
- d) Identifications
- e) Sleeves

2. OBJECTIVES

This document provides a method statement for chilled water piping (Above/Ground) system in accordance with the Contract Scope of work.

The work will be carried out as per approved planning sequence of work and project schedule with adequate resources to meet target.

The methodology contains the construction procedures, the requirements of materials, manpower, equipment and management thereof.

The work shall consist of Chilled water piping (Above/Ground) system along with accessories about the installation procedure with respect to Project specifications, QCS-2010, Approved shop drawing and the manufacturer recommendations.

3. REFERENCE DOCUMENTS

- 3.1 Project Specifications Sec.(15075,15184)
- 3.2 Tender/ Contract documents.
- 3.3 Project IFC Drawings.
- 3.4 Approved Shop Drawing
- 3.5 Project Quality Plan.
- 3.6 HSE Plan.
- 3.7 QCS-2010 References section-22.

4. GENERAL

- a) Ensure that the Chilled water pipes, fittings, valves and accessories are correct and as per project specification and approved material submittal before commencing the installation works.
- b) Prior to commencing any works, a risk assessment must be conducted, taking into account all possible risks and the appropriate precautions put in place, i.e. fire extinguishers, fire blankets, safety harnesses, etc. Refer to the risk assessment/risk management section of this method statement.
- c) Ensure that shop drawing used on site are approved and latest prior to commencing works on site.

5. PRE WORKS

- 5.1 Installation procedure is to be as per manufacturers recommendations.
- 5.2 Manufacturer's recommendations are to be obtained from one of the listed vendors in the project specifications/material submittal.
- 5.3 All workers to attend safety induction training on the safe installation methods by the safety department.
- 5.4 Ensure that pipe & fittings materials received are inspected; found acceptable as per approved materials submittal.
- 5.5 Ensure that all related materials are of approved make and are available before carrying out any work.
- 5.6 Prior to commencement of work, inspect areas and access to confirm that the site is ready to commence the work.
- 5.7 All relevant documentation (drawings) and materials applicable to particular section of works will be checked by site engineer prior to commencement of work and ensure that shop drawings are as of latest revision approved.
- 5.8 The site engineer/ site supervisor will give necessary instructions to tradesmen (pipefitters/installers) and provide necessary construction shop drawings of latest revision.
- 5.9 The site supervisor/ foremen will also check that proper tools and equipment are available to carry out the work and are in compliance with contract specifications.
- 5.10 The Site supervisor and safety officer will explain to the tradesmen regarding safety precautions to be observed.
- 5.11 Ensure that grid lines, reference levels etc. are marked by main contractor.
- 5.12 Site supervisor and foremen will carry out a site survey and mark the route of piping as per approved shop drawings. In the event of any discrepancies or difficulties in executing the work, these shall be brought to notice of project engineer for corrective contractor.
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5.14 Co-ordination with other trades will be carried out while marking the route of piping.

6. WORKS

6.1 Chilled water piping installation shall be as per **Interpipe** (manufacturers) recommendations

6.2 Chilled water piping & fittings should be correctly used as per approved materials submittal.

6.3 Install piping to allow adequate service space for equipment.

6.4 Install piping free of sags or bends.

6.5 Diagonal runs are not permitted, unless expressly indicated on the drawings.

6.6 Horizontal run random lengths of pipe may be lifted into place using mechanical means or manual means, depending on the size of the pipe.

6.7 All pipes will be supported by hangers / supports at intervals as approved / recommended by the manufacturer/supplier and contract specifications, Confirmed the installation of support hanger, bracket is securely fixed and at the correct elevation.

Pipe Support Spacing

Pipe Size (mm)	Horizontal Spacing (m)			Vertical Spacing (m)		
	Steel Pipe Sch. 40	Copper	ABS/PVC-U	Steel Sch. 40	Copper	ABS/PVC-U
15	2.0	1.5	0.7	2.4	2.0	1.3
20	2.0	1.5	0.7	3.0	2.4	1.5
25-32	2.4	1.8	0.9	3.0	2.4	1.8
40	2.7	2.4	1.0	3.6	3.0	1.8
50	3.0	2.4	1.0	3.6	3.0	2.0
65	3.3	2.7	1.0	4.5	3.6	2.0
80	3.7	3.0	1.3	4.5	3.6	2.5
100/125	4.0	3.7	1.5	5.0	4.0	3.0
150	5.2	4.0	2.0	6.0	5.0	3.5
200	5.5	5.0	-	-	-	-
250	6.0	5.5	-	-	-	-
300	7.0	6.0	-	-	-	-
350	7.5	-	-	-	-	-
400	8.0	-	-	-	-	-
450	8.5	-	-	-	-	-
500	9.0	-	-	-	-	-

6.8 Allow sufficient thread on threaded rods for pipe level adjustment. Upon satisfactory levelling cut back excess threaded rods and touch up with approved paints.

6.9 Install drains throughout systems to ensure that the entire system can be drained. This includes but is not limited to all low points, bases of all risers, and at each branch take off.

- 6.10 Install drains valves at low points in piping system mains and elsewhere as required.
- 6.11 Equipment condensate drains shall be trapped at equipment connection. Drain lines shall run full size to nearest floor drain or as shown on drawings.
- 6.12 Do not install piping over electrical panel boards, switchgear, switchboards or motor control centres.
- 6.13 Install piping tight to slabs, beams, columns, walls, and other permanent elements of the building.
- 6.14 The Surface and internal pipes & fittings should be cleaned and free from grease and oil prior to threading.
- 6.15 Threading for the pipes should be done with appropriate threading machine. Black steel size up to 50mm will be threaded and size 65mm and above will be welded. Weld metal is to be thoroughly fused with base metal at all sections. Welds shall be sound metal, free from laps, slag inclusion or other defects.
- 6.16 Teflon tape/cotton/jute should be wrapped prior to pipe joints.
- 6.17 For welded pipe and fittings the following shall apply:
- a) Fit up the two ends to be welded as per the approved welding procedure.
 - b) Tack the two pieces together ensuring a uniform root gap and internal alignment.
 - c) Only welders holding a valid welders qualification certificate for the applicable welding procedure may weld any joints.
 - d) Each welder shall have a unique identification number. All welds shall bear this identification number of the welder.
 - e) Safety policy should be strictly followed in the place of welding.
- 6.18 Eccentric reducer fittings should be used in horizontal positions and concentric reducer fittings for vertical installations.
- 6.19 Welding of pipe in situation shall be minimized by the pre-fabrication of spools at ground level, or in the fabrication facility on site. Spools will be fabricated in manageable lengths, making allowance for the field weld location.
- 6.20 Site sketches will be prepared for all spools by the relevant engineer or supervisor.
- 6.21 Pipes shall be marked and cut square and cleanly by cutting disc or Oxy/Acetylene cutting torch as applicable.
- 6.22 Pipe ends will be prepared according to the type of joint, i.e. threaded, butt weld. Pipe ends for welded joints will be prepared by grinding as per the approved welding procedure.
- 6.23 On completion of pipe end preparation check to ensure the inside of the pipe is free of all dust and debris.
- 6.24 Where pipes penetrate through walls and floors sleeves of the appropriate size and type, according to the wall or floor type, shall be installed.
- 6.25 Pipes going through sleeved shall be independently supported of the sleeve as per an approved support detail. All vibration isolators shall be installed as per approved shop drawings.
- 6.26 Pipes going through risers shall be supported from the building structure as per an approved support details.
- 6.27 Proper clean out, Tees with dummy caps and drain valve should be installed as per

er site requirements.

6.28 Proper safety precautions should be taken for pipe installation in Shaft/risers with proper lifting tools.

6.29 Branch connections shall be made using standard fittings of the appropriate wall thickness or "Weld-o-lets".

6.30 All high points shall have vents installed and all low points shall have drain points installed as indicated on the approved drawings or as identified on site.

6.31 All valves shall be installed as indicated on the approved drawings & **Crane** (manufacturers) recommendations. Valve orientation and flow direction shall be carefully checked. And it should be in positions of maintenance.

INSTALLATION

Preparation

Ensure valve is suitable for service conditions e.g. pressure, temperature, service media.

Remove dust caps/flange protectors, where fitted.

The installation shall be designed to provide adequate means of draining and venting to permit cleaning, inspection and maintenance in the correct manner.

The product has not been designed to include corrosion, erosion or abrasion allowances. Any queries regarding service applications should be addressed to the Crane Fluid Systems - Technical Sales Department.

The valves have been designed for loadings, appropriate to their intended use and other reasonably foreseeable operating conditions. Loadings caused by traffic, wind and earthquake have not been taken into account.

It is the responsibility of the installer to ensure that the valves do not exceed the allowable limits of pressure. However the equipment is designed to withstand a momentary pressure surge of up to 10% above the maximum working pressure. The piping system shall be so designed to reduce the risk of fatigue due to vibration of pipes.

Valve Location

Valves should be located to ensure ease and safety of operation and access allowed for subsequent maintenance of the valve.

Valves should be located to allow access for gland adjustment and re-packing.

Flange Joints

Bronze and cast iron flanges may be damaged by over tightening the bolts. The following procedures will reduce this risk:

Make sure the pipe flanges are correctly aligned.

Full faced gaskets should be used with flat faced flanges to reduce stress.

Low strength carbon steel bolting has traditionally been used to restrict the load imposed on grey iron flanges, but should not be used for temperatures above 200°C.

Always use the correct size and number of bolts.

Always use the correct size and number of bolts.

Appropriate gaskets, bolting, and correct assembly torques should be used to ensure integrity of joint. Do not match flat-faced flanges to raised face flanges.

Threaded Joints

The valves are supplied with taper threads and, with the use of a thread sealant will give a pressure tight seal. To avoid distortion of the valve when fitting and tightening pipe, the valve must be held securely using the flats provided at the end of the valve to which the pipe is being fitted. Care should be taken to avoid 'pipe ending'. This is a condition that occurs when the pipe is screwed in too far resulting in distortion to the valve seat. The male thread on the pipe must have fully formed, undamaged threads.

6.32 Piping connection to Valves and Equipment:

- a. DN50 and smaller: 2070 kPa brass seat unions for steel piping and with heavy semi-flushed brass unions on copper piping.
- b. DN65 and larger: Flat face welding neck flanges for pressure 860kPa and less; raised face welding neck flanges for pressure above 860kPa.

6.33 Install strainers as indicated on the approved drawing.

6.34 Where piping crosses a building expansion joint approved expansion bellows or couplings shall be installed as per the manufacturer's instructions.

6.35 Check to ensure that the correct type and size of gaskets have been installed at all flanged joints and that the bolt type, size and length are correct.

6.36 On completion of the works all elements of the installation shall be checked to ensure the installation is in compliance with the specifications.

6.37 Ensure all field engineering changes are approved and noted on the drawings as "Red Lined". All additional vents and drains shall be red Lined on the drawings. Red Lined drawings shall be returned to the engineering department for the production of "As Built" drawings.

6.38 Prior to Pressure testing the system shall be inspected and as necessary a snag /punch list issued by the QA/QC department. On satisfactory completion of the punch list, the client will be requested to inspect the works.

6.39 Only when the client has inspected and such punch items as raised by the client cleared and approval given for leak testing, can such testing proceed. An in-house test of the system will be performed prior to inviting the client to inspect the test for record purposes.

6.40 On satisfactory testing of the system, it shall be released for insulation. Insulation should not be compressed with support and installation procedure for insulations should be as per manufacturer's recommendations.

6.41 Provide space to permit insulation applications as per approved material submittal and Approved Shop drawings insulation detail.

6.42 Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

6.43 Ensure all the piping installation should follow the clearance from pipe to pipe and service to services as per Approved Shop drawings or QCS-2010

6.44 Identifications/Labels for Chilled water pipe works as follows:

- a. Identifications Labels for Chilled water pipe works services should be as per Approved Material submittal/Shop Drawings, Project Specifications and Manufacturers recommendations.
- b. Identifications labels shall with stand climatic conditions. The Size, Font and Colours should be as per Approved Material Submittal, Project Specifications and Manufacturers recommendations.
- c. Chilled water(Supply/Return) should have their own identifications with flow direction mark for future maintenance
- d. Installations of Identifications labels should be as per Manufacturers recommendations.

WATER PRESSURE TEST

A. GENERAL

- a) Prior to water pressure test WIR will be raised as per project requirements for a approval of installation of piping work. Inspection request for testing will raised with piping portion highlighted on drawing plan offered for testing inspection.
- b) Check all supports are installed as per approved drawings and specifications
- c) Chilled water piping shall be testing should be 1.5 times of working pressure for minimum 2 hours and final testing with complete system should be for 4 hours if in case of drops the leak points should indentified and same replace with new fittings and repeat the procedure and after conforming offer for Inspections.
- d) Estimate the piping volume and make arrangement for required quantity of clean water.
- e) Trained Personnel will conduct the test monitored by a responsible site engineer and safety department.
- f) Arrange for test plug, temporary piping / hose pipe connections for filling and draining the water.
- g) Strict and close supervision is necessary before, during, and after the test so to minimize water damage and/or unnecessary stains to finished items within the confines of testing location.
- h) Always coordinate with safety and construction departments for a safe and methodical conduct of testing works. All other MEP discipline supervisory staff shall be informed by concerned site engineer before carrying out the tests for precautionary measures to protect other MEP services.

B. SETTING – UP OF EQUIPMENTS

- a) Place visible signage i.e. **“System Under Pressure”**, **“Keep Away”**, **“Danger”**, **“Caution”**
- b) Warning notices and barricades (if deemed necessary) will be used to identify the system under test.

C. PROTECTION FROM WATER DAMAGE

- a) Eliminate possible sources of water spillages. Where potential sources of leakage during the test, such as pipe to fitting joints, is above or nearby a finished item, provide an adequate protective shield to minimize damage due to water.
- b) Furnish adequate number of personnel during the filling up with water to the pipes under test in monitoring pipe joints, so to provide early warning of any leaking point, with two - way radio and working flashlights.
- c) When a leaking point is known, immediately inform the site supervisor depressurized the pipelines under test.
- d) Inform Client to examine the damaged coating section of pipe before and after

repair.

D. REPAIR OF LEAKS

- a) During initial filling, employ sufficient man power to monitor the entire length of piping system for possible leakages.
- b) If leakages are observed, arrest the leakages immediately. If leakages are major, isolate the leaking portion with nearest isolating valve and / or stop the water filling.
- c) Rectify the leakages and again fill the water.
- d) Examine clearly the source of noted leak. If the leak is coming from joints/fittings, drain the pipeline and check the joints/fittings of each pipe. Also check the fitting for any scratch or internal surface damage. Replace the fitting if necessary.
- e) In some cases, leaks come from a pipe end plug. Drain the pipeline and unscrew the plug. Examine closely its threaded, if damage, replace such plug.
- f) Physically inspect the entire circuit for any leaks. If any leaks are detected then they are to be attended prior to proceeding further.
- g) Leaks and repairs (if any) will be repaired as necessary and pipe work will be retested.
- h) Repeat the leak test procedure after clearing the leaks (if any).
- i) Consultant shall be notified in advance, as per agreed procedures and/or contract requirements, to witness the test by issuing an inspection request.

E. TESTING WITNESS BY THE CONSULTANT

- a) Site Engineer shall ascertain that the pipeline under test is leak proof while coordinating with QC for the consultant site inspection and/or witnessing the test.
- b) QC engineer shall inform the consultant for the testing being conducted. The consultant shall, on his discretion, witness the whole testing process up to satisfying the design and specification requirements.
- c) All tests result shall be recorded in the format as per approved QC procedure / documentation.

F. DISPOSAL OF TEST MEDIUM

- a) Provide a safe and adequate disposal of test water after successful water pressure test.

Make sure that test water disposal is carried out without damaging any finished item, and to ascertain that it will not cause any untoward incident

8. RESPONSIBILITY

All personnel engaged in the installation of Chilled water Piping System activity shall be adequate experience in their respective discipline

- a. **Construction Manager** is responsible for the overall works.
- b. **Site Engineer, Surveyor and Foreman** is responsible for the installation activities accordance with the scope of work, approved drawings, related specification and HSE requirements implementation.
- c. **QA/QC Engineer** shall ensure that all works are carried out strictly in accordance with approved method statement, and Inspection and test plan.
- d. **Safety Engineer, Safety Officer, Safety Assistant** shall ensure that works are carried out in accordance to approved method statement, Risk assessment and control measures.

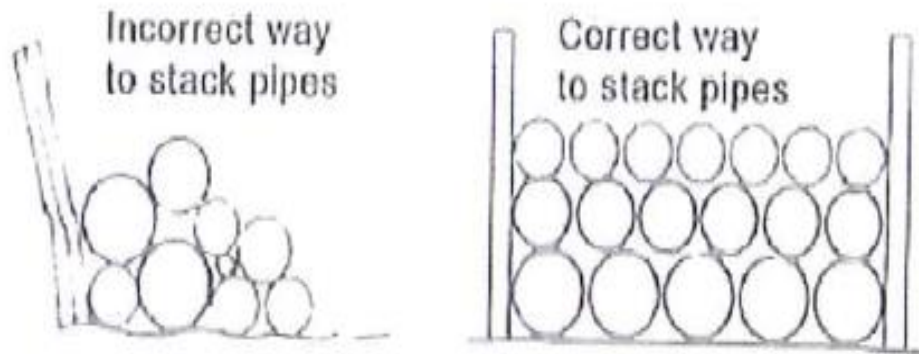
9. ENGINEERING

- a. Ensure that the shop drawings issued to site are approved and latest.
- b. Shop drawings shall follow the IFC drawings, project specification requirements and local authorities' codes and regulations.

10. MATERIALS

- a. In this method statement following materials shall be used:
 - Chilled water pipes & fittings (pipes & fittings).
 - Valves, strainer, air vent and accessories.
 - Support (Threaded rod, clamps, nuts/bolts, jutes, tefflon tapes etc).
 - Identifications.
 - Sleeves (penetration).
- b. Material will be delivered at site in undamaged condition, in manufacturer's packaging, with identifying labels intact and legible.
- c. All related documents i.e. delivery notes, country of origin, bill of landing and test certificates shall be available along with materials.
- d. Materials will be off loaded according to manufacturer's recommendations.
- e. Pipes or fittings will not be drop or drag.
- f. Pipes and fittings will be offloaded in our lay down area prior to transport to site.
- g. The storage area must be flat. The ground must not be marshy or unstable and it must not contain any corrosive material.

- h. Timber supports of suitable size shall be placed at equal distance below the Chilled water pipes.
- i. Pipes shall be stacked on a flat surface free from any sharp objects and shall be given adequate supports at all times.
- j. While stacking it shall be ensured that pipes of bigger sizes will be placed at the bottom and smaller sizes at the top.



- k. Pipes can be stacked as per any following case, shown in below:



- l. Pipes shall be protected from direct sunlight as per manufacturer's recommendation, where ever applicable.
- m. While handling the pipes care shall be taken as per manufacturer recommendations to avoid damage to pipe coating.
- n. Ends caps will not removed from all pipes until taken out for installation.
- o. Delivery of chilled water pipes and fittings will be checked / Inspected by QC engineer to ensure all items on the delivery note are correct prior to signing. Any shortage or damaged items should be recorded on the delivery note and damaged materials will store separate with identification tag or shall be removed from site.
- p. Upon delivery of materials at contractor's site stores, inspection will be offered for Client approval.

11. PLANT AND EQUIPMENT

- a) Pipe Cutter
- b) Paint brush
- c) Measuring Tape, Plum bob, chalk line, Nylon string line.
- d) Ball peen hammer
- e) Ladder
- f) Spirit Level
- g) Pipe fitter standard tool box
- h) Socket spanner
- i) Screw driver
- j) Test Plugs, end caps
- k) Ratchet
- l) Water level
- m) Square drive Ratchet spanner
- n) Box spanner
- o) Allen socket adaptor
- p) Calibrated torque wrenches
- q) Electric impact screw driver

12. HEALTH, SAFETY & WELFARE

- a. All safety rules & regulation for the project shall be adhered to at all times. Third party certified equipment's and competent personnel to be deployed. Required permit to be secured. Risk assessment and risk control measures are to be in place.
- b. All site personnel shall be properly equipped with protective clothing and tools appropriate for their duties and shall ensure that work area facilities are safe prior to the commencement of work activities.
- c. All individual tasks mentioned in this method statement will be subject to individual, risk assessments and toolbox talks by safety officer in situ before work commence on a daily basis.
- d. No refuelling whilst equipment is running. To be done only at designated area on the field.
- e. Provide banks man or spotter during equipment maneuvering and during hauling of excavated materials.
- f. All lifting tackle will be inspected before use.
- g. All personnel will have undergone the applicable safety training and wear PPE i.e., Safety Helmet, Steel-Toed Safety Boots or Shoes, Safety Glasses and coveralls as the minimum requirement and gloves and High Vests where necessary.

h. For dusty working environment dust masks shall be used.

13. ENVIRONMENT

Works will proceed under controlled environment. Control measures identified in the risk assessment to be in place. Significant aspect highlighted to dust and contamination during dewatering. Dust suppression by means of water sprinkling and dewatering method statement to be followed.

14. COMMUNICATION AND TRAINING

After approval of this method statement, a pre-construction meeting to be held among the supervisory staff involved. Trainings mentioned in the risk assessment to be followed.

15. QUALITY CONTROL

Significant stages of work shall be monitored and ensured to be enforced by the concerned as per the Inspection and Test Plan attached to this document. Inspection request to be submitted to the Engineer a day prior to inspection schedule.

Quality Control tests on performed work and materials shall be in accordance with Project Specification

16. ATTACHMENTS

- ITP
- Pressure Test Report
- HSE Risk Assessment

ATTACHMENTS