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Specification for :

مشخصات فنی :

**Composite Wrap System for Repairing of Non-Leaking
Gas Pipelines from 4 to 56 Inch.**

APPROVED

Foreword:

The purpose of this standard specification (part 1) and application procedures (Part 2) are to describe and explain the application , specification , advantages & limitations of composite wrap system for general corrosion defects repair and grith weld re-inforcement concerning carbon steel gas pipeline.

This standard intended to be mainly used by all division of N.I.G.C , and has been prepared on interpretation of recognized standards, technical documents, knowledge, backgrounds and experiences in national gas industry at national and international levels.

Iranian gas standards (IGS) are prepared, reviewed and amended by technical standard committees within NIGC standardization division of research & technology management and approved by the " NIGC Standard Council".

Iranian gas Standards are subjected to revision, amendment or withdrawal if required, thus the latest edition of IGS shall be checked/inquired by NIGC user.

Any comments from concerned parties or individual on IGS'S are welcome.

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Technical specification of composite wrap system for gas pipelines from diameters of 4 to 56 inch

1.0 Scope

- 1.1. This standard specification provides minimum requirements for repairing of non-leaking defects in gas pipeline from diameter of 4 to 56 inch inclusive. The composite wrap performance, test methods and inspection shall be all in accordance with standards as specified in table 1 and manufacturer's recommendations.

- 1.2. Manufacturer/Supplier shall provide all required documents, application instruction, safety check list and guidelines required in practice on application.

2.0. Normative references:

Through out this standard specification the following standards and codes are referred to, the edition of these standards and codes that are in effect at the time of issues of this standard specification .

The applicability of changes in standards and codes that occur after the date of standards that referred shall be mutually agreed upon by the purchaser and supplier and / or manufacturer.

- 2.1. ASME/ANSI B314A-2001: Pipeline transportation systems for liquid hydrocarbons and other liquid.
- 2.2. API/ANSI 1160- 2001: Managing system integrity for hazardous liquid pipeline.
- 2.3. ASME B31.8 S – 2001: Managing system integrity of gas pipeline.
- 2.4. ASTM D-3039 – 2001: Standard test method for tensile properties of polymer matrix composite material.
- 2.5. ASTM D-3163-2001: Standard test method for determining strength of adhesively bonded rigid plastic lap shear joints in shear by tension loading.
- 2.6. ASTM C-579-2001 : Standard test method for comprehensive strength of chemical-resistant mortars, grouts monolithic surfacings and polymer concrete.
- 2.7. ASTM D2240-2002: Standard test method for rubber property – durometer hardness.
- 2.8. Department of transportation, U.S.A (DOT)

2.9. Gas research institute of U.S.A (GRI)

3.0. Introduction :

Composite wrap is an engineered repair system utilizing a cured laminated composite technology for the permanent and temporary repairs of general corrosion defects associated with gas pipelines.

The system is suitable for pipe diameters from 4 to 56 inch regardless of pressure.

While the composite wrap repair can be made at full line pressure, manufacturers recommend that line pressure be reduced during repair.

The techniques described here in, are applicable for underground and above ground pipeline. In the latter case, composite wrap must be U.V resistance .

4.0 Composite wrap system general characteristics:

Composite wrap consists of three parts :

- 1- A high strength unidirectional composite structure of glass fiber and a polymer base.
- 2- A fast curing, high performance , two parts adhesive system.
- 3- A high compressive strength load transferring filler compound.

4.1. Composite structure:

The composite wrap laminate layers are nominally 0.062in (1.6mm) thickness have a glass fiber content ranging from 60 to 70 percent by weight. The composite wrap is normally wound 8 times around the pipe to create a min ½in (12.7 mm) thickness of repairing material .

4.2. Adhesive:

The two – parts cold applied adhesive is used to hold the repair in place.

4.3. Load transfer filler:

The composite wrap, works by sharing the hoop load carried by the pipe wall. This load is efficiently transferred to the composite by the filler. The external defect is filled with the high compressive strength filler material to prevent the weakened pipe wall from further yield .

4.4. Composite wrap kit contents:

Each composite wrap kit should consist of the following items:

- Composite wrap sleeve .
- Adhesive.
- Load transfer filler .
- Roller applicator .
- Double sided adhesive pad.
- Alignment blocks.
- Application brushes, paint tray, stir stick.
- Cinch bar type system (re-useable device)

5.0 Composite wrap system properties**TABLE 1**

COMPOSITE SLEEVE		
SPECIFICATION	REQUIREMENTS	TEST METHOD
APPLICATION	DESIGNED TO REPAIR, CORRODED SECTIONS OF LINE PIPE WITH UP TO 80% WALL THICKNESS LOSS LOCALLY (NOT COMPLETELY)	----
STANDARD CONFIGURATION	8 LAYERS (TYPICAL)	----
NOMINAL THICKNESS	½ IN (13MM) (TYPICAL)	----
MATERIAL	E-GLASS, POLYESTER	----
TENSILE STRENGTH (AVERAGE)	60,000 PSI	ASTM D-3039

FLEXURE STRENGTH (AVERAGE)	4.5 310⁶ PSI	ASTM D 790
MODULUS OF ELASTICITY (MIN)	5×10⁶ PSI	ASTM D-3039
APPLICATION TEMPERATURE	-18 TO +45⁰ C	----
SERVICE TEMPERATURE	-29 TO 60⁰ C	----
WIDTH	MIN 12 IN (TYPICAL VALUE)	----
LENGTH	AS REQUIRED	
ADHESIVE		
LAP SHEAR STRENGTH	>1200 PSI	ASTM D3163
SHORE D HARDNESS	75-85 AFTER 24 H CURE PERIOD	ASTM D2240
SHELF LIFE (MIN)	12 MONTH FROM DATE OF MANUFACTURING	
FILLER		
COMPRESSIVE STRENGTH	>8000 PSI	ASTM C579
SHELF LIFE (MIN)	12 MONTH FROM DATE OF MANUFACTURING	----
ACTIVATOR		
SHELF LIFE (MIN)	12 MONTH FROM DATE OF MANUFACTURE	----

NOTE :

- 1- Refrigeration at 3 to 11⁰C will extend adhesive filler and activator shelf life an additional 3 month.
- 2- Application shall be in a accordance with part 2 of this standard and manufacturer's application instruction .

6.0 Applicable defect types:

Composite wrap is applicable for the following defect types:

6.1. General and pitting corrosion:

General and pitting corrosion of up to 80 percent of wall thickness loss and there is no limitation to the defect length as composite wrap can be installed side by side to cover the complete repair area.

6.2. Girth welds:

Composite wrap is suitable for the re- inforcement of corrosion associated with girth welds as well as some weld defects including porosity, lack of fusion and under cut.

7.0 Non – Applicable defects:

7.1. Cracks:

The composite wrap system must not use for crack repair and axial type defects , except the defect, has been ground out and inspected to ensure no further cracking is present.

8.0 Composite wrap field inspection :

To test composite wrap, visual inspection will provide the best indication of performance.

The composite wrap installation should be inspected to insure that:

- The coating is continuous and free of defects .
- There are at least 8 layers of composite material (Total thickness of minimum ½ in)
- There is no evidence of movement.
- The adhesive can be tested to ensure that, it has a hardness of 40 shore D .

9.0 Documents:

The manufacturer of composite wrap material must submit the following documents :

- 9.1. Laboratory and field test data from a recognized certifying organization, showing at least a period of 7 years,. Material under test and confirm long term performance.
- 9.2. Third party clarification that their repair material is acceptable for use of permanent repair on the high pressure gas transmission pipeline.
- 9.3. Supporting documentation from various pipeline and regulatory authorities concerning sub – clause 9.2.
- 9.4. User reference list for at least 10 years
- 9.5. Technical catalogue.
- 9.6. Application instruction
- 9.7. Confirm action of all clauses stated in this standard specification .In case of any deviation , it must be clearly announced.