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**Polyethylene coated steel pipes — Part 1:
External 3 layer extruded polyethylene
coated steel pipes**

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Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry based on the provision of Article 14, paragraph (1) of the Industrial Standardization Act applied mutatis mutandis pursuant to the provision of Article 16 of the said Act in response to a proposal for revision of Japanese Industrial Standard with a draft being attached, submitted by The Japan Iron and Steel Federation (JISF), an accredited standards development organization. This edition replaces the previous edition (**JIS G 3477-1 : 2018**), which has been technically revised.

However, **JIS G 3447-1 : 2018** may be applied in the **JIS** mark certification based on the relevant provisions of Article 30, paragraph (1), etc. of the Industrial Standardization Act until 19 December 2023.

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JIS G 3477 series consists of the following 3 parts under the general title *Polyethylene coated steel pipes* :

Part 1 : External 3 layer extruded polyethylene coated steel pipes

Part 2 : External extruded polyethylene coated steel pipes

Part 3 : External polyethylene powder coated steel pipes

Blank

Polyethylene coated steel pipes — Part 1 : External 3 layer extruded polyethylene coated steel pipes

1 Scope

This Japanese Industrial Standard specifies requirements for the external 3 layer extruded polyethylene coated steel pipes (hereafter referred to as coated steel pipes) mainly used for the straight pipes of pipelines for underground services (including the bottom of river and the bottom of sea) of transporting gas, oil, water, etc.

NOTE 1 Coated steel pipes using black pigments may be used for above-ground piping.

NOTE 2 This Standard is applicable to pipes of outside diameter 76.3 mm (nominal diameter 65A or 2½B) to 1 625.6 mm (nominal diameter 1 600A or 64B) (see Table 2).

NOTE 3 The coated steel pipes are usually used at temperatures in the range of −40 °C to +60 °C.

2 Normative references

Part or all of the provisions of the following standards, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS G 0202 *Glossary of terms used in iron and steel (Testing)*

JIS G 0203 *Glossary of terms used in iron and steel (Products and quality)*

JIS G 0404 *Steel and steel products — General technical delivery requirements*

JIS G 0415 *Steel and steel products — Inspection documents*

JIS G 3452 *Carbon steel pipes for ordinary piping*

JIS G 3454 *Carbon steel pipes for pressure service*

JIS G 3455 *Carbon steel pipes for high pressure service*

JIS G 3457 *Arc welded carbon steel pipes*

JIS G 3460 *Steel pipes for low temperature service*

JIS K 0068 *Test methods for water content of chemical products*

JIS K 5500 *Glossary of terms for coating materials*

JIS K 5600-2-4 *Testing methods for paints — Part 2 : Characteristics and stability of paints — Section 4 : Density (Pyknometer method)*

JIS K 5600-9-1 *Testing methods for paint — Part 9 : Coating powders — Section 1 : Determination of gel time of thermosetting coating powders at*

a given temperature

JIS K 6761 *Polyethylene pipes for general purposes*

JIS K 6900 *Plastics — Vocabulary*

JIS K 6922-2 *Plastics — Polyethylene (PE) moulding and extrusion materials — Part 2 : Preparation of test specimens and determination of properties*

JIS K 7112 *Plastics — Methods of determining the density and relative density of non-cellular plastics*

JIS K 7121 *Testing methods for transition temperatures of plastics*

JIS K 7161-1 *Plastics — Determination of tensile properties — Part 1 : General principles*

JIS K 7161-2 *Plastics — Determination of tensile properties — Part 2 : Test conditions for moulding and extrusion plastics*

JIS K 7206 *Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)*

JIS K 7209 *Plastics — Determination of water absorption*

JIS K 7210-1 *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1 : Standard method*

JIS K 7215 *Testing methods for durometer hardness of plastics*

JIS K 7251 *Plastics — Determination of water content*

JIS K 7350-2 *Plastics — Methods of exposure to laboratory light sources — Part 2 : Xenon-arc lamps*

JIS Z 0103 *Glossary of terms used in rust and corrosion preventive technology*

ISO 3183 *Petroleum and natural gas industries — Steel pipe for pipeline transportation systems*

API Specification 5L *Specification for Line Pipe*

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions, and those given in **JIS G 0202**, **JIS G 0203**, **JIS K 5500**, **JIS K 6900** and **JIS Z 0103** apply.

3.1

adhesive polyethylene

resin with a polar group introduced into polyethylene to give it polarity and adhesion

Note 1 to entry The resin is obtained by modifying polyethylene with maleic acid, acrylic acid, etc. and has adhesion to steel materials and polyethylene.

3.2

epoxy resin primer

coating which is applied on the surface of steel materials for the purpose of improving adhesion durability and which serves as a medium between adhesive polyethylene and steel materials

Note 1 to entry Epoxy resin primer has two types, liquid primer in a liquid state and powder primer in a powder state at an ordinary temperature, and has the nature of curing by heating.

3.3

cathodic disbondment

disbondment of a coating from the steel surface which occurs adjacent to defects of coating due to alkali, hydrogen, etc. generated by protection current, when electrolytic protection is applied on the coated steel pipe and the steel surface at the defects serves as a cathode

3.4

type test

test that demonstrates that the quality satisfies the specifications on the premise that stable manufacturing conditions have been established, rather than test that is conducted at each delivery

Note 1 to entry When manufacturing conditions that could affect the quality are changed, the type test shall demonstrate again that the quality satisfies the specifications.

Note 2 to entry The type test may be applied when the test duration is prolonged.

3.5

value specified by the manufacturer

characteristic value of coating materials specified by the manufacturer of coating materials

Note 1 to entry The values specified by the manufacturer are applied to the density and gel time of epoxy resin primer coating materials.

Note 2 to entry The coating materials are manufactured generally using several kinds of raw materials, and the characteristic values of coating materials on coated steel pipes exerting the same level of performance often differ greatly among manufacturers.

4 Symbols of grade

The coated steel pipes are classified into two grades, and their symbols of grade shall be as given in Table 1.

Table 1 Symbols of grade

Symbol of grade	First layer	Second layer	Third layer
P3X-L	Epoxy resin primer	Adhesive polyethylene	Low density polyethylene
P3X-M	Epoxy resin primer	Adhesive polyethylene	Middle and high density polyethylene

5 Materials

5.1 Original pipes

5.1.1 Applicable standards of original pipes

The original pipes used for coated steel pipes shall be straight pipes, and the applicable standards shall be as given in Table 2.

Table 2 Applicable standards of original pipes

Nominal diameter or outside diameter ^{a)}	Applicable standard of original pipes
Nominal diameter 65A to 1 600A Nominal diameter 2 ¹ / ₂ B to 64B	JIS G 3452 JIS G 3454 JIS G 3455 JIS G 3457 JIS G 3460
Outside diameter 76.3 mm to 1 625.6 mm	ISO 3183 API Specification 5L
Note ^{a)} Nominal diameter and outside diameter shall be indicated following the applicable standard of each original pipe.	

5.1.2 Pipe-end shape of original pipes

Unless otherwise specified by the purchaser, the original pipes shall have bevel ends.

5.2 Coating materials

Polyethylene coating materials shall be as specified in Annex A. Adhesive polyethylene coating materials shall be as specified in Annex B. Epoxy resin primer coating materials shall be as specified in Annex C.

6 Manufacturing method

6.1 Pretreatment

Harmful oils, rust and other foreign substances adhering to the original pipes shall be removed by a mechanical method (e.g. blasting) or chemical method. The chemical conversion coating may be applied on the original pipes after the removal. Scabs ¹⁾, cracks, scratches, etc. on the original pipe surface may be removed previously by grinding or the like, provided that the original pipes retain at least the specified min-

imum pipe thickness after grinding.

Note ¹⁾ Scabs may be partially lapped or exfoliated surface.

The control items for blasting are shown in Table D.1 for reference.

6.2 Coating method

The outer surface of pretreated original pipes shall be heated, then coated with epoxy resin primer coating materials (normally in a thickness of 5 µm to 50 µm for liquid primers and of 80 µm to 500 µm for powder primers) by an appropriate method and further coated with adhesive polyethylene coating materials (normally in a thickness of 0.05 mm to 0.5 mm). Then the pipe shall be further coated with polyethylene coating materials by the extrusion method. Adhesive polyethylene coating materials and polyethylene coating materials may be extruded separately from two extruding machines and applied at the same time by the coextrusion method. The control items in the coating process are shown in Table D.2 for reference.

6.3 Inner coating

Paint, lining, etc. may be applied on the inner surface of the steel pipe upon agreement between the purchaser and the manufacturer.

7 Coated steel pipes

7.1 Coating performance

The coating performance of coated steel pipes shall be as given in Table 3. The test method shall be in accordance with 8.3 to 8.11.