

**REQUIREMENTS FOR INSTALLATION OF STEAM PIPING IN SINGAPORE
(WORKPLACE SAFETY & HEALTH (GENERAL PROVISIONS) REGULATIONS, REGULATION 34)**

All steam piping in Singapore shall be designed, fabricated and installed in compliance with an approved code. It is the duty of the factory occupier to ensure that these code requirements and the inspection guidelines below are complied with. The relevant codes for steam piping issued by the American Society of Mechanical Engineers and the British Standards Institute is acceptable for use in the design of steam piping. Use of other piping codes will require prior approval from the Commissioner of Workplace Safety & Health.

Design Calculations of Piping

The owner/user has to ensure that

1. The piping is safe for use at the temperature and pressure intended and design is in compliance with an acceptable piping code.
2. The pipes and pipe components used must be certified to the relevant pressure-temperature ratings. Only materials listed in the appropriate codes are to be used.
3. The owner may choose not to carry out a design review if he is satisfied that his piping is safe for use at the temperature and pressure intended, and if the steam piping meets the following criteria:
 - a) design temperature not exceeding 370 deg C (700 deg F);
 - b) the total pipe system length not exceeding 10 m and the spacing between supports not exceeding 3 m;
 - c) pipes and pipe components used are of NPS 2" (DN50 mm) to NPS 12" (DN300 mm), and
 - d) for pipe system with threaded connections and a design pressure not exceeding 160 psi (11 bars), the pipes and pipe components used are of Schedule 80 rating and above; or
for pipe system without threaded connections and a design pressure not exceeding 350 psi (24 bars) the pipes and pipe components used are of Schedule 40 and above.

APPLICATION

The requirements for application for the various categories of piping are stipulated in the table below:

Category of piping (Design Pressure or Design Temperature)	Requirement for Application to MOM?	Information/Documents required to be submitted for Application			Remarks
		Design Pressure & Design Temperature	Name of Proposed TPI or pAE	Design Calculations & Drawings by PE	
Low Pressure (LP) Less than 500 kN/m ² (5 Bar)	No	No	No	No	Occupier is responsible to ensure the installation of piping is surveyed by a suitable competent person (may be an in-house inspector)^ who shall ensure the inspection requirements stipulated in Appendix 1 are carried out. Approved design and drawings, and records of all inspections and tests to be retained by occupier and made available for inspection by the Workplace Safety & Health Inspector. ^ Occupier may choose to engage Approved 3 rd Party Inspector (TPI) or suitably qualified private Authorised Examiner (pAE) in place of the in-house inspector.
Medium Pressure I (MP1) 500 – 1500 kN/m ² (5 - 15 Bar) where the piping design data falls within item No. 3 (a-d) of the <u>Design Calculations of Piping</u> above.	No	No	No	No	Occupier is responsible to ensure the installation of piping is surveyed by a suitable competent person (may be an in-house inspector)^ who shall ensure the inspection requirements stipulated in Appendix I are carried out.. Approved design and drawings, and records of all inspections and tests to be retained by occupier and made available for inspection by the Workplace Safety & Health Inspector. ^ Occupier may choose to engage Approved 3 rd Party Inspector (TPI) or suitably qualified private Authorised Examiner (pAE) in place of the in-house inspector.

Category of piping (Design Pressure or Design Temperature)	Requirement for Application to MOM?	Information/Documents required to be submitted for Application			Remarks
		Design Pressure & Design Temperature	Name of Proposed TPI or pAE	Design Calculations & Drawings by PE	
Medium Pressure II (MP2) 500 – 3500 kN/m ² (5 - 35 Bar) that does not fall under MP1.	Yes	Yes	Yes (see note 3 below)	No	3 rd party inspector (TPI) or private authorised examiner (pAE) engaged must be pre-approved by MOM before carrying out the survey. The appointed inspector is to review and approve the piping design and drawing, and to carry out necessary examination and testing of the piping as stipulated in Appendix I.
High Pressure (HP) Above 3500 kN/m ² (35 Bar) or above 400 °C	Yes	Yes	Yes (see note 3 below)	PE endorsed calculations and drawings to be only when requested by MOM inspector (if appointed, see Appendix I)	3 rd party inspector (TPI) or private authorised examiner (pAE) engaged must be pre-approved by MOM before carrying out the survey. The appointed inspector is to review and approve the piping design and drawing, and to carry out necessary examination and testing of the piping as stipulated in Appendix I and any other requirements stipulated by MOM inspector.

1. If the steam piping installation is part of an installation for steam boiler or steam receiver, the above application and documents may be submitted together with the application for registration and approval for use of the pressure vessel. Applications can be made to “The Commissioner of Workplace Safety & Health, Occupational Safety & Health Division, 18 Havelock Road #03-02, Singapore 059764.
2. The Department reserves the right to require the installation of the steam piping to be surveyed by inspectors appointed by the Department.
3. The occupier must submit a written declaration that he has evaluated the proposed inspector (TPI or pAE as the competent person for the job) and is satisfied that the inspector is competent and has the relevant experience to carry out the specified survey work and is able to provide the necessary attention and survey coverage sufficiently for the time period of the project applied for.

The updated lists of the local inspection agencies in Singapore authorised to provide 3rd party inspection services for piping works and the private authorised Examiner are available at MOM’s website:
http://www.mom.gov.sg/publish/momportal/en/communities/workplace_safety_and_health.html (under “List of Accredited Professional Services).

Inspection Requirements for Steam Piping

In-house inspectors, private authorised Examiners and 3rd party inspectors, in surveying piping installation, must carry out the following:

- a) Review and approval of the piping design to meet codes indicated above, including pressure design of components, branch connection considerations, analysis of piping components and design of pipe supporting elements.
- b) Identification and verification of all materials
- c) Review welding procedure specification
- d) Review welding procedure qualification
- e) Review welders' qualification
- f) Review qualifications of personnel conducting Non Destructive Examination (NDE)
- g) Review Non Destructive examination procedures
- h) Review Non Destructive examination results
- i) Witness hydrostatic pressure tests
- j) Put up a full report on piping installation survey and certify in writing that all welding and NDE are carried out according to required standards and that the piping is of sound material, good construction, free from defects and meets with required standards.

On top of items a) to j) above the Inspectors must carry out the survey and in-progress inspections as indicated in the 'Minimum Inspection Requirements' in the table below, and any other additional inspections necessary (either stipulated in the Design Codes used or as required by the Commissioner of Workplace Safety & Health).

Category of piping (Design Pressure or Design Temperature)	Requirement for Inspector to survey installation	Minimum Inspection Requirements to be carried out by inspector	Applications or Submissions to MOM	Remarks
Low Pressure (LP) Less than 500 kN/m ² (5 Bar)	Occupier is to appoint an inspector whom he had determined to be competent. The appointed inspector may be an in-house inspector.	<ul style="list-style-type: none"> ■ Inspection by the appointed inspector ■ Visual examination* for all welds ■ Hydrostatic test 	Nil	<p>The appointed inspector is to review and approve the piping design and drawing, and to carry out necessary examination and testing of the piping stipulated in this Appendix.</p> <p>Approved design and drawings, and records of all inspections and tests to be retained by occupier and made available for inspection by the Workplace Safety & Health Inspector.</p>

Category of piping (Design Pressure or Design Temperature)	Requirement for Inspector to survey installation	Minimum Inspection Requirements to be carried out by inspector	Applications or Submissions to MOM	Remarks
Medium Pressure (MP) 500 – 3500 kN/m ² (5 - 35 Bar)	Occupier is to engage an Approved 3 rd party inspector (TPI) or a suitable private authorised examiner (pAE) to carry out survey of the piping.	<ul style="list-style-type: none"> ■ Inspection by appointed inspector. ■ Visual examination* for all welds ■ Hydrostatic test ■ If the piping is using Schedule 60 and above, the following non-destructive test is to be carried out before hydrostatic test: <ul style="list-style-type: none"> i) Schedule 60 pipe: full radiographic examination (RT) [Note 5] on all butt welds and welded branch connections [Notes 2 & 3] ; for pipes of NPS 18 (DN450) and above; ii) Schedule 80 pipe: full RT for pipes of NPS 14 (DN350) and above; iii) Schedule 120 pipe : full RT for pipes of NPS 10 (DN250) and above; iv) Schedule 160 pipe: full RT for pipes of NPS 8 (DN200) and above. 	<p>Notification to MOM to engage TPI or suitable pAE# (see APPLICATION above)</p> <p>Survey report of the piping installation prepared by the appointed inspector to be submitted to MOM#.</p> <p>#Exemption from application and submission is given to MP1 category (see APPLICATION)</p>	<p>3rd party inspector or private authorised examiner engaged must be pre-approved by MOM.</p> <p>The appointed inspector is to review and approve the piping design and drawing, and to carry out necessary examination and testing of the piping stipulated in this Appendix.</p>

Category of piping (Design Pressure or Design Temperature)	Requirement for Inspector to survey installation	Minimum Inspection Requirements to be carried out by inspector	Applications or Submissions to MOM	Remarks
<p>High Pressure (HP) Above 3500 kN/m² (35 Bar) or above 400 °C</p>	<p>Occupier is to engage an Approved 3rd party inspector (TPI) or a suitable private authorised examiner (pAE) to survey of the piping.</p> <p>Commissioner may appoint an MOM Inspector to supervise the survey of piping installation, if deemed necessary.</p>	<ul style="list-style-type: none"> ■ Inspection by appointed inspector. ■ Visual examination* for all welds ■ Non-Destructive Testing <ol style="list-style-type: none"> 1. Full radiographic examination (RT) [Note 5] on all <ol style="list-style-type: none"> a) Butt welds for pipes over NPS 2 (DN50) b) Welded branch connections [Notes 2 & 3] for branch piping over NPS 4 (DN100). 2. Full Magnetic particle examination (MT) or liquid penetrant examination (PT) [Note 5] for <ol style="list-style-type: none"> a) Butt welds of NPS 2 (DN50) and less b) Welded branch piping of NPS 4 (DN100) and less c) Fillet, socket, attachment, and seal welds (Note 4) <ul style="list-style-type: none"> ■ Hydrostatic test 	<p>Notification to MOM to engage TPI or suitable pAE (see APPLICATION above)</p> <p>Survey report of the piping installation prepared by the appointed inspector to be submitted to MOM.</p>	<p>3rd party inspector or private authorised examiner engaged must be pre-approved by MOM.</p> <p>The appointed inspector is to review and approve the piping design and drawing, and to carry out necessary examination and testing of the piping stipulated in this Appendix and any other requirements stipulated by MOM inspector (if appointed).</p>

NOTES:

- (1) The thickness of butt welds is defined as the thicker of the two abutting ends after end preparation.
 - (2) RT or UT of branch welds shall be performed before any non-integral reinforcing material applied.
 - (3) In lieu of volumetric examination (RT, UT) of welded branch connections when required above, surface examination (PT, MT) is acceptable and, when used, shall be performed at the lesser of one-half of the weld thickness or each ½ in.(12.5mm) of weld thickness and all accessible final weld surfaces.
 - (4) Fillet welds not exceeding ¼ in. (6 mm) throat thickness which are used for the permanent attachment of non-pressure retaining parts are exempt from the PT or MT requirements of the above Table.
 - (5) All RT, UT, MT, PT and other NDE are to be carried out by SINGLAS Accredited Testing Companies and issued with SINGLAS approved reports.
- * ASME B31.1 defines Visual Examination as the observation of whatever portions of components, joints, and other piping elements that are exposed to such observation either before, during, or after manufacture, fabrication, assembly, erection, inspection, or testing. This examination may include verification of the applicable requirements for materials, components, dimensions, joint preparation, alignment, welding or joining, supports, assembly, and erection.