

Snowy Technical Standards

SHL-MEC-103

Piping Fittings and Supports

Subject Matter Expert
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1. Executive Summary

The purpose of this Standard is to ensure a consistent approach and hence a consistent standard of Pipe and Fitting installation with each major maintenance or refurbishment contract throughout Snowy Hydro Power Stations.

This Standard is based upon a historical Technical Specification which had been developed for a Contractual Major Work.

This revision adopts the new standard format and incorporates new references and AS/NZS.

2. Scope

General requirements for Pipework in the Snowy Hydro Power Stations for:

- Cooling Water, Control Water and Drainage Water Systems – including embedded and non-embedded Pipework
- Governor Oil Systems
- Other Hydraulic Oil systems
- Turbine and Generator Guide Bearings, and
- Air Coolers

2.1. Applicable Standards

AS/NZS 1200	Pressure Equipment
AS 1345	Identification of the Contents of Pipes, Conduits and Ducts
AS 1722.2	Fastening Pipe Threads
AS 2129	Flanges for Pipes, Valves and Fittings
AS 2528	Bolts, Stud Bolts & Nuts for Flanges
AS 4041	Pressure Piping
AS 4458	Pressure Equipment - Manufacture
AS/NZS 4680	Hot Dip Galvanised (zinc) Coatings on Fabricated Ferrous Articles
ASME B31.1	Process Piping
ASME B31.3	Process Piping

ISO 2604 Parts 2 & 3	Steel Products for Pressure Purposes
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3. Definitions

Technical Specialist	The relevant Snowy Hydro Asset Engineer
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4. Technical Requirements

4.1. General

- a) Specific design requirements of Pipes and Valves are specified in the Functional Specification. The clauses below generally apply where they have not been over-ridden in the Functional Specification.
- b) Unless otherwise noted in the Functional Specification, all pipes for oil, water and air service shall conform to AS 4041-2006 Pressure Piping.
- c) Thread forms shall be chosen that are appropriate for service in the specified Operating Pressures/conditions.
- d) The working pressure of any system shall be taken as the maximum pressure to which it can be subjected in service including water-hammer and safety or relief valve blow-off pressure where appropriate.
- e) Except as permitted by paragraphs i), j), & k) of this specification, joints in pipes shall be bolted flanges in accordance with AS 2129 Flanges for pipes, valves and fittings, with bolting to AS 2528 bolts, stud bolts and nuts for Flanges and other high and low temperature applications.
- f) Flanges for working pressures of 1720 KPa and above shall be weld neck type. Sealing shall be by toroidal rings. The rings may be contained in separate plates clamped between the Flanges.
- g) Flanges for working pressures below 1720 KPa shall be slip-on or weld neck type. Sealing shall be by flat Gaskets.
- h) Socket welding flanges and fittings shall not be permitted except for hydraulic services. Socket welding must be as defined in an appropriate Australian Standards (AS 4041 & AS 4458), or equivalent.
- i) Couplings of approved proprietary type may be used as alternatives to flanges in accordance with manufacturer's ratings. The use of 'Victaulic' couplings or equal instead of flanges is preferred for pipes of 50 mm nominal bore and above at working pressures not exceeding 700 KPa. Use of 'Victaulic' couplings at higher pressures requires approval by the Technical Specialist.
- j) Screwed Joints and Fittings may be used for steel pipes of not greater than 50 mm nominal bore at working pressures not exceeding 700 KPa.
- k) Pipes of 26 mm bore and less for working pressures of more than 700 KPa shall be joined by unions of approved type.

- l) Tee and angle branch connections shall be made with welding saddle type connectors or, subject to j) of this subclause, by screwed connections.
- m) Piping shall be identified in accordance with AS 1345 - Identification of the contents of pipes, conduits and ducts. The identification shall be achieved by colour and by legend. Direction of flow shall also be indicated.
- n) Identification colours shall be applied to external surfaces by painting.
- o) Installing additional embedded pipes shall be avoided to the maximum extent possible.
- p) All new (including replacement) embedded Pipework is to be pressure tested and any leaks/faults rectified prior to being grouted in to position.

The test pressure shall be 1.5 times the working pressure. Testing results must be accepted by the Technical Specialist prior to grouting.

- q) All piping shall be arranged neatly with pipe runs grouped together as far as possible (including existing runs or runs supplied by others).
- r) Piping for Compressed Air service shall conform to AS 4041 Pressure Piping.
- s) Pipes shall have continuous falls to drain points, with drain facilities fitted in accordance with the appropriate standards.
- t) All necessary modifications to existing Pipework to enable connections, interconnections, routing, and all other necessary work in order to complete and make the systems function in accordance with specification shall be performed as part of this work scope unless explicitly stated otherwise.
- u) Snowy Hydro shall not supply any tools and materials necessary for the work unless explicitly stated otherwise.
- v) Identification of Pipework, valves and associated components prior to and during the disassembly process is critical to ensure correct and efficient re- assembly. Hence, an appropriate tool such as registers and/or drawings to assist with re-installation must be undertaken:
 - of new (replacement) Pipework, Valves etc
 - of (existing) Pipework, Valves etc that has been refurbished

4.2. Cooling Water, Control Water, Drain Water - Non-embedded Pipework

- All non Stainless Steel Pipework of nominal bore of 50 mm (2") or less shall be replaced with 316L stainless steel.
- The existing Pipework that has been dismantled shall be disposed of.
- The replacement pipework, inclusive of the associated fittings, fastenings and mountings, shall be assembled and installed and pressure tested to 1.5 times the working pressure.
- All existing non-stainless steel (SS) Pipework with a nominal bore of greater than 50 mm (2") that is determined acceptable for re-use is to be managed as follows:

- It shall be dismantled, transported, grit-blasted, hot dip galvanised and reassembled back on site.
- Welding shall be done before galvanising.
- Existing Pipework shall be replaced with Pipe of the same bore size.
- New steel Pipework (not Stainless Steel) above 50 mm nominal bore shall be hot-dip galvanised

4.3. Cooling Water, Control Water, Drain Water - Embedded Pipework

All non-stainless steel Pipework with a nominal bore of 50 mm (2") or less that is grouted into enclosure walls shall be replaced with Stainless Steel pipe.

The replacement Pipework, shall be supplied, assembled and installed inclusive of all fastenings, and re-grouted within walls from where the original Pipework was removed.

The bore of all embedded Pipework (with a nominal bore greater than 50 mm (2")) shall be cleaned and provided with a protective coating. The means of cleaning and verification of successful outcome, and the method and type of coating shall be submitted to the Principal for approval. Refer also to 4.4 below

4.4. Cleaning of Embedded Pipework - Minimal requirement

The bore of all embedded Pipework (with a nominal bore greater than 50 mm (2")) shall be cleaned and provided with a protective coating. The means of cleaning, and the method and type of coating shall be approved by the Technical Specialist.

Minimum acceptable requirements are provided here as a guide and are as follows:

Immediately following the advice of the Technical Specialist that the pipes are available for inspection, the Service Provider(s) shall satisfy himself/themselves that the pipes are satisfactory for the purpose and shall rod the pipes throughout with a mandrel 3 mm less than the inside bore of the pipe followed by a wire brush.

The pipes shall then be inspected and if approved by the Superintendent the ends of pipes shall be plugged with properly prepared and shaped timber plugs until the installation is commenced. If the Service Provider is not satisfied with the condition of a pipe they shall notify the Technical Specialist immediately

4.5. Turbine and Generator Guide Bearings - Cooling Water (where Guide Bearings are cooled by water)

Inlet and outlet cooling water piping to guide bearings are to be fitted with flexible Stainless Steel hose, and the stainless steel hose shall have a high degree of mechanical protection provided by stainless steel wire braiding. This is to prevent failure of the pipe due to vibration and relative movement.

Where flexible hose already exists at the Inlet and outlet of the cooling water piping, it is to be inspected in conjunction with a Principal's Representative.

If necessary, due to signs of wear and possible imminent failure, The Technical Specialist may direct that the flexible pipe be replaced at an appropriate rate

4.6. Cooling Water, Control Water and Drain Water Valves

Where the Technical Specialist advises of the need to improve flow control, suitable flow control valves are to be used. Orifices and/or throttling of gate valves shall not be used unless explicitly stated.

All existing non stainless steel valves of 50mm nominal bore or less shall be replaced with Stainless Steel valves.

All existing stainless steel valves shall be inspected for wear and replaced only where it is not economical to repair.

NOTE: The cost of modification to Pipework (if any) to install replacement valves is to be considered in the overall evaluation.

Supply and installation of gaskets and fastening devices and any other fitting(s) necessary are included as part of the work scope.

All new and repaired valves shall be pressure tested to 1.5 times the working pressure. The test pressure shall be maintained for 30 minutes to prove the valves are drip tight.

Pressure relief valves shall be tested and set in the workshop and a tag fitted which states the set pressure and date of calibration..

4.7. Air Cooler Bleed Lines

Air cooler bleed lines, where fitted, are to be replaced with an appropriate clear piping.

The air cooler valves, where they are not stainless steel, are to be replaced with Stainless Steel valves.

All stainless steel air cooler valves are to be inspected and replaced only if not economical to repair.
NOTE: The cost of modification to Pipework (if any) to install replacement valves is to be considered in the overall evaluation.

The existing drip tray(s), where and if (they) exist, and if not made of Stainless Steel or galvanised steel, are to be replaced with a galvanised tray following approval by the Technical Specialist.

4.8. Oil Pipes, Valves and Filters

Oil filters, if fitted, shall be disassembled, cleaned, filter element replaced and reassembled.

New Gaskets shall be provided and installed.

External surfaces shall be painted and identification label fitted.

Oil flow direction shall be marked and associated valves are to be fully labelled as defined in the General Technical Requirements – General.

The oil piping shall be disassembled, cleaned, reassembled and painted. Lint free rags shall be used.

The cleaning process shall not cause corrosion to the bore of the Pipework.

The Pipework shall be stored until reassembly in such a way as to prevent corrosion and

contamination of the bore.

Upon reassembly the Pipework shall immediately be filled with oil to prevent corrosion of the bore.

All new and repaired valves shall be pressure tested to 1.5 times the working pressure. The test pressure shall be maintained for 30 minutes to prove the valves are drip tight.

Pressure relief valves shall be tested and set in the workshop and a tag fitted which states the set pressure and date of calibration.

4.9. Oil Flexible Hose

Where flexible hose does not exist, sections of the inlet and outlet oil piping between the oil cooler and the upper guide and thrust bearing which go from the foundations to the machine shall be replaced with flexible hose. This is to prevent failure of the pipe due to vibration and relative movement.

Replacement shall be performed as per Clause 5.4 of this document.

Selection and application of the Flexible Hoses shall comply with the relevant Snowy Hydro Standard SHL-MEC-111 and SHL MEC-112.

5. References

- [SHL-MEC-104](#) Valves
- [SHL-MEC-111](#) Flexible Hoses Design
- [SHL-MEC-112](#) Flexible Hoses Installation
- [SHL-MEC-113](#) Flexible Hoses Storage
- [SHL-MEC-120](#) Work Hygiene - Bearings
- [SHL-GEN-123](#) Protective Coatings