





OWNER :	Project Name:	DESIGNER :	
	COATING & WRAPPING OF UNDERGROUND PIPING		SABZ ENGINEERING COMPANY PROJ. NO. : PJ-
	Doc. No.:SEC-PJ-000-SPC-PI-008		

CONSTRUCTION
STANDARD SPECIFICATION



**COATING & WRAPPING OF
UNDERGROUND PIPING**

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1. SCOPE

This specification describes the materials, applications, handling, installation and testing procedures For external coating and wrapping over Carbon Steel piping to be laid under ground for protection against corrosion.

- 1.1 All buried Carbon Steel and Galvanized pipes, valves, fittings etc., shall be externally double wrapped. Double wrapping of pipe shall be achieved by overlapping the wrap by a minimum of 55%.
- 1.2 All conflicts between the requirements of this standard, purchase order or data sheets shall be referred to contractor for clarification before commencement of site operations.

2. DEFINITION

OWNER :

CONTRACTOR : SABZ Engineering Company

3. CODES AND STANDARDS

- 3.1 The following standard should be the latest edition.

BS 2782	Method of Testing for Plastics.
EN 12068	Cathodic protection. External organic coatings for the corrosion protection of buried.
ASTM	American Society for Testing of Materials.
D-1000	Standard Specification for Method of Testing Sensitive Adhesive Coated Tapes.
D-1004	Standard Specification for Test Method for Initial Tear Resistance.
D-638	Standard Test Method for Tensile Properties of Plastics.
G-14	Test Method for Impact Resistance of Pipeline Coating.
G-8	Test Methods for Cathodic Disbonding of Pipeline Coating.
G-62	Standard Test Method for Holiday Detection in Pipeline coatings.

4. MATERIALS



Polyethylene wrapping material shall be used in cold applied tape system.

4.1 POLYETHYLENE WRAPPING MATERIAL

All materials shall be furnished from the same manufacturer and consist of the followings:

- a) Laminated polyethylene (low-density), backed self-adhesive, rubberized, bitumastic compound tape.
 - a.1) Polyethylene inner wrap:

Thickness should be minimum 0.305 mm (0.012"), with self-adhesive compound thickness 0.203 mm (0.008") minimum. Interleaf in rolls supplied shall be double sided release coated paper or polymer preferably with extra width for roll protection. Final thickness should be defined as per vendor data.

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Characteristics of tape:

- Elongation : 250%
- Tensile strength : 7 N/mm²
- Tear resistance : 8 kg/cm
- Dielectric strength : 40 Kvolt/mm
- Insulation strength : 1 x 10⁶ Ohm/mm
- Impact resistance : 3.2 Joules
- Adhesion to steel (With primer) : 2.6 N/mm
- Adhesion to self : 0.5 N/mm
- Temperature range : -5° C to 90° C

a.2) Polyethylene outer wrap :

Thickness should be minimum 0.229 mm (0.009") with 0.102 mm (0.004") self-adhesive compound. Polyethylene to be White or Silver-Grey light reflecting. Final thickness should be defined as per vendor data.

Characteristics of tape:

- Elongation : Min 200%
- Dielectric strength : Min. 10 KVolt
- Insulation resistance : 1x10¹² Ohm/in

b) Bitumen solution type primer, fast drying (3 to 10 minutes).

c) Molding Putty



A compatible molding putty to the supplied tape shall be provided for applying around fittings and flanges, etc., supplied in packs as per manufacturers standard.

4.2 STORAGE

- a) All materials shall be stored in a covered warehouse in a location as cool as possible and protected from the ingress of dirt, dust, moisture, etc.
- b) Any coating materials show evidence of deterioration due to weathering or damage due to mishandling while are in the custody contractor, shall be replaced by the contractor at his expense.
- c) Any materials, which have been rejected for any reason, shall be removed from the site.

4.3 SURFACE PREPARATION

- 4.3.1 Surface shall be completely free from rust, mill scale, grease, weld spatter, weld slag, dirt, dust, oil and any other foreign matter and to be dry at time of application.
- 4.3.2 Oil and grease shall be removed using an approved solvent. White spirit and paint thinners are suitable solvents. Kerosene shall not be used.

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- 4.3.3 Blast cleaning shall not be conducted when the temperature of the surfaces is less than 3° C above dew point of the surrounding air or when the relative humidity of the air is greater than 85%.
- 4.3.4 The coat of primer shall be given as soon as practicable and before detrimental corrosion or recontamination occurs. The cleaned surface shall never be left unprotected over night. Mechanical cleaning machines shall not employ knives or other tools, which may produce notches or gauges on the pipe surface.
- 4.3.5 Blast cleaning machines shall be maintained in correct adjustment and replacement tools shall be available throughout the cleaning process.
- 4.3.6 The cleaning method employed shall not result in thinning of the pipe wall beyond the limits of the pipe specification. Wire brush (surface according to ST2) is accepted.
- 4.3.7 Cleaning shall be carried out immediately before application of the priming coat and shall be to the satisfaction of OWNER. If the outside of the pipe becomes contaminated with any foreign matter, OWNER shall have the right to call for relearning before the priming coat is applied.

4.4 APPLICATION OF PRIMER

- 4.4.1 The clean and dry prepared surface shall be primed with one thin continuous coat of the primer and allowed to dry completely.
- 4.4.2 Coating and wrapping shall not be started until that section of line has been tested and accepted.
- 4.4.3 The primer shall be suitable for brush or spray application and still form a thin uniform coating with an approximate 40 micrometer dry film thickness according to vendor's instruction.

4.5 APPLICATION OF WRAPPING

- 4.5.1 Clean and dry primed surface shall be shaped up at pipe fittings and flanges, using the cold applied bitumen based molding putty packed into crevices around bolts, etc., to provide an even contour suitable for wrapping. Unequal tees shall receive a 45° fillet at the branch inter section.
- 4.5.2 The total, clean, dry prepared surface shall be spirally wrapped with the laminated tape with 55% overlap using sufficient tension to ensure complete conformability. Any bulges formed at covers may be removed by splicing the tape in site and repress ring.
- 4.5.3 End laps between adjoining rolls of the wrap or between pipe sections shall be a minimum of 150 cm.
- 4.5.4 When the wrapping shall be performed "AT SHOP" or "AT SITE" (when it is necessary to stock the wrapped pipes), an outer wrap shall be spirally wound over a clean dry inner wrap with a 55% or 50 mm minimum overlap using sufficient tension to ensure complete conformity. No bulges shall be permitted.

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4.5.5 Roll widths of wrapping tapes to be used shall be conform to the table below:

TAPE WIDTH (MM)	PIPES	BENDS	TEES	FLANGES
150	Up to 3"	Up to 8"	Up to 12"	All
100	4" to 8"	10" to 24"	14" and above	-
150	10" to 16"	28" and above	-	-
225	18" and above	-	-	-

a) Flanges and tees shall receive molding putty as per 3.5.1; Cross bandaging technique shall be used in accordance with manufacturer's instruction.

b) Tees shall be machine-wrap only, otherwise 150 mm tape shall be used.

4.5.6 At the wind and weather line (pipe risers), Pipe wrap shall be applied with 55% overlap completely.

4.6 WRAPPING OF BURIED FLANGES, VALVES AND OTHER FITTINGS

4.6.1 The approved tape shall protect buried flanges, valves and fittings, plus primer and putty supplied by the tape manufacturer.

4.6.2 All exposed metal surfaces of the object to be protected and existing protective coating at each extremity to be cleaned by blasting or wire brushing as appropriate so that the metal surfaces are free of all rust, weld spatter, mill scale, dirt, dust, lime wash and other deleterious matter.

4.6.3 The clean, dry prepared surface to be brush primed with one thin continuous coat of quick drying primer and allowed to dry completely.

4.6.4 Where necessary the dry cleaned, primed surfaces to be shaped up using cold-applied molding putty supplied by the tape manufacturer packed into crevices, around bolts etc. to provide an even contour suitable for wrapping.



4.7 HANDLING OF COATED PIPE

4.7.1 All coated pipes shall be handled in such a way that the coating does not suffer damage. Coated pipe shall be handled at all times with wide non-abrading slings or belts, or other equipment designed to prevent damage to the coating. All skids used to support coated pipe shall be padded.

4.7.2 If the pipeline protective coating suffers damage between the coating and laying operations, the Contractor shall replace or repair the coating to the satisfaction of the OWNER

4.7.3 Coating materials shall be handled in such a way that the materials do not suffer damage.

4.7.4 Pipe shall normally be lowered into the trench immediately after the coating and wrapping has been approved. Where coated and wrapped pipe is supported on padded skids, their number shall be sufficient to ensure that no damage will be caused to the coating and wrapping.

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4.7.5 All coated and wrapped pipes which have been supported in any manner on padded skids, or lowering devices, shall be subjected to closed inspection to see that the coating is undamaged before the pipe reaches the bottom of the trench. Backfilling shall be carried out immediately after the pipeline is lowered into the trench but Contractor shall first obtain the approval by OWNER. If any backfilling is carried out without this approval, OWNER will have the right to require the Contractor to remove the backfill for examination of the coating and wrapping.

4.8 TESTS ON NEW MATERIALS

Manufacturers shall conform to the following tests or OWNER approved equivalent tests, in writing. OWNER reserves the right to have any production sample tested subsequently to ensure that the material conforms to these specifications.

4.8.1 Tensile strength and elongation at break tests shall be carried out according to BS 2782 ,D638 or EN12068.

4.8.2 Tear resistance test shall be carried out according ASTM D1004. Laboratory conditions may alternatively be $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and $65 \pm 2\%$ relative humidity.

4.8.3 Adhesion testing shall be carried out according to ASTM D 1000 or EN 12068.

4.8.4 Impact resistance tests shall be carried out according to ASTM G-14.

4.8.5 Dielectric strength test shall be carried out according to BS 2782 or ASTM D1000.

4.8.6 Cathodic disbonding test shall be carried out according to ASTM G-8 or EN12068.

4.9 INSPECTION AND TESTING OF COMPLETED WORK

4.9.1 All coating shall be subjected to 100% visual inspection and 100% inspection with an electrical holiday detector according to ASTM G62 before being lowered into the trench.



4.9.2 Prior to back filling, all wrapped pipe shall be holiday tested using an approved holiday tester set at 5KV per mm of tape thickness to a maximum of 15KV.

4.9.3 Visual inspection shall ensure that the coating is continuous, that the overlap is correctly maintained and that there are no wrinkles in the tape.

4.9.4 The holiday detector shall be used to check that there is a continuous coating over the pipe surface, particular attention being given to bends and to areas where the tape has been spliced or repaired.

NOTE: It is not intended that the holiday detector should be used to reveal pin holes and minor faults in the inner tape wrap. Such defects would not normally show up on the holiday detector with the specified coating system, unless the voltage was set at a level, so high, that it would be likely to damage the coating.

4.9.5 The holiday detector shall be of an approved type and the operating voltage and setting shall be determined by a method approved by OWNER.

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- 4.9.6 The holiday detector settings shall be checked at least twice per day, while it is in use.
- 4.9.7 The holiday detector shall be operated strictly in accordance with the manufacturer's instructions at all times.
- 4.9.8 At no time, shall the holiday detector be permitted to remain stationary around a coated pipeline with the operating voltage switched on.
- 4.9.9 All defects, whether discovered visually or by means of the holiday detector, shall be clearly and indelibly marked.
- 4.9.10 To ensure continuity between the brushes or rings, a short circuit test shall be carried out at regular intervals to determine the efficiency. If brushes are used, these must be cleaned every day.

4.10 REPAIRS OF COATINGS

- 4.10.1 All defects in the coating shall be made good immediately after their detection.
- 4.10.2 The Contractor shall be responsible for the complete cost, including cost of materials, of making good all defects caused by incorrect storage, handling, application, erection and testing of the protective coating or caused by incorrect construction of the pipeline.
- 4.10.3 In the event of numerous defects in the coating, OWNER shall have the right to order the whole coating to be stripped, the pipe cleaned and another coating provided, applied and tested in accordance with this specification at the Contractor's expense.
- 4.10.4 Holiday or localized defects in the inner tape wrap shall be repaired by the following procedure:
- Strip off outer wrap from affected area, after ensuring that completed coating on either side is properly secured to prevent the outer wrap from unraveling.
 - Strip off inner wrap and primer from the affected area and thoroughly clean the pipe surface.
 - Reprime in accordance with this specification.
 - Apply patch of inner wrap not smaller than 150 mm x 150 mm (6" x 6").
 - Test for continuity of repaired inner wrap with holiday detector before replacing outer wrap.
 - Replace outer wrap and secure firmly.
- 4.10.5 Tears, abrasion or other coating defects shall be repaired as directed by contractor.