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**Industry Standard
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CJ/T 225-2011

Replace CJ/T 225-2006

**Metal reinforced polyethylene (PE) spiral
corrugated pipe for underground sewer**

埋地排水用钢带增强聚乙烯（PE）螺旋波纹管

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Foreword

This Standard is prepared according to the rules specified in GB/T 1.1-2009.

This Standard is a revision to CJ/T 225-2006 "Metal Reinforced Polyethylene (PE) Spiral Corrugated Pipe for Underground Sewer". Compared with CJ/T 225-2006, the changes of main technical content are as follows:

- INCREASE technical indicators' requirements of raw materials, and ADD galvanized steel-strip.
- PROPOSE the requirements of dividing sections according to the pipe diameter, and IMPROVE indicators for the tensile strength of the laminated wall and welding seam.
- ADD planar-shaped port pipe that is vertical to axis in pipe structure.
- PERFORM larger revision on connection type and method: ADD planar-shaped port form in connection type (listed in Annex C).
- ADD ring-stiffness SN10 level.
- ADD pipe dimensions of 2200, 2400, and 2600 specifications.
- ADD Annex B Test Method of Adhesive Resin Water Immersion Resistance Performance, Annex C Common Pipe Connection Type, Annex D Preparation of Ring-stiffness Sample, and Annex E Preparation Method of Pipe Laminated Wall Tensile Strength Test Sample.

This Standard was proposed by Standard Rating Institute of Ministry of Housing and Urban-rural Development.

This Standard shall be under jurisdiction of Water Supply and Drainage Products Standardization Technical Committee of the Ministry of Housing and Urban-rural Development.

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Previous version of the standard replaced by this Standard are as follows:

— CJ/T 225-2006.

Metal reinforced polyethylene (PE) spiral corrugated pipe for underground sewer

1 Scope

This Standard specifies the terms and definitions, symbols, abbreviations, raw materials, grading and marking, pipe structure and connection methods, requirements, test methods, inspection rules, marking, transportation and storage of the metal reinforced polyethylene (PE) spiral corrugated pipe.

This Standard applies to the rainwater, sewage and other underground drainage pipeline with transmission medium temperature not greater than 45°C.

2 Normative references

The following documents are essential for the application of this Standard. For dated references, only dated edition applies to this Standard. For undated references, the latest edition (including all amendments) applies.

GB/T 228 Metallic materials - Tensile testing at ambient temperature

GB/T 1033.1 Plastics - Methods for determining the density of non-cellular plastics
- Part 1: Immersion method liquid pycnometer method and titration method

GB/T 1633 Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST)

GB/T 1842 Plastics - Test method for environmental stress-cracking of polyethylene

GB/T 2828.1-2003 Sampling procedures for inspection by attributes - Part 1:
Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB/T 2918 Plastics - Standard atmospheres for conditioning and testing

GB/T 3682 Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics

GB/T 5470 Plastics - Determination of the brittleness temperature by impact

GB/T 6111 Thermoplastics pipes for the conveyance of fluids - Resistance to internal pressure - Test method

GB/T 8840.3 Thermoplastic pipes - Determination of tensile properties - Part 3: Polyolefin pipes

GB/T 9341 Plastics - Determination of flexural properties

GB/T 9345.1 Plastics - Determination of ash - Part 1: General methods

GB/T 9647 Thermoplastics pipes - Determination of ring-stiffness

GB/T 14152-2001 Thermoplastics pipes - Determination of resistance to external blows - Round-the-clock method

GB/T 17391 Test method for thermal stability of polyethylene pipes and fittings

GB/T 13021 Determination for the carbon-black content of polyethylene pipes and fittings by calcination and pyrolysis

GB/T 18042 Thermoplastics pipes - Determination of creep ratio

GB/T 19472.2 Polyethylene structure-wall piping system for underground usage - Part 2: Polyethylene spirally enwound structure-wall pipes

GB/T 19789 Packaging materials – Test method for oxygen gas permeability characteristics of plastic film and sheeting - Coulometric sensor

3 Terms and definitions, symbols, and abbreviations

The following terms and definitions, symbols, and abbreviations are applicable to this document.

3.1 Terms and definitions

3.1.1 Metal reinforced polyethylene (PE) corrugated pipe, MRP

The metal reinforced spiral corrugated pipe that takes polyethylene (PE) resin as matrix; uses the steel-strip of which the surface is coated with adhesive resin and is shaped into waveform as the main support structure; and combines with the inner and outer layers of polyethylene into overall inner wall straightness type.

3.1.2 Anticorrosion layer thickness

The sum of the thickness of the outer layer polyethylene of pipe's steel-strip and the thickness of the adhesive resin.

3.1.3 Spigot length

The effective length of the outer circumferential surface of socket-and-spigot-type

8 Test method

8.1 Pretreatment of samples

Unless otherwise specified, the pretreatment of the sample shall comply with the provisions of GB/T 2918. ADJUST the state and test the samples under the temperature of $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$; the time for state adjustment shall not be less than 48 h.

8.2 Appearance and color

Visual inspection, inner wall can be irradiated by light source.

8.3 Dimensions

8.3.1 Length

Pipe length shall be measured by a flexible ruler with the minimum scale of being not less than 1mm, accurate to 1mm; measure once for each 90° rotation. The pipe length value shall be the arithmetic mean of the maximum and minimum values measured along the longitudinal direction of pipe.

8.3.2 Mean inner diameter

Pipe inner diameter shall be measured by gauges with the minimum scale of being not less than 1mm; measure once for each 90° rotation on the same section of pipes. TAKE the arithmetic mean value of 4-times measurement value; the results shall retain one decimal.

8.3.3 Wall thickness (including inner wall and laminated wall thickness)

Wall thickness shall be measured by gauges with the minimum scale of being not less than 0.02mm. TAKE the minimum value, accurate to 0.05mm.

8.3.4 Screw pitch

Screw pitch shall be measured by gauges with division value of 0.02mm. MEASURE three times and take the minimum, accurate to 1.0mm.

8.3.5 Anticorrosive coating thickness

Anticorrosive coating thickness shall be measured by gauges with the minimum scale of being not less than 0.02mm. MEASURE 3-times; take the minimum value, accurate to 0.05mm. Anticorrosive coating thickness shall be the minimum thickness at the crest section subtracting the thickness of steel-strip and the other side adhesive resin layer.

8.3.6 Steel-strip thickness

PREPARE samples and then test according to Annex A. Dynamometer for test is vertical to pipe surface, and pulls the anticorrosive coating with constant speed at 10 mm/min rate. RECORD the dynamometer value. DIVIDE the peel width of anticorrosive coating by dynamometer count value, that is the peel strength, in units of N/cm. TAKE the mean value of the three measured values as peel strength value.

8.4.4 Ring flexibility

Sample test is conducted according to provisions of GB/T 19472.2.

8.4.5 Oven test

8.4.5.1 Sample

CUT out three sections of samples from the different parts of the pipe with the length of $300\text{mm} \pm 20\text{mm}$. When pipe DN/ID $< 400\text{mm}$, it can be cut into two test blocks of the same size in the axial direction; When pipe DN/ID $\geq 400\text{mm}$, it can be cut into four (or more) test blocks of the same size in the axial direction.

8.4.5.2 Test procedures and results

- a) RAISE the oven temperature to 110°C and place in the sample. The sample can not be mutual connected and can not be connected to the oven walls when placing it. After the oven temperature recovering to 110°C , start to timing and maintain for 90min at the temperature of $110^{\circ}\text{C} \pm 2^{\circ}\text{C}$.
- b) After heating to specified time, take the sample from the oven, and cool to indoor temperature and inspect whether the sample has cracking, stratification, and other defects.

8.4.6 Tensile strength of pipe laminated wall

PREPARE samples according to Annex E. PERFORM the test according to the provisions of GB/T 8804.3, the tensile rate is 15mm/min.

8.4.7 Creep ratio

The test shall be performed according to the provisions of GB/T 18042; the test temperature shall be $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$. According to the test results, use calculation method to extrapolate the 2-year creep ratio.

8.5 System adaptability

8.5.1 Hydraulic pressure sealing test

Test shall be performed according to the provisions of Annex F.

8.5.2 Tensile strength of welding connections

PREPARE samples according to Annex G. The sample shall be cut at the welding area in longitudinal direction. And the sample shall include the connection area. SPARE sufficient length at the both sides of the sample to ensure that it can be clamped during tensile test. PERFORM the test according to the provisions of GB/T 8804.3; the tensile rate is 15mm/min.

8.5.3 Hydraulic pressure sealing test in case of deformation and deflection angle

The flexible connection that uses socket-and-spigot-type elastic seal ring shall perform the test according to the provisions of Annex H.

9 Inspection rules

9.1 Products shall pass inspection conducted by quality inspection department and with qualification certificate before leaving the factory.

9.2 Batch grouping

The pipes of same-specification, produced with same-raw materials, same-formulations, and same-process are deemed as one batch. The number of each batch shall not be greater than 300t. If the production in 30 days is less than 300t, then the production of 30 days is deemed as one batch.

9.3 Dimension grouping

GROUP according to the nominal inner diameter. Table 10 provides the grouping provisions of two dimensions.

qualified samples that have been inspected according to the provisions of 9.4.2 to retest this item. If it still fails, then determine this batch as unqualified.

Table 11 Random sampling method

Batch N	Number of sample size n/root	Acceptance number Ac	Rejection number Rc
≤150	8	1	2
151-280	13	2	3
281-500	20	3	4
501-1200	32	5	6
1201-3200	50	7	8
3201-10000	80	10	11

10 Marking, transportation, and storage

10.1 Marking

10.1.1 The product shall have the following permanent marks:

- a) Marking according to the provisions in 5.2;
- b) Manufacturing factory name and (or) trademark;
- c) The pipes that can be installed and laid at the temperature below -10°C shall be marked with an ice crystals (*) symbol.

10.1.2 Date of production shall be marked on the product.

10.2 Transportation

10.2.1 In the process of handling and transportation, the pipes shall not be severely impacted, collided, and pressed.

10.2.2 When handling pipes with machinery, the hanging points of the pipe shall be at a distance of about $1/4$ of the length of the both ends of the pipe.

10.2.3 The contact areas between the bottom of cars, boats and the pipe shall be flat as possible. It shall have measures to prevent rolling and colliding, and shall not contact with sharp objects to avoid scratching the pipe.

10.3 Storage

Pipe shall be stored in ventilated warehouse, away from heat source and chemical pollution, and with flat-neat ground. If stacked outdoor, it shall have shelter. Pipe shall be stacked neatly and horizontally.

mean value of three measurement values.

Annex B

(Informative)

Test methods of water immersion resistance property indicator of adhesive resin

B.1 Water immersion resistance indicator

See water immersion resistance indicators in Table B.1.

Figure B.1 Water immersion resistance indicator

Test indicator	Unit	Technical indicator
Peel time of water immersion resistance	Day	≥180

Test method:

- a) CUT the coating-qualified steel-strip into three samples with length of 150mm;
- b) Completely SEAL the sections of both ends of the steel-strip by adhesive resin with thickness of being greater than 1mm.
- c) IMMERSE the prepared sample in water at room temperature;
- d) OBSERVE it once a week. INSPECT the peeling phenomena visually (the local-peeling of 5mm-or-above is deemed as peeling between steel-strip and adhesive resin). If it has no peeling phenomena for more than 180 days, then it is deemed as qualified.

M — Sealing baffle;

T — Connector;

Y — Pressure gage.

Figure F.1 Schematic diagram of hydraulic pressure sealing test device

F.2.3 Sample

Samples are composed of pipes with two or more sections and one or more pipe fittings, containing at least one joint.

The joints under test must be assembled in accordance with the manufacturer's requirements.

F.2.4 Steps

F.2.4.1 The following steps shall be performed at indoor temperature and with water at $(23 \pm 2) ^\circ\text{C}$.

F.2.4.2 INSTALL the samples on the test device.

F.2.4.3 APPLY a specified internal hydrostatic pressure P of 0.1 MPa; remain for 15min.

F.2.4.4 FILL the assembled samples with water; discharge the air. Gradually increase the hydrostatic pressure to specified test pressure P (0.1MPa); remain for 15 min, or terminate prematurely due to leakage.

F.2.4.5 OBSERVE the leakage conditions of samples during test. And record any leakage or non-leakage condition (pressure and time, etc. during the test) during the test and at the end of the test.

F.2.4.6 Upon completion of the required compression time, release the pressure and discharge the water in the samples.

F.3 Test report

The test report shall include the following contents:

- a) CJ/T 225-2011, this Annex, and reference standards;
- b) Pipes, pipe fittings, and joints name;
- c) Indoor temperature in degree Celsius;
- d) Test pressure in MPa;

- e) Compression time in min;
- f) If there is a leak, report leakage conditions and pressure value when the leak occurs; or report of no leakage at joints.
- g) Any factor that may affect the test results, such as accident or any operating details not specified in test methods of this Annex.
- h) Test date.

G — Measuring point of the deformation of connection seal area;

H — Measuring point of pipe deformation;

W — Adjustable support;

R/P — Pipes;

S — The support at connection seal area;

a — Angular deviation.

Figure H.1 Typical example of radial deformation and angular deviation condition

H.2.3 Steps

H.2.3.1 The following steps shall be performed at indoor temperature and with water at $(23 \pm 2) ^\circ\text{C}$.

H.2.3.2 INSTALL the samples on the test device, and conduct it according to the following two conditions respectively.

Condition A: at connection seal area, USE mechanical or hydraulic devices to apply the required compressing forces F_1 and F_2 to the pipes and connection seal area (see Figure H.1), thereby forming a deformation of $5\% \pm 0.5\%$ ($5\% \pm 0.5\%$ of the nominal diameter of pipes) at pipes connection seal area.

Condition B: at connection seal area, USE adjustable support W to form test angular deviation α .

Test angular deviation α is as follows:

When $300\text{mm} < d_e \leq 700\text{mm}$, $\alpha = 1.5^\circ$.

When $d_e > 700\text{mm}$, $\alpha = 1^\circ$.

If the design of connection allows angular deviation β , then the test angular deviation is the sum of designed allowable angular deviation β and angular deviation α .

H.2.3.3 APPLY a specified internal hydrostatic pressure P of 0.1MPa; remain for 15min.

H.2.3.4 FILL the assembled sample with water; discharge the air. Gradually increase the hydrostatic pressure to specified test pressure P (0.1MPa); and remain for 15 min, or terminate prematurely due to leakage.

H.2.3.5 In test, observe the leakage conditions of samples and record any leakage or

non-leakage condition (pressure and time etc. during the test) during the test and at the end of the test.

H.2.3.6 Upon completion of the required compression time of 15 min, release the pressure and discharge the water in the samples.

H.3 Test report

The test report shall include the following contents:

- a) This Annex and reference standards;
- b) Pipes, pipe fittings, and joints name;
- c) Temperature in degree Celsius;
- d) Test conditions, represented by actual amount of deformation or angular deviation;
- e) Test pressure, in MPa;
- f) Compression time, in min;
- g) If there is a leakage, report leakage situation and pressure value when the leakage occurs; or report of no leak at joints;
- h) Any factor that may affect the test results, such as accident or any operating details not specified in test methods of this Annex;
- i) Test date.

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