

IGS-C-TP-014-8(0)

Dec.2023

Approved

مصوب



شرکت ملی گاز ایران
مدیریت پژوهش و فناوری
امور تدوین استانداردها

IGS

دستورالعمل

سیستم پوشش غشایی قیر اصلاح شده پلیمری گرم اجرا برای سرجوش ها و
تعمیرات لوله های فولادی مدفون

Hot-Applied Polymer Modified Bituminous Membrane Coating
System for Field Joints and repairs of Buried Steel Line Pipes



تاریخ: ۱۴۰۲/۱۱/۱۱

شماره بگ/دب/۰/۴۴۳/۰-۲۱۷۵۶



شرکت ملی گاز ایران



دفتر مدیرعامل

ابلاغ مصوبه هیأت مدیره

مدیر محترم پژوهش و فناوری

باسلام،

به استحضار می‌رساند در جلسه ۲۰۴۳ مورخ ۱۴۰۲/۱۰/۲۴ هیأت مدیره، نامه شماره ۱۸۸۴۷۱ مورخ ۱۴۰۲/۱۰/۱۹ آن مدیریت درمورد تصویب نهایی مقررات فنی شرکت ملی گاز ایران به شرح زیر مطرح و مورد تصویب قرار گرفت.

۱- مشخصات فنی خرید غربال مولکولی نوع 3A°

IGS-M-CH-051-1(1)

۲- دستور العمل سیستم پوشش غشایی قیر اصلاح شده پلیمری گرم اجرا، برای سرجوش ها و تعمیرات لوله های فولادی مدفون

IGS-C-TP-014-8(0)

سید محمد پیشوایی
دبیر هیأت مدیره

رونوشت: مدیرعامل محترم شرکت ملی گاز ایران و رئیس هیأت مدیره

اعضای محترم هیأت مدیره

مشاور و رئیس دفتر محترم مدیرعامل

سرپرست محترم امور حقوقی

سرپرست محترم حسابرسی داخلی

رئیس محترم امور مجامع

Foreword

This standard specification is intended to be mainly used by N.I.G.C. and contractors, and has been prepared base on interpretation of recognized standards and technical documents, as well as knowledge, backgrounds and experiences in gas industries at national and international levels.

Iranian Gas Specification (IGS) are prepared, reviewed and amended by technical standard committees within NIGC standardization division of research and technology management and submitted to "the standards council of NIGC" for approval.

IGSs are subjected to revision, amendment or withdrawal, if required, and thus the latest edition of IGS shall be checked / inquired by NIGC'S users.

This standard must not be modified or altered by NIGC employees or its contractors. Any deviation or conflicts between this specification and other applicable standards, codes, procedure or well-known manufacturer's specifications must be resolved in writing by the user or its representative through Manager, Engineering Department or standardization division of NIGC.

The technical standard committee welcomes comments and feedbacks from concerned or interested corporate and individuals about this standard, and may revise this document accordingly based on the received feedbacks.

General Definitions

Throughout this standard the following definitions, where applicable, should be followed:

- 1- "STANDARDIZATION DIV." is organized to deal with all aspects of industry standards in NIGC. Therefore, all enquiries for clarification or amendments are requested to be directed to mentioned division.
- 2- "COMPANY": refers to National Iranian Gas Company (NIGC).
- 3- "SUPPLIER": refers to a firm who will supply the service, equipment or material to IGS specification whether as the prime producer or manufacturer or a trading firm.
- 4- "SHALL ": is used where a provision is mandatory.
- 5- "SHOULD": is used where a provision is advised only.
- 6- "MAY": is used where a provision is completely discretionary.

Website: <http://igs.nigc.ir>

Contents	Page
1. SCOPE	4
2. REFERENCES	4
2.1 Normative References	4
2.2 Informative References.....	5
3. DEFINITIONS	6
4. REQUIREMENTS	7
4.1 Hot – Applied polymer modified Bituminous membrane	7
4.2 Primer	8
4.2.1 Properties	8
4.3 Properties of Primer.....	9
5. DOCUMENTATION	9
5.1 Documents to be Submitted by the Manufacturer	9
5.2 Documents to be Submitted by The Applicator	10
6. PACKAGING	10
6.1 Membrane	10
6.2 Primer	10
7. MARKING.....	11
7.1 Membrane	11
7.2 Primer	11
8. STORAGE CONDITION	12
9. QUALITY ASSURANCE	12
10. APPLICATION OF COATING	12
10.1 Surface Preparation	12
10.2 Application Procedure	12
11. INSPECTION AND TESTING.....	13
11.1 Inspection for Qualification.....	14
11.2 Inspection for Batch Certificate	14
11.3 Inspection for Field	15
12. REPAIR	16
13. HEALTH, SAFETY AND ENVIRONMENT	16
ANNEX A.....	17
Data Sheet for Hot Applied Modified Bituminous membrane	17
ANNEX B.....	18
Data Sheet for Primer.....	18



Table 1-Qualification Requirements..... 8
Table 2-Properties of Primer..... 9

GasPlus.ir

1. SCOPE

This standard specification specifies the minimum requirements for field joint membrane and comprises a woven glass fiber carrier incorporating a tough and flexible polymer modified bituminous hot applied for corrosion protection of field joints and field repair of steel line pipes coated with bitumen enamel or polymer modified bitumen enamel in conjunction with cathodic protection.

This standard specification covers the use of hot applied polymer modified bituminous membrane when the design temperature is from -20 °C to +60 °C.

Note 1: This standard withdraws and replaces IGS-M-TP-014-8 (1).

2. REFERENCES

Throughout this standard the following dated and undated standards/codes are referred to. This referenced documents shall, to the extent specified herein, from a part of this standard. For dated references, the edition cited applies. For undated references, the latest edition of the referenced documents applies.

2.1 Normative References

ASME B 31.8 (2018) "Gas transmission and distribution piping systems"

ASTM D 149 (2020) "Standard test method for dielectric breakdown voltage and dielectric strength of solid electrical insulating materials at commercial power frequencies"

ASTM D 4285 (2018) "Standard Test Method for Indicating Oil or Water in Compressed Air"

ASTM D 4940 (2020) "Standard Test Method for Conducti Metric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives"

EN 10300 (2005) "Steel Tubes and Fittings for Onshore and Offshore Pipelines – Bituminous Hot Applied Materials for External Coating"

EN 12068 (1999) "Cathodic Protection – External Organic Coatings for the Corrosion Protection of Buried or Immersed Steel Pipelines Used in Conjunction with Cathodic Protection – Tapes and Shrinkable Materials"

IGS-C-TP-016 " polymer modified bitumen enamel factory coating system for external surface of buried and submerged line pipes"

IGS-M-PL-001-2 "SMLS/HFW/SAWH Carbon Steel Pipes, Part 2- Grades B to X80, Sizes 6 to 56 inches"

IGS-M-PL-001-2 "SMLS/HFW Carbon Steel Pipes, Part 1- Grades B, 0.5 to 4 inches"

IGS-O-TP-001 "Maintenance and Rehabilitation of Coating of Gas Pipeline Under Operation"

ISO 11124 (all parts) (2018) Preparation of Steel Substrates before Application of Paints and Related Products –Specifications for Metallic Blast-Cleaning Abrasives

ISO 11126 (all parts) (2018) "Preparation of Steel Substrates before Application of Paints and Related Products –Specifications for Non-metallic Blast-Cleaning Abrasives"

ISO 13736 (2021) "Petroleum Products and Other Liquids. Determination of Flash Point. Abel Closed Cup Method"

ISO 2431 (2019) "Paints and Varnishes – Determination of Flow Time by Use of Flow Cups"

ISO 3801 (1977) "Textiles – Woven Fabrics – Determination of Mass per Unit Length and Mass per Unit Area"

ISO 5256 (2013) "Steel Pipes and Fittings for Buried or Submerged Pipelines – External and Internal Coating by Bitumen or Coal Tar Derived Materials"

ISO 8501-1 (2007) "Preparation of Steel Substrates before Application of Paints and Related Products – Visual Assessment of Surface Cleanliness – Part 1: Rust Grades and Preparation Grades of Uncoated Steel Substrates and of Steel Substrates after Overall Removal of Previous Coatings"

ISO 8502-3 (2017) "Preparation of Steel Substrates before Application of Paints and Related Products – Test for Assessment of Surface Cleanliness – Part 3: Assessment of Dust on Steel Surface Prepared for Painting (Pressure Sensitive Tape Method)"

ISO 8502-6 (2020) "Preparation of Steel Substrates before Application of Paints and Related Products – Test for Assessment of Surface Cleanliness – Part 6: Extraction of Soluble Contaminants for Analysis – The Bresle Method"

ISO 8502-9 (2020) "Preparation of Steel Substrates before Application of Paints and Related Products – Test for the Assessment of Surface Cleanliness – Part 9: Field Method for the Conduct Metric Determination of Water-Soluble Salts"

ISO 8503-5 (2017) "Preparation of Steel Substrates before Application of Paints and Related Products –Surface Roughness Characteristics of Blast-Cleaned Steel Substrates – Part 5: Replica Tape Method for the Determination of the Surface Profile"

ISO 9001 "Quality system – Model for quality assurance in design, development, production, installation and servicing"

ISO 2808 (2007) "Paints and varnishes — Determination of film thickness"

2.2 Informative References

EN 10204 (2004) "Metallic Products-Types of Inspection Documents"

3. DEFINITIONS

Applicator

The party that applies the coating

Batch

The batch shall consist of an indefinite number of rolls or sheets manufactured by a single plant run through the same processing equipment, with no change in ingredient materials.

Bitumen

Viscous liquid or a solid, consisting of hydrocarbons and their derivatives, which is soluble in carbon disulfide or trichloroethylene. It is substantially non-volatile and softens gradually when heated. It is black or brown in color and possesses waterproofing and adhesive properties. It is obtained by refinery processes from petroleum.

Coating Applicator

The party, which is ultimately responsible for the coating operations which include supply coating materials, application of the coating materials, etc. as specified in the relevant contract.

Coating System

The complete number and types of coats applied to a substrate in a predetermined order. (When used in a broader sense, surface preparation, pretreatments, dry film thickness, and manner of application are included).

Coating:

A coating is an electrically insulating covering applied to a metal surface, as passive protection against external corrosion.

Hot Applied Material

Material which is solid at ambient temperature and becomes fluid on heating to application temperature.

Inspection Test Plan (ITP)

Document providing an overview of the sequence of inspections and tests, including standard references, recommended apparatuses (tools) and testing procedures.

Manufacturer/Supplier

The company that manufactures or supplies coating material

Maximum Continuous Operating Temperature

Maximum continuous operating temperature of the medium transported through the buried or immersed coated pipeline

Modified Bitumen Enamel

Bitumen enamel, which has been rheologically changed by the addition of a polymer or polymers

MSDS

Material safety data sheets

Plasticizer

A substance incorporated in a material to increase its workability, flexibility, or distensibility

Primer

A solution applied as an undercoat directly to the metal surface in order to assist the bonding of a subsequent coating

Purchaser

The owner company that has the authority for the pipeline or piping systems to which the coating is to be applied

Resin

A material, natural or synthetic, contained in varnishes, lacquers, and paints, the film former

Shelf Life

Amount of time a coating or other material remains in useable condition

Solvent

A volatile liquid, which is used in the manufacture of primer to dissolve or disperse the film forming constituents, and evaporates during drying and therefore does not become a part of the dried film

4. REQUIREMENTS

The coating system consists of a primer and a coated polymer modified bituminous membrane with the following general description:

4.1 Hot – Applied polymer modified bituminous membrane

Polymer modified Bituminous membrane shall consist of a special glass fiber, impregnated and coated with polymer modified bitumen. Field Joint Membrane comprises a woven glass fiber carrier incorporating a tough and flexible polymer modified bitumen.

polymer modified bitumen membrane shall meet the requirements specified in Table 1.

Table 1-Qualification Requirements

Item	Property	Unit	Acceptance Criteria	Test Method
1	Thickness, min	mm	4.0	ISO 2808
2	Mass per unit area, min	g/m ²	5000	ISO 3801
3	Holiday detection (5 kV per mm of coating thickness), max	kV	20	EN 10300 Annex R
4	Tensile strength, min - Longitudinal - Transverse	N/mm N/mm	15 20	EN 12068 Annex A
5	Peel strength at 23±2 °C (to pipe surface, to factory coating), min	N/cm	80	EN 10300 Annex S
6	Peel strength at 60±3 °C (to pipe surface, to factory coating), min*	N/cm	20	EN 10300 Annex S
7	Lap shear strength at 60±3 °C, min	N/mm ²	0.05	EN 12068 Annex D
8	Impact resistance at 23±2 °C, min	J	15	EN 12068 Annex H
9	Cathodic disbondment resistance, max - at 23±2 °C - at 60±3 °C	mm mm	5 12	EN 12068 Annex K
10	Dielectric strength, min	kV	25	ASTM D 149
11	Water absorption, max	g/m ²	0.7	ISO 5256

* Use a water bath that is set at 60 ± 3 °C and keep a sample in it for a minimum of 45 minutes, or an oven is set at 60±3 °C and keep the sample in it for minimum 12 hours.

4.2 Primer

It shall be fast dried (5 – 15 minutes at 23 °C), synthetic and specially formulated to be used with the relevant polymer modified bitumen enamel materials.

The primer shall consist of hydrocarbon resins and plasticizer and, when required, coloring matter, together with solvents needed to give a consistency suitable for application by spray, brush or other approved method and compatible with the polymer modified bitumen enamel and shall be supplied by the same manufacturer of the modified bitumen enamel.

4.2.1 Properties

The primer shall comply with the requirements of table 2 and, when dry, shall provide a highly effective bonding medium between the surface to be protected and applied polymer modified bitumen enamel membrane, to meet the requirements given in table 1.

4.3 Properties of Primer

Table 2-Properties of Primer

Item	Characteristic	Unit	Requirement	Test Method
1	Flow time (Flow cup No. 4 at 23 0C)	seconds	35 to 60	ISO 2431
2	Flash point (Abel closed cup), min	°C	23	ISO 13736
3	Volatile matter, max	% loss by mass	75	EN 10300 Annex H

5. DOCUMENTATION

The manufacturer/supplier shall provide sufficient information to identify the coating system and shall supply, as a minimum requirement, the technical information of the coating components as follows:

- ISO 9001 "CERTIFICATION" for "Design, Manufacturing and Quality Control" of an offered coating system for "pipeline corrosion protection" issued by an internationally recognized body.
- Original technical catalogues, manufacturing product data sheet and application procedure recommendation and guidelines (application instructions) for all of the items offered.
- Storage and handling procedures.
- Material Safety Data Sheet (MSDS).
- Filled, signed and stamped data sheets in Annex A and Annex B.

5.1 Documents to be submitted by the Manufacturer

The manufacturer/supplier shall provide sufficient information to identify the coating systems and shall supply, as the minimum requirement, the technical information of the coating components as follows:

- a. Technical specification and material data sheets as detailed in Annex A and Annex B.
- b. Test reports as detailed in Table 1 (The test methods shall be specified for any tests);
- c. Batch certificates
- d. Application procedure of the coating material
- e. Directions for handling and storage
- f. Material safety data sheets (MSDS)
- g. Filled, signed and stamped data sheets
- h. ISO 9001 " CERTIFICATION" for "Design & Manufacturing" of offered tape coating system (tape and primer) for "pipeline corrosion protection" issued by an internationally recognized body

- i. Certificate and approval test report from an internationally well-known certifying body (i.e. DVGW (Germany) and ADVANTICA (UK) for the offered coating system for

maximum continuous operating temperature up to 50°C and compatibility with this standard specification

Note 2: For Iranian manufacturers certificates from recognized certifying bodies shall be approved by the standard council of NIGC.

Note 3: At the discretion of the purchaser, the qualification tests may be waived, provided that the certificates and the results of tests carried out at a reputable third-party test laboratory, not exceeding two years from the date of tests, are submitted by the manufacturer/supplier and approved by the purchaser.

5.2 Documents to be submitted by The Applicator

The following documents shall be prepared by the applicator and submitted to the purchaser for review and approval:

- a. Quality Control Plan (QCP) for application of the coating;
- b. Repair procedure.

6. PACKAGING

The packaging of primer and membranes shall be according to manufacturer Instructions” but, as a minimum, the following conditions shall be fulfilled:

6.1 Membrane

The membranes shall be delivered in roll or sheet form. Each roll or sheet of membrane shall be individually packaged with a proper moisture-proof material. The membranes shall be packaged on heavy wooden pallets with a light plate on top. Pallets shall be strapped on all sides to be suitable for long-distance shipment and additionally shrink wrapped to be weather-proof. Each pallet of coating material shall contain an application instruction.

6.2 Primer

The primer shall be packaged in new steel drums which shall be perfectly tight in order to prevent solvent from evaporating and being polluted with dust, water and foreign materials. All containers shall be of a suitable shape with a removable lid to allow adequate stirring and mixing.

The primer shall be delivered in maximum 20 liters of new steel drums and shall be located on heavy wooden pallets with a light plate on top. Pallets shall be strapped on all sides to be suitable for long-distance shipment.



7. MARKING

7.1 Membrane

7.1.1 Marking of rolls

Each roll shall be marked with the following information:

- Name or trade mark of the manufacturer
- Type and trade name of membrane
- Dimension
- Batch No.
- Date of manufacture
- Storage in a closed and dry place, must be marked with a red "double roof" symbol.

7.1.2 Marking of Pallets

Each pallet container shall be plainly marked with the following information:

- Name and trademark of the manufacturer
- Product designation
- Quantity (number of rolls in container)
- Roll sizes
- Batch No.
- Date of manufacture
- Manufacturer's name and address
- Storage in a closed and dry place, must be marked with a red "double roof" symbol.

7.1.3 Direction for use

The manufacturer's instructions for use shall be supplied with each pallet of membranes.

7.2 Primer

Each drum shall be legibly marked with the following information:

- Name and trade mark of the manufacturer
- Product designation
- Batch No.
- Application temperature
- Type of thinner (if applicable)
- Cleaning material
- Flash point
- Drying time
- Date of manufacture
- Maximum/minimum storage temperature
- Manufacturer's name and address
- MSDS warning sticker
- Shelf life
- Net weight
- IGS Specification

8. STORAGE CONDITION

The membrane shall meet the requirements of clause 4 after storage for 12 months of delivery date. This means 12 month remain until the expiration date, in a tightly covered container at temperatures between -10 to +35 °C. The primer shall show no thickening, curdling, skinning, gelling, or hard caking after storage for 12 months at storage condition, from date of delivery This means 12 months remain until the expiration date, in a full, tightly covered container.

9. QUALITY ASSURANCE

Manufacturers shall operate an effective, documented quality system based on the relevant part of the ISO 9001 and maintain records identifying the product, date of manufacturing, batch numbers and all results of inspection and testing.

10. APPLICATION OF COATING

10.1 Surface Preparation

– Prior to blast cleaning, the steel surface shall be dry and free from surface defects (such as slivers and laminations), contamination (such as oil, grease, hydrocarbons and temporary corrosion protection), previously applied coatings and deleterious materials. The pre-blasting surface preparation processes may be used, such as chemical treatment, solvent cleaning, water jetting and use of hand or power tools. These processes shall be approved by the purchaser. After blast cleaning, the degree of cleanliness shall be SA 2½ or better in accordance with ISO 8501-1 and the roughness RZ shall be between 60 and 100 µm as measured in accordance with ISO 8503-5.

– Abrasive materials shall comply with the requirements of ISO 11124(all parts) or ISO 11126(all parts). They shall be free from contamination and contain less than 100 mg/kg chloride and less than 0.3% copper. If the conductivity of the blasting material is greater than 50 µS/cm (in accordance with ASTM D 4940), the blasting material shall be replaced.

– Compressed air for surface preparation shall be free of oil and condensed water. These shall be determined daily with a blotter test in accordance with ASTM D4285. If necessary, After-coolers shall be provided to reduce the water content to an acceptable level. Traps, filters and separators shall be regularly emptied and cleaned.

– Nozzles for blast cleaning equipment shall be of Venturi design and shall be discarded when wear reaches 30% of the original bore.

– The pipe surface shall be maintained at least 3 °C above the dew point temperature and humidity shall not exceed 85% during cleaning and prior to coating.

– If pipe heating is used to meet required environmental conditions, the pipe must be heated with caution to prevent damage to the parent coating or lining.

– Blast-clean pipe surfaces shall be protected from condensation, moisture, rainfall, frost and snow. Blast-clean surfaces shall also be protected from other contaminants



Including sand, grit and dirt. The blasted pipe surface shall not be allowed to flash rust or exhibit deterioration before coating.

– The maximum residual chloride level on the blast-cleaned surface shall be 30 mg/m² in accordance with ISO 8502-6 or ISO 8502-9 or using Elcometer 130/SCM400 or any other method approved by purchaser.

– Contaminants (e.g. residual abrasive dust and dirt) shall be removed from all blasted surfaces prior to coating application. Dust contamination shall be a maximum in class 2,

In accordance with ISO 8502-3. A tape test shall be conducted to verify that the surface is free of contaminants.

– Prepared surfaces shall be visually inspected for surface defects and surface imperfections that may cause holidays in the coating.

– After blast cleaning, the surface of the pipe shall be inspected. All slivers, laminations, weld spatters and other surface imperfections made visible by the blast cleaning process shall be removed. After removal of these defects, the residual thickness of pipe shall satisfy the minimum requirements specified by IGS-M-PL-001-1 & IGS-M-PL-001-2.

The treated areas greater than 10 cm² shall be ground flash to a smooth contour profile.

10.2 Application Procedure

–The applicator shall follow the coating manufacturer's procedures and recommendations, which are subject to approval by the purchaser.

– No thinner shall be used to dilute or change the consistency of the coating material.

– Coating shall not be applied during rain, fog, mist or when there is free moisture on the prepared surface or rust flashes.

– The coating operation shall be suspended when the metal temperature falls to within 3 °C of the dew point, or is less than 5 °C and/or when the relative humidity is higher than 85%.

– If the surface to be coated is below 10 °C, preheating of the substrate is recommended. Pipe temperature shall not exceed 50 °C as a result of preheating.

– The maximum time between surface preparation and start of the coating application shall be no longer than 4 hours for relative humidity up to 70% and 2 hours for relative humidity between 70% and 85%.



NIGC

11. INSPECTION AND TESTING

11.1 Inspection for Qualification

– Inspection shall be carried out as per Table 1 & 2 by the applicator. The results of inspection shall be recorded by the applicator and made available to the purchaser's inspector.

– The purchaser's appointed inspector shall have free access to the workshops, storage yards and laboratory of the coating applicator. An inspector shall have the right and opportunity to witness any quality control tests and/or to perform such tests himself. The applicator shall furnish the purchaser's inspector with all tools and equipment necessary for inspection at the application site.

– Purchaser's inspector shall have free access at all times to all work related to the coating application process, with the right to inspect work and materials. All such work and materials shall be subject to approval by inspectors. Failure of inspector to identify or reject Defective work or materials shall not be construed as acceptance of such work or materials.

11.2 Inspection for Batch Certificate

To guarantee the quality of the products to be delivered, the inspection is carried out at the manufacturer's site prior to shipment.

Based on the results of material tests during the inspection and on the provided quality control data (process control, in-house and external tests), an inspection report shall be filled-out and signed by the inspector according to inspection type 3.1 of standard EN 10204.

This inspection and Testing Procedure regulates the steps that are taken during the inspection process.

The Inspector's work and duties consist of the following activities, but not limited to:

1. Checking of Documents

a. Checking the raw material quality control test results and Certificates for all items and verifying the results versus the manufacturer's data sheets.

b. Checking the manufacturer's daily production quality control test reports showing the amounts of produced material & results of the relevant tests and verifying the results versus the manufacturer's data sheets.

c. Check the calibration certificates of the testing and inspection instruments.

d. Check the test report for all items (long term and short term) of qualification properties according to related standard IGS, not exceeding two years from issuance date.

2. Visual Inspection of the Produced Goods:

a. Visual inspection of the marking and packaging (number and weight of container, batch number of components, etc.) according to this standard and purchase order.

b. Crosscheck purchase order quantities with stock

3. Selection of Samples for Material Tests

Selection of three rolls per each batch of all material to prepare samples from the coating system running for each item according to related test methods.

4. Batch Certificate Tests:

All tests shall be carried out according to tables 1, 2 of this standard.

5. Inspection Report:

Inspection report shall include the following items, but not limited to:

- List of inspection materials, quantities and batch numbers
- Report of document check (according to section 1)
- Report of visual inspection (according to section 2), plus photos of activities
- Description of sample selection and preparation of specimens, plus photos of activities
- Report of calibration certificates of the testing and inspection instruments
- Date of presence in factory, preparation of specimens and start of test
- Test reports include test results and graphs (if that is to exist)
- Third party inspection agency approves

Notes4: All in-house tests shall be performed under the witness of an inspector.

For Non-Iranian manufacturers, tests of one produced batch are exemplary for the whole shipment, to be carried out by an internationally well-known independent laboratory and all of documents shall be accepted by inspectors.

For Iranian manufacturers, the tests shall be carried out at a third-party laboratory that is approved by Technical & Industrial Research Laboratories of NIGC.

Details of all inspection and testing shall be fully documented by the manufacturer and certified by an inspector.

The results of all mentioned tests shall be checked and complied with criteria which are mentioned in related standards.

In the case of any failure to comply with any of the NIGC's requirements mentioned in the related standard IGS, new samples according to the above-mentioned table shall be selected by an inspector and all of the required tests shall be carried out accordingly. If any failure occurs again, it shall be the effect of rejection for each batch presented.

At least one photo of an inspector next to the goods is required. The photos of all parts (including of storage, batch number of drum, preparation of test specimens, test instruments etc.), plus the image of the inspector's photo attached to the certificate on the inspection report (via CD/DVD) are required.

A third party inspector shall issue a release note to the supplier and purchaser (two copies) after item acquisition.

A third party inspection agency shall issue an inspection certificate after a release note has been issued.

11.3 Inspection for Field

The applicator shall prepare a daily production summary containing the following information for each pipe section coated:

- Date and pipe section number;
- Number of holidays;
- The coating shall not have any defects such as wrinkles, pinholes, cuts, disbanded zones, bubble spots, etc.
- The type of tests and frequency of inspection shall be as per purchaser's ITP.

12. REPAIR

- Any repair operation shall be carried out in accordance with the repair procedure approved by the purchaser.
- The repair material and the application conditions shall be in accordance with IGS-O-TP-001

13. HEALTH, SAFETY AND ENVIRONMENT

The applicator shall comply with the requirements of the purchaser's HSE Management System, the product's MSDS and other requirements such as site regulations, safety rules, etc. The applicator shall ensure that updated MSDS are obtained from the manufacturer. The applicator shall provide all painters with approved protective clothing including safety glasses, safety shoes, hard hats, goggles, respirators, earplugs, fresh-air-fed hood and any other necessary safety equipment. All the safety equipment shall be maintained in a good working condition. The applicator shall be required to test work areas for flammable vapors, with an appropriate vapor tester, prior to and throughout abrasive blasting and coating operations. The applicator shall post appropriate warning signs and erect appropriate barriers in the work area. The waste produced during operation, repairing and maintenance shall be managed and disposed under waste management laws and related regulations (MOP-HSED-301 to 306).

ANNEX A

Data Sheet for Hot Applied Modified Bituminous membrane

Manufacturer's name and address	
Product	
Product designation	

Item	Property	Actual and Reproducible Data	Unit	Test Method	Remark
1	Thickness, min		mm	EN ISO 2808	
2	Mass per unit area, min		g/m ²	ISO 3801	
3	Holiday detection (5 kV per mm of coating thickness), max		kV	EN 10300 Annex R	
4	Tensile strength, min - Longitudinal - Transverse		N/mm	EN 12068 Annex A	
5	Peel strength at 23±2 °C (to pipe surface, to factory coating), min		N/cm	EN 10300 Annex S	
6	Peel strength at 60±3 °C (to pipe surface, to factory coating), min*		N/cm	EN 10300 Annex S	
7	Lap shear strength at 60±3 °C, min		N/mm ²	EN 12068 Annex D	
8	Impact resistance at 23±2 °C, min		J	EN 12068 Annex H	
9	Cathodic disbondment resistance, max - at 23±2 °C - at 60±3 °C		mm mm	EN 12068 Annex K	
10	Dielectric strength, min		kV	ASTM D 149	
11	Water absorption, max		g/m ²	ISO 5256	

ANNEX B**Data Sheet for Primer**

Manufacturer's name and address	
Product	
Product designation	

Item	Property	Actual and Reproducible Data	Unit	Test Method	Remark
1	Flow time (Flow cup No. 4 at 23 0C)		seconds	ISO 2431	
2	Flash point (Abel closed cup), min		°C	ISO 13736	
3	Volatile matter, max		% loss by mass	EN 10300 Annex H	