

CLEANING OF HVAC PIPING

1. GENERAL

1.1 Scope

- .1 Provide for cleaning and degreasing of hot water heating systems.
- .2 Provide all necessary equipment and chemicals to treat hot water heating systems.
- .3 Provide for flushing and disinfection of domestic water systems.

1.2 References

- .1 American Society for Testing and Materials
 - .1 ASTM E 202, Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

1.3 Waste Management and Disposal

- .1 Dispose of unused cleaning solutions at official hazardous material collections site approved by the Contract Administrator.
- .2 Do not dispose of unused cleaning solutions into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.
- .3 Remove from Site and dispose of packaging materials at appropriate recycling facilities.
- .4 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin for recycling in accordance with Site waste management program.

1.4 Quality Assurance

- .1 Provide services of a chemical treatment agency to perform the cleaning and degreasing operation on-site and submit written reports on all situations found, actions taken and final results.
 - .1 Acceptable Agency: Betz Dearborn, Pace Chemicals Ltd., IPAC Chemicals Ltd.
- .2 Inform the Contract Administrator fifteen (15) working days prior to commencing of Work.
- .3 Provide chemical treatment as specified herein and provide written reports. Reports shall be signed by the chemical treatment agency and Contractor.
- .4 Chemical treatment agency shall provide direction and assistance in the degreasing, cleaning and chemical treatment of all piping systems.
- .5 Use of the permanent mechanical systems for pumping or heating of cleaning and dilution solutions is not permitted. Permanent systems shall be isolated and portable pumps and boilers utilized for the duration of the cleaning process. Permanent equipment shall be flushed, degreased and chemically treated independent of the piping systems.

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1.5 Submittals

- .1 Submit Shop Drawings with complete description of proposed chemicals, quantities, calculations, procedures, test kits and equipment to be supplied. Along with product Shop Drawings, provide copies of data sheets, procedure instructions and analysis reports to be used on this Project.
- .2 Include with the Shop Drawings Material Safety Data Sheets (MSDS) for all chemicals to be used.
- .3 Provide written reports to the mechanical contractor and Contract Administrator containing procedure of system cleaning and degreasing, giving times, dates, conditions of water and problems and actions encountered.
- .4 Submit written reports to the mechanical contractor and Contract Administrator containing results of tests taken after completion of chemical treatment.

2. PRODUCTS

2.1 Materials

- .1 Provide sufficient chemicals to treat and test the systems from the time of activation and acceptance of the building for the first year of operation by the City.
- .2 Materials which may contact finished areas shall be colourless and non-staining. Chemicals used must comply with environmental and health standards applicable to the usage on this project.
- .3 System Cleaner: Alkaline compound which in solution removes grease and petroleum products.
- .4 Close System Treatment: Sequestering agent to reduce deposits and adjust pH, and a corrosion inhibitor.

2.2 Equipment

- .1 Solution Pumps: Provide positive displacement diaphragm type metering pumps for adding chemicals. Pumps shall have an adjustable flow rate and be suitable for chemicals to be pumped. Pumps shall be self flushing. Provide pumps with plastic solution tanks complete with agitator, pump mounting, cover, provision for fill line and pump strainer. Size the pumps and tanks to permit operation for three (3) days at 50% pump capacity without refill of tanks. Provide agitator motor with terminals and junction box for electric wiring.

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- .2 Provide chemical pot feeder with a minimum of 10 L (2.6 USgal) capacity, semi-sphere top and bottom, one pot feeder per system, located as shown on system schematics and floor plans. If location is in question obtain clarification from the Contract Administrator prior to installation.

3. EXECUTION

3.1 Cleaning Hydronic Systems

.1 Timing

- .1 Systems to be operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.

3.2 System Cleaning

- .1 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.

.2 Cleaning procedures:

- .1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:
 - .1 Cleaning procedures, flow rates, elapsed time.
 - .2 Chemicals and concentrations to be used.
 - .3 Inhibitors and concentrations.
 - .4 Specific requirements for completion of Work.
 - .5 Special precautions for protecting piping system materials and components.
 - .6 Complete analysis of water to be used to ensure water will not damage systems or equipment.

.3 Conditions at time of cleaning of systems

- .1 Systems to be free from construction debris, dirt and other foreign material.
- .2 Control valves to be operational, fully open to ensure that terminal units can be cleaned properly.
- .3 Strainers to be clean prior to initial fill.
- .4 Install temporary filters on pumps not equipped with permanent filters.
- .5 Install pressure gauges on strainers to detect plugging.

.4 Report on Completion of Cleaning

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- .1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.
- .5 Hydronic Systems:
 - .1 Fill system with water, ensure air is vented from system.
 - .2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).
 - .3 Use water meter to record volume of water in system to +/- 0.5%.
 - .4 Add chemicals under direct supervision of chemical treatment supplier.
 - .5 Closed loop systems: circulate system cleaner at 60°C for at least 36 h. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.
 - .6 Flush velocity in system mains and branches so as to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.
 - .7 Add chemical solution to system.
 - .8 Establish circulation, raise temperature slowly to 82°C minimum. Circulate for 12 h, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38°C. Drain as quickly as possible. Refill with clean water. Circulate for 6 h at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

3.3 Start-up of Hydronic Systems

- .1 After cleaning is completed and system is filled:
 - .1 Establish circulation and expansion tank level, set pressure controls.
 - .2 Ensure air is removed.
 - .3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.
 - .4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.
 - .5 Clean out strainers repeatedly until system is clean.
 - .6 Commission water treatment systems as specified in Section 23 08 00 - Commissioning of Mechanical.
 - .7 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.

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- .8 Repeat with water at design temperature.
- .9 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.
- .10 Bring system up to design temperature and pressure over a 48 hour period.
- .11 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .12 Adjust pipe supports, hangers, and springs as necessary.
- .13 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.
- .14 If sliding type expansion joints bind or if bellows type expansion joints flex incorrectly, shut down system, re-align, and repeat start-up procedures.
- .15 Re-tighten bolts, etc. using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.
- .16 Check operation of drain valves.
- .17 Adjust valve stem packings as systems settle down.
- .18 Fully open all balancing valves (except those that are factory-set).
- .19 Check operation of over-temperature protection devices on circulating pumps.
- .20 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

END OF SECTION