PROCESS INDUSTRY PRACTICES

REAFFIRMATION W/EDITORIAL REVISION
August 2017

Piping

PIP PNSC0035
Steam Tracing Specification

PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

In an effort to minimize the cost of process industry facilities, this Practice has been prepared from the technical requirements in the existing standards of major industrial users, contractors, or standards organizations. By harmonizing these technical requirements into a single set of Practices, administrative, application, and engineering costs to both the purchaser and the manufacturer should be reduced. While this Practice is expected to incorporate the majority of requirements of most users, individual applications may involve requirements that will be appended to and take precedence over this Practice. Determinations concerning fitness for purpose and particular matters or application of the Practice to particular project or engineering situations should not be made solely on information contained in these materials. The use of trade names from time to time should not be viewed as an expression of preference but rather recognized as normal usage in the trade. Other brands having the same specifications are equally correct and may be substituted for those named. All Practices or guidelines are intended to be consistent with applicable laws and regulations including OSHA requirements. To the extent these Practices or guidelines should conflict with OSHA or other applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by the Practice.

This Practice is subject to revision at any time.

PUBLISHING HISTORY

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1. Scope

This Practice provides requirements and details for the design and installation of steam tracing systems.

This Practice describes minimum requirements for design, materials of construction, installation, leak testing, and inspection of steam tracing systems for process fluids that require heating to prevent condensation, freezing, unacceptable viscosity, crystallizing, separation, or temperature control. This Practice provides requirements for equipment, piping, and instruments for steam tracing including steam supply piping, steam tracers, tracer traps, and condensate collection.

Comment: Use of this Practice for contractual purposes requires the purchaser to make specific choices and assemble additional supporting documents. Listing of or reference to supporting documents within this Practice does not imply suitability for specific designs.

2. References

Applicable parts of the following Practices and industry codes and standards shall be considered an integral part of this Practice. The edition in effect on the date of contract award shall be used, except as otherwise noted. Short titles are used herein where appropriate.

2.1 Process Industry Practices (PIP)

- PIP INSH1000 - *Hot Service Insulation Materials and Installation Specification*
- PIP PN50SD0L01 - *Piping Material Specification 50SD0L01, 316/316L Stainless Steel, 0.000" C.A., Process Tubing*
- PIP PNF0200 - *Vents, Drains, and Instrument Connection Details*

2.2 Industry Code and Standards

- ASTM B68 - *Standard Specification for Seamless Copper Tube, Bright Annealed*
- ASTM B75 - *Standard Specification for Seamless Copper Tube*
- ASME B31.3 - *Process Piping*

3. Definitions

air convection tracing: Tracers attached to the pipe without the use of heat-transfer compounds. Tubing may be bare or have a polymer jacket. A tracer is attached to the pipe with high-temperature tape, tie-wires, or bands. Heat transfer is by means of air convection movement of heat in the annular space between the thermal insulation and the heated pipe.

ambient temperature: The temperature of the air in the surrounding atmosphere

condensate: Water that is formed in the steam tracer tube if latent heat from the steam is given up to the heated pipe or equipment

conduction tracing: Tracer tube that is thermally bonded to the heated pipe or equipment by heat-transfer compound if the primary heat transfer means is by conduction directly into the metal wall of the pipe or equipment being heated

dry steam: Steam containing no moisture; either saturated or superheated

heat loss: The rate at which heat flows from a hot surface, such as a process pipe to a cooler atmosphere, usually stated in Btu/h feet (kcal/m) of length of pipe. The heat loss is typically from the pipe through the pipe insulation to the cooler atmosphere, but can also be from conduction through hangers and supports.

heatsink: A surface or mass such as a flange or valve that is at a lower temperature than the warm pipe

heat tracing: The application of hot liquid, vapor, steam tracing tubes, electric heating cables, or tapes to pipes, fittings, valves, pumps, tanks instruments, or instrument lines to offset the heat loss through thermal insulation

heat-transfer compound: A heat-conductive material with highly efficient thermal characteristics for use on any steam or fluid tracer tube. The heat-transfer compound is used to establish a broad, heat-conductive contact surface, for heat-transfer purposes, between the tracer tube and the surface to be heated.

isolated tracing: Tracing for sensitive piping and processes where the tracer tube is separated from the pipe or equipment by a low conductive material. This tracing includes preinsulated tubing with a polymer protective jacket. Heat transfer is primarily by air-convection movement of heat in the annular space between the thermal insulation and the heated pipe.

owner: The party who owns the facility wherein the steam tracing system will be used

saturated steam: Steam at the temperature and pressure at which vaporization takes place for that pressure and is free of moisture

steam and condensate manifolds: Modular prefabricated steam supply and condensate collection units designed specifically for steam tracing circuits

steam tracing: A tube or small pipe carrying steam, which is placed parallel and attached to the surface of the pipe or equipment to be heated. The tube is referred to as the “tracer,” “tracer tube,” or simply “tracing.”

supplier: The party responsible for designing, providing the materials for, and installing the insulation system

4. Requirements

4.1 Design

4.1.1 Tracing System Temperature Control

Proper temperature control based on an assessment of the actual system shall be evaluated.

4.1.2 Steam Supply Design/Layout

4.1.2.1 Steam used to supply steam tracing shall be from a constant source that can be maintained independently of plant operations.

4.1.2.2 If possible, the steam supply shall be taken from a source that is continuously available even during normal shutdown periods.

4.1.2.3 Steam shall be distributed at the highest pressure and reduced to the design requirements of the tracer system using a pressure-reducing valve.

4.1.2.4 To help ensure the quality of the tracing steam, all steam supply manifolds and tracer circuits shall have a separate steam trap station installed.

4.1.2.5 Tracing steam shall be dry saturated steam at a pressure that provides the tracing design heat input requirements.

4.1.2.6 The tracing supply header shall be adequately sized to provide the maximum tracer design load (steam pounds per hour) and trapped at its low points.

4.1.2.7 The number of tracer connections on a manifold shall be 12 maximum. A minimum of two of these connections shall be designated as spares.

4.1.2.8 If possible, vertical type manifolds shall be provided.

4.1.3 Steam Trap Selection

Comment: Effective removal of condensate and air is essential to achieving uniform temperatures and maximum heat-transfer rates from steam tracing circuits.

4.1.3.1 Steam trap manufacturers shall be consulted regarding the selection and sizing of the steam traps as well as for sizing and proper installation techniques to provide trouble-free winter performance.

4.1.3.2 Preassembled steam trapping stations with universal connectors are preferred.

4.1.3.3 The type of traps selected shall be in accordance with the design and efficiency requirements of the tracing system.

4.1.4 Steam Pressure Selection

The following criteria shall be considered when selecting the steam pressure that can be utilized to meet the steam tracing design requirements:

a. Desired maximum allowable number of tracers on a line

b. Desired maximum allowable length of the tracer tubing that is connected to the line

c. Elevation differences between the location of the steam manifold and traced piping

d. Sensitivity of process fluid or piping material to conduction or localized heating

e. Plant site environmental design criteria (summer and winter design temperatures and mean wind velocity)

f. Pressure differential between steam trap discharge and the condensate return header including any static pressure head

g. Pressure of plant steam that is dedicated for steam tracing

h. Required maintenance temperatures (allowable minimum/maximum temperature range for traced piping)

i. Safety factor for drops in steam pressure

j. Size and desired maximum length of all steam supply and condensate return leads