



**Ranhill
SAJ**

**SPECIFICATION FOR ORIENTED UNPLASTICIZED POLYVINYL
CHLORIDE (PVC-O) PIPES FOR COLD WATER SERVICES OR
POTABLE WATER SUPPLY SYSTEMS**

SPECIFICATION SAJ PS / PVCO/ 001

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QUALITY ASSURANCE DEPARTMENT
RANHILL SAJ SDN. BHD.

Ranhill

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1.0 General

- 1.1 This specification is applicable to Oriented Unplasticized Polyvinyl Chloride (PVC-O) pipes for pressure application used in cold water services or potable water shall be manufactured and shall in accordance with ISO 16422:2014 or equivalent.
- 1.2 All materials with different type associated with any connection for s-bend, valve and tee should be approved by SAJ.

2.0 Pipes

- 2.1 The PVC-O pipes to be supplied shall be of PN16 for sizes 90 mm and above in standard six (6) meter lengths with an integral socket formed on one end to provide for jointing by mechanical rubber ring seal.
- 2.2 The color of pipes shall be blue.

3.0 Materials

- 3.1 The material used in the manufacture of pipes and joints shall consist substantially of polyvinyl chloride, to which may be added only those additives that are needed to facilitate the manufacture of the polymer and the production of sound and durable pipes of good surface finish, mechanical strength and opacity.
- 3.2 None of these additives shall be used separately or together in quantities sufficient to constitute a toxic hazard, to impair the fabrication of welding properties of the pipes, or to impair the chemical and physical properties of the pipes (in particular long term mechanical and impact strength) as defined in this technical specification.
- 3.3 The minimum required strength of materials for the purpose of the prescribed standard shall be evaluated according to the procedures of ISO 9080: 2003 and ISO 12162 or equivalent.

4.0 Classification of Pipes

- 4.1 The pipes and joints shall be classified in accordance with Maximum Permissible Working Pressure in Table 1 below:

Table 1 Classification of Pipes

Class of Pipes	Maximum Sustained Working Pressure	
	At 20°C	At 30°C
PN16	16 bar	13 bar

5.0 Dimensions and Tolerances

- 5.1 The pipes shall be designated by the nominal size and shall conform to the mean outside diameter and wall thickness as specified in Table 2. The out-of roundness (Ovality) shall conform to ISO 11922-1: 1997 Grade M.
- 5.2 The standard length of the pipes shall be 6 meters measured from end-to-end. A tolerance of +15 mm/ - 0 mm shall be allowed on the length of an individual pipe.
- 5.3 The pipes shall be reasonably round. The pipe walls shall be homogeneous throughout the wall thickness and the internal and external surfaces shall be clean smooth and reasonably free from grooves, blisters, wrinkles, dents and other defects that would impair the performance in services.

Table 2 Dimension of PN16

DN	Mean OD (mm)		Wall Thickness (mm)
	min	max	min
90	90.0	90.3	2.00
110	110.0	110.4	2.40
125	125.0	125.4	2.80
140	140.0	140.5	3.10
160	160.0	160.5	3.50
180	180.0	180.5	4.00
200	200.0	200.6	4.40
225	225.0	225.7	5.00
250	250.0	250.8	5.50
280	280.0	280.9	6.20
315	315.0	316.0	6.90
355	355.0	356.1	7.80
400	400.0	401.2	8.80
450	450.0	451.4	9.90
500	500.0	501.5	11.0
560	560.0	561.7	12.3
630	630.0	631.9	13.8
710	710.0	712.0	15.4
800	800.0	802.0	17.4

6.0 Rubber Ring

- 6.1 All rubber rings shall be manufactured for pipe sizes of 90mm and above and shall be factory fitted and positioned in the ring housing of the socket.
- 6.2 The rubber rings shall be of EPDM and have a hardness range of 55 – 65 IRHD and meet the requirements of ISO 4633 or equivalent.

7.0 Cutting and Chamfering

- 7.1 Smooth chamfer at 15° is required at the outer edge of the plain ended side for rubber ring joint.
- 7.2 Pencil in a witness mark on the plain ended to make the pipe goes far enough into the socket and to act as guide for putting on the lubricant.

8.0 Marking

- 8.1 All pipes shall be visibly marked on the outside as follows;
- Nominal diameter and material classification
 - Nominal pressure
 - Name of manufacturer and brand/trade mark
 - Batch number and year of manufacture
 - Reference standard and certification license
 - C-factor
 - Production site
 - Initial SAJ in capital letter

9.0 Packaging

- 9.1 All PVC-O pipes shall be individually packed with proper methods and protected from damage. Both sides of the PVC-O pipe ends shall be properly covered with plastic end caps to prevent the pipe from foreign particle.

10.0 Testing

10.1 The testing of PVC-O shall be conducted in accordance to ISO 16422:2014. The types of testing as listed in Table 3 below.

Table 3 Physical characteristics

Characteristic	Requirement	Test parameters	Test method
K value	≥ 64	ISO 1628-2	ISO 1628-2
Vicat softening temperature) ^a	≥ 80 °C	Shall conform to ISO 2507-1 and ISO 2507-2 No. of test pieces: 3	ISO 2507-1
Resistance to dichloro-methane at a specific temperature (degree of gelation) ^a	No attack at any part of the surface of the test piece	Temperature of bath: (15 ± 1) °C	ISO 9852
Uniaxial tensile test	Minimum stress 48MPa	In accordance with ISO 6259-2:	ISO 6259-2
Differential Scanning Calorimetry (DSC)	B onset temperature ≥ 185°C	Shall conform to ISO 18373-1 No. of test pieces: 4	ISO 18373-1

11.0 Test Certificate

11.1 The Supplier shall submit One (1) original copy of certificates for each batch of completed pipes supplied giving the process of manufacture and the results of the specified tests. The material shall be suitably marked to enable it to be identified from reference on the certificate.

12.0 Certification

- 12.1 The Manufacturer or Supplier are required to provide proof of listing as registered with SPAN as part of the Quality Assurance Plan.
- 12.2 When requested, the Manufacturer and Supplier are required to provide a valid copy of the certificate and testing report from SIRIM/IKRAM or other recognized certification bodies. Test Report required shall be those tests conducted within a year period.
- 12.3 SAJ has the rights to refuse offer of reject supply if the documents required are not enclosed.