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JAPANESE INDUSTRIAL STANDARD

Asphalt Protective Coatings for Steel Water Pipe

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JAPANESE INDUSTRIAL STANDARD

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Asphalt Protective Coatings
for Steel Water PipeG 3491-1977
(Reaffirmed: 1983)1. Scope

This Japanese Industrial Standard specifies the protective coating and wrapping methods using the asphalt or asphalt enamel, hereinafter referred to as the "asphalt", unless particularly otherwise stated, for steel water pipes, hereinafter referred to as the "pipes". The interior coating for field jointing specified in this standard applies to the pipes of 800 A or larger in nominal diameter.

2. Coating Materials

The coating materials to be used for coating and wrapping of pipes include two types: asphalt primer and asphalt. They shall not be injurious to health nor adversely affect the quality of water after getting dry.

2.1 Asphalt Primer The asphalt primer, hereinafter referred to as the "primer", is to ensure close bonding of the subsequent asphalt coating to the pipe; it shall be in compliance with the following requirements.

2.1.1 Composition The primer shall consist of blown asphalt⁽¹⁾ (20 to 40 in penetration) and refined petroleum solvent or tar solvent, and shall not contain any toxic substance such as benzol or other poisonous matter. The primer, however, is permitted to contain other suitable additives to improve its properties. Furthermore, when other primer than that abovementioned, including fast drying primer, is used, its raw materials, natures and properties shall be clearly indicated for the purchaser's⁽²⁾ approval.

Notes ⁽¹⁾ The blown asphalt means that specified in JIS K 2207.

⁽²⁾ The purchaser means the orderer of the coated and wrapped steel pipes, and also the orderer of the coating and wrapping application to steel pipes.

2.1.2 Workability The workability of the primer shall be such that it is able to be coated uniformly by brushing or spraying.

2.1.3 Residue on Heating The residue on heating of the primer shall be 40 % or more.

2.1.4 Drying Time The primer shall attain the drying hard to the finger touch within 3 h.

2.2 Asphalt The asphalt is the essential material for anti corrosion coating of the pipe; it shall be in compliance with the following requirements.

Applicable Standards: See page 25.

2.2.1 Composition The asphalt shall be of petroleum blown asphalt or asphalt enamel to which inert mineral filler of fine powder⁽³⁾ is mixed. Other suitable additives may be added to improve the properties of coating material.

Note (3) The inert mineral filler of fine powder shall be so fine as to be shifted down by 90 % or more through 74 μm mesh of standard sieve specified in JIS Z 8801.

2.2.2 Quality The asphalt shall prove to meet the quality requirements specified in Tables 1 and 2, when subjected to the tests enumerated in the tables.

Table 1. Quality Requirements for Blown Asphalt

Object to be tested	Nominal penetration		10 to 20		20 to 30		30 to 40	
	Test item and method		Min.	Max.	Min.	Max.	Min.	Max.
Blown asphalt	Softening point (JIS K 2531) °C		90	—	80	—	65	—
	Penetration (JIS K 2530)	0°C · 200 g · 60 s	7	—	10	—	14	—
		25°C · 100 g · 5 s	10	20	20	30	30	40
		46°C · 50 g · 5 s	—	45	—	70	—	95
Test piece coated with primer and blown asphalt	Sag test at high temperature	40°C · 24 h mm	—	—	—	—	—	3.0
		50°C · 24 h mm	—	—	—	2.0	—	—
		60°C · 24 h mm	—	2.0	—	—	—	—
	Cracking test at low temperature (to examine existence of crack and disbonding)	-20°C · 6 h	None		—		—	
		-30°C · 6 h	—		None		None	
	Deflection test	Deflection until outbreak of cracks mm	20	—	38	—	38	—
		Disbonded area at deflection of 38 mm cm ²	—	20	—	0	—	0
	Impact test (25°C · 650 g · 2.4 m)	Disbonded area due to direct impact cm ²	—	65	—	0	—	0
		Disbonded area due to indirect impact cm ²	—	15	—	0	—	0
	Peel test	Method 1	No peeling		No peeling		No peeling	
		Method 2	No peeling		No peeling		No peeling	

Remark: The peel test shall be carried out as follows:

Method 1: To be applied to the test piece which has been once cooled down to room temperature after coated with the asphalt and then kept at each specified test temperature (Table 11).

Method 2: To be applied to the test piece which is heated for 72 h at each specified test temperature (Table 12) after coated with the asphalt and then tested in the similar way to Method 1.

Table 2. Quality Requirements for Asphalt Enamel

Object to be tested	Nominal penetration		10 to 20		20 to 30		30 to 40	
	Test item and method		Min.	Max.	Min.	Max.	Min.	Max.
Asphalt enamel	Softening point (JIS K 2531) °C		95	—	80	—	70	—
	Penetration (JIS K 2530)	25°C · 100 g · 5 s	10	20	20	30	30	40
		46°C · 50 g · 5 s	—	50	—	70	—	90
	Specific gravity (JIS K 2249) (25/25°C)		1.10	1.45	1.10	1.45	1.10	1.45
	Ash content (JIS K 2421) %		10	40	10	40	10	40
Test piece coated with primer and asphalt enamel	Sag test at high temperature	50°C · 24 h mm	—	—	—	2.0	—	4.0
		60°C · 24 h mm	—	2.0	—	—	—	—
	Cracking test at low temperature (To examine existence of crack and disbonding) (-30°C · 6 h)		None		None		None	
	Deflection test	Deflection until outbreak of cracks mm	15	—	38	—	38	—
		Disbonded area at deflection of 38 mm cm ²	—	20	—	0	—	0
	Impact test (25°C · 650 g · 2.4 m)	Disbonded area due to direct impact cm ²	—	50	—	0	—	0
		Disbonded area due to indirect impact cm ²	—	10	—	0	—	0
	Peel test	Method 1	No peeling		No peeling		No peeling	
		Method 2	No peeling		No peeling		No peeling	

Remark: Methods 1 and 2 of peel test shall be carried out in the similar way to that described in Remark of Table 1.

2.3 Marking The coating material shall be legibly marked on its container with the manufacturer's name, name of product, year and month of manufacture, lot number, etc. When it is difficult to be fully marked, a part of those may be omitted subject to the purchaser's approval.

3. Wrapping Materials

The wrapping materials are intended for the protection of asphalt coating or for the increase of the mechanical strength of the coating; usually hessian cloth, heat resistant vinylon cloth, glass cloth or glass mat are used.

3.1 Hessian Cloth The hessian cloth shall be of No. 7 or No. 9 specified in JIS L 3405.

3.2 Heat Resistant Vinylon Cloth The heat resistant vinylon cloth shall have been made for the purpose of anti-corrosion. It shall be suitably sized, and such as to bond the coating well. It shall be free from uneven weaving, knots, folds, frays, etc. liable to hinder the cloth in its practical use, and shall meet the quality requirements specified in Table 3.

Table 3. Quality Requirements for Heat Resistant Vinylon Cloth

Weave			Plain weave
Thickness mm			0.5 ± 0.1
Yarn			Two folded yarn of 20 count or single yarn of 10 count
Density (both warp and weft) yarns/cm			7 ± 1
Tensile strength kgf{K}/50 mm width	Room temperature	Warp	40 min. {392} min.
		Weft	35 min. {343} min.
	After heat treatment (220°C · 3 min)	Warp	35 min. {343} min.
		Weft	32 min. {314} min.
Shrinkage (%)	After heat treatment (220°C · 3 min)	Warp	5 max.
		Weft	5 max.

Remarks 1. The yarn count shall be expressed in number of hanks (1 hank = 768.1 m) per 0.4536 kg weight (that is to say cotton yarn count). The weight mentioned herein implies that containing the water equivalent to official regain (5.0 %).

2. The width shall usually be made into 160 mm or 280 mm each with tolerance of $^{+15}_0$ mm.
3. One roll shall usually be made into the length of 400 m.
4. The units and numerical values given in { } in this standard are in accordance with the International System of Units (SI), and are appended for reference.

3.3 Glass Cloth The glass cloth shall have been made for anti-corrosion use and shall be uniform in thickness, rich in flexibility and durability. It shall be free from uneven weaving, knots and folds liable to hinder the cloth in its practical use, and shall meet the quality requirements specified in Table 4.

Table 4. Quality Requirements for Glass Cloth

Type	Non-alkaline		Alkaline	
Alkaline content (%)	0.8 max.		15 max.	
Weave	Plain weave			
Thickness mm	0.13 ± 0.02	0.22 ± 0.03	0.15 ± 0.02	0.27 ± 0.03
Yarn count (both warp and weft)	68 ± 7	136 ± 14	70 ± 6	140 ± 10
Diameter of single fibre µm	9 ± 1.8 or 12 ± 1.8			
Density (both warp and weft) yarns/cm	7 min.			
Tensile strength (both in warp and weft directions) kgf{N}/15 mm width	20 min. {196} min.	40 min. {392} min.	20 min. {196} min.	40 min. {392} min.

Remarks 1. The yarn count shall be expressed in the yarn count system (number of grammes for 1000 m long yarn) formulated in 2.6 of JIS R 3413.

2. The width shall usually be made into three dimensions: 160 mm, 280 mm and 330 mm, in any case, with tolerance of $^{+15}_0$ mm.

3. The length of one roll shall usually be 90 m or 420 m.

3.4 Glass Mat The glass mat, which was made from short glass fibres bonded with thermosetting resin, shall be of flexibility and uniform porosity. It shall neither deform when being wound round nor produce bubbles when being brought in contact with the molten asphalt. It shall meet the quality requirements specified in Table 5.

Table 5. Quality Requirements for Glass Mat

Thickness mm		0.25 to 0.60
Content of organic matters %		17 ± 5
Tensile strength kgf(N)/15 mm width	Along warp direction	2.0 min. {19.6} min.
	Along weft direction	1.0 min. {9.81} min.
Density of reinforcement yarns yarns/cm		Approx. 1

Remarks 1. The width shall usually be made into three dimensions: 135 mm, 160 mm and 245 mm, in any case, with tolerance of $+5_0$ mm.

2. One roll shall usually be made into a length of 250 m or 300 m.

4. Shop Coating and Wrapping

4.1 Treatments Prior to Coating

4.1.1 Preparation Before Blasting

- (1) Any protrusion harmful to coating on beads portion of interior welding shall be removed to make a surface as smooth as possible by any means of sander or grinder before blasting.
- (2) Oily stains adhering onto the pipe shall be completely removed with cloth or the like impregnated with solvent naphtha or other appropriate solvent. The solvent naphtha shall be in compliance with 1.2 (1) of JIS K 2433.

4.1.2 Cleaning of Steel Surface Any mill scale, rust and other foreign substances adhering onto the steel surface shall be removed by the blasting. The blasting, however, may be altered to the chemical treatment or other appropriate means, subject to the purchaser's approval. When the pickling is applied, remaining acid on the steel surface shall be scrubbed off with water and shall be dried immediately. When compressed air is used for the blasting, oil, moisture, etc. contained in the compressed air shall be removed through an air cleaner.

4.1.3 Treatment After Cleaning of Steel Surface Care shall be taken, until the coating of the primer, so that the surface of pipe cleaned may be kept from rust and adhesion of foreign substances such as dust and oil. The sander or wire brush shall be employed, if the rust of the pipe is slight, but the blasting shall be employed again, if the rust is heavy.

The dust adhering onto the surface of the pipe shall be removed by a vacuum cleaner or other appropriate means.

4.1.4 Drying of Pipe When the damp is found on the steel surface at the time of primer coating, the primer coating shall be applied after drying the pipe by a suitable means.

4.2 Primer Coating

4.2.1 Coating The primer shall be thoroughly agitated after the opening of its container. Being transferred into a small container, the primer shall be quickly used for coating.

The coating, either by brushing or spraying shall be applied, immediately after cleaning and drying the steel surface. The coating shall be made to a uniformity using an adequate amount of primer not to make any over-coating, drooping and holiday spot.

4.2.2 Coverage Rate of Primer The coverage rate of primer shall be 70 to 110 g/m².

4.2.3 Coating Interval The time interval between the primer coating and the asphalt coating shall be about 4 h or more at room temperature. For the fast drying primer, the time interval shall be subject to that indicated by the material manufacturer.

At the lapse of five days or more after primer coating, the primer shall be recoated. In this case, the amount to be coated shall be half the amount of the initial coating.

4.2.4 Protection of Coated Surface After primer coating, the surface shall be protected from adhesion of foreign substances such as rain, water-drops and dusts.

4.3 Melting of Asphalt

4.3.1 Melting Apparatus The apparatus for melting asphalt shall be so constructed as to raise the temperature uniformly and also to be easily cleaned. It shall provide an autographic thermometer.

4.3.2 Melting

- (1) The asphalt shall be uniformly heated and molten and be reached to the coating temperature (170 to 230°C) as rapidly as possible.
- (2) During the heating of the asphalt, its quality shall be completely controlled by properly stirring it up.

The permissible highest temperature during the melting shall be 250°C.

4.3.3 Reuse of Asphalt The reuse of the asphalt once melted and remained, or once coated and peeled off shall be made after the ascertainment of no abnormality in quality according to the tests made on its property and its mixture with fresh asphalt.

4.3.4 Cleaning of Melting Kettle When necessary, the melting kettle shall be made empty and cleaned, and all the contents remained in it at that time shall be scrapped.

4.4 Drying of Primer Coated Pipe When the primer coated surface is wet at the time of asphalt coating, it shall be dried by any means harmless to the primer, and immediately be coated with asphalt.