

Approval & Reception Procedure

DEE – Departamento de Estruturas e Edifícios	
Building Water Distribution System – Copper Pipes and Accessories	Document No.: ARP/DEE/010
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1 Reference standard

Regulations No. 46/96/M	Regulamento de Águas e de Drenagem de Águas Residuais de Macau (RADARM)
AS/NZS 4020:2005	Testing of products for use in contact with drinking water
BS EN 806-4:2010	Specifications for installations inside buildings conveying water for human consumption. Installation
BS 3412:1992	Methods of specifying general purpose polyethylene materials for moulding and extrusion
BS 6920-1:2014	Suitability of non-metallic materials and products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. Specification
BS 7786:2006	Specification for unsintered PTFE tapes for general use
BS EN 1057:2006+A1:2010	Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications
BS EN 1254-1:1998	Copper and copper alloys. Plumbing fittings. Fittings with ends for capillary soldering or capillary brazing to copper tubes
BS EN 1254-2:1998	Copper and copper alloys. Plumbing fittings. Fittings with compression ends for use with copper tubes
BS EN 1254-4:1998	Copper and copper alloys. Plumbing fittings. Fittings combining other end connections with capillary or compression ends
BS EN 1254-5:1998	Copper and copper alloys. Plumbing fittings. Fittings with short ends for capillary brazing to copper tubes
BS EN 12449:2012	Copper and copper alloys. Seamless, Round tubes for general purposes
BS EN 13349:2002	Copper and copper alloys. Pre-insulated copper tubes with solid covering
GB 5749:2006	Standards for Drinking Water Quality
GB/T 17219:1998	Standard for safety evaluation of equipment and protective materials in drinking water system
BS EN ISO 17672:2016	Brazing -- Filler metals
ISO 9453:2014	Soft solder alloys -- Chemical compositions and forms

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2 Approval procedures

All materials (pipes, fittings/accessories, exterior coatings, interior linings, welding rods, fluxes, sealing tapes, insulation material, etc) are required to be approved in advance, and the following documents should be submitted for the approval:

- Products specification
- Test reports or related recognized documents
- Method statements
- Depending on the actual situation, inspections on the factory will be required to verify the technical and quality competence for the project

2.1 Product specification

1. Product specification should include at least but not limited to the following content :

Items	Content
General Parameters	Reference standards for product manufacture, dimensions, diameter, wall thickness, etc
Mechanical Properties	Product grade, tensile strength, compressive strength, etc
Water-tightness Properties	Maximum working pressure, etc
Chemical Composition	the content of copper, silver, lead, antimony, phosphorus, tin, cadmium, etc
Construction Guidelines	Storage, transportation, installation method and equipment required for installation, etc

2. If the pipe sections are connected by soldering or brazing, suitable solder should be selected according to BS EN 1254-1 Table 6 and BS EN 806-4 (Annex A.6.3.1). Generally, lead-free solder alloys should be used, and under the condition of special design requirement, cadmium-free brazing alloys can be used. Furthermore, the requirements of ISO 9453 and BS EN ISO 17672 must be complied.
3. The plastic coating of copper pipe should comply with BS 3412、BS EN 13349 or other equivalent standard, and should be produced by the copper pipe manufacturers or their recognized 3rd parties.

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- Unless otherwise specified in the project design, the submitted materials should comply with the requirements of the reference standard.

2.2 Test reports or related recognized documents

- Test reports or certification documents should be issued by third-party organization.
- Submit test reports issued in recent three years.
- The test content of the test reports should include but not limited to the following :

Items	Content
General Parameters	Marking, diameter, wall thickness, appearance, etc
Mechanical Properties	Drift-expanding test, bending test, hardness test, etc
Water-tightness Properties	Water-tightness tests, etc
Chemical Composition	Chemical composition of material, carbon film test, etc

In general, the reference standards of the test reports should be consistent with the reference standards for product manufacture.

- If the pipe sections are connected by soldering or brazing, relevant test reports must be submitted for the solder, and the test reports must include chemical composition analysis.
- If the installed pipelines are used for drinking water, valid certification documents that can be used for drinking water should be submitted for all materials of the pipelines (such as pipes, solder, etc.), to ensure that the materials comply with AS/NZS 4020, GB/T 17219, BS 6920 (only for non-metal) or other equivalent standards, in order to ensure that the materials comply with the requirement of relevant standards in parameters of bacteria, heavy metals, chemical and physical, etc. If the relevant documents have not specified the effective date, it is advisable to submit the documents issued in recent three years.

2.3 Method statements

The method statements should comply with the requirements of RADARM and the designer, and should follow the construction guidelines of the product manufacturers. The contents of the method statements should state the transportation, storage, installation and cleaning,

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etc, of the materials. If welding is included in the method statements, the information of solders and the welding methods should be provided.

3 Reception procedure

3.1 On-site acceptance

The mill certificates issued by the material manufacturers and the delivery notes issued by the suppliers must be submitted.

Logos of the material manufacturers should be marked on the plastic coating. Otherwise, mill certificates of the plastic coating issued by the material manufacturers should be submitted.

The materials delivered on-site should be good in appearance and clearly marked. The content should include: brand, reference standard, dimension, grade, etc.

3.2 Field tests

1. If the pipelines are connected by welding, after the installation is completed, non-destructive lead test (such as LeadCheck™ Swabs, X-Ray fluorescence (XRF)) should be performed on the pipeline welding joints. The sampling method should be performed in accordance with Table 1:

Table 1

Type	Sampling method
Building of storeys ≥ 4	For every five storeys, select three joints at the pipes and fittings (including concealed parts), including: (i) two joints at communal pipes; (ii) one joint in individual units.
Building of storeys < 4	Select three joints at the pipes and fittings (including concealed parts)
Separate meter	Select two joints

Notes: The content of lead cannot exceed 0.07% for XRF test.

If the above-mentioned sampling test results are found to contain lead, the contractor should review the construction method, identify the cause of the problem and propose the improvement methods, or perform further tests to determine whether the lead content

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of the above samples exceeds the standard (e.g., inductively coupled plasma optical emission spectrometry (ICP-OES) analyzer, atomic absorption spectroscopy (AAS)) .

2. After installation, water-tightness tests should be performed in accordance with Article 191 of RADARM in all pipe sections.

3.3 Water Quality Testing

1. After flushing of the main water supply system, water quality testing should be performed in accordance with ARP/DEE/018.