Gas Industry Standard

GIS/CW2:2020

Specification for

COLD APPLIED WRAPPING TAPES AND TAPE SYSTEMS

Cadent Your Gas Network
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WALES&WEST UTILITIES

Contents

Foreword

Gas Industry Standards (GIS) are revised, when necessary, by the issue of new editions. Users should ensure that they are in possession of the latest edition. Contractors and other users external to Gas Transporters should direct their requests for copies of a GIS to the department or group responsible for the initial issue of their contract documentation.

Comments and queries regarding the technical content of this document should be directed in the first instance to the contract department of the Gas Transporter responsible for the initial issue of their contract documentation.

This standard calls for the use of procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Compliance with this engineering document does not confer immunity from prosecution for breach of statutory or other legal obligations.

Mandatory and non-mandatory requirements

For the purposes of a GIS the following auxiliary verbs have the meanings indicated:

can indicates a physical possibility;

may indicates an option that is not mandatory;

shall indicates a GIS requirement;

should indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment needs to be completed to show that the alternative method delivers the same, or better, level of protection.

Disclaimer

This engineering document is provided for use by Gas Transporters and such of their contractors as are obliged by the terms of their contracts to comply with this engineering document. Where this engineering document is used by any other party, it is the responsibility of that party to ensure that the engineering document is correctly applied.

Brief history

First published as BGC/PS/CW2	September 1975
Revision published BGC/PS/CW2	December 1988
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1. Scope

Historically the gas industry in the UK has made use of a variety of cold applied tapes and tape systems for corrosion protection of areas such as field joints, tees, bends, valves and service fittings. The original 1975 CW2 specification described performance tests intended to provide a common basis for cold applied tape supply as at that time an international or national standard was not available. However, more recent international standards address the testing of these systems and thus the requirement for company bespoke tests has been reduced.

This Technical Specification* therefore includes tests based on available international standards appropriate to the needs of the gas industry.

* Hereinafter referred to as 'this specification'.

For the purposes of the operation of this specification, manufacturers must be required to declare and agree values of the properties covered by data sheets. This requirement applies to both tapes and their respective primers. Ranges of these values must then be agreed and used for quality assurance purposes.

Suppliers wishing to submit new materials for approval should direct their enquiries to the Gas Transporter.

Due to the wide range of applications, it may be necessary for the Engineer to select a tape system for a particular application. The selection should be based on the materials selection protocols available in GIS/CW5. GIS/CW5 also details the materials, surface preparation and methods of application for the tape system by definition of Specific Coating Application (SCA) groups applicable to coating product groups. Cold applied tapes are covered by SCA1 containing product groups 1, 2, 3 and 4. In ISO 21809-3 these tape systems are covered by code 12 “Cold-applied polymeric tape coatings” and 11A “Petrolatum tape coatings”.

This specification specifies the general test requirements for the maintenance of production quality of cold applied wrapping tapes and tape systems required for corrosion protection of gas assets.

The product groups covered are:

- Product Group 1 - Cold applied self-adhesive overwrap tapes.
- Product Group 2 – Light duty cold applied laminate tapes.
- Product Group 3 – Heavy duty cold applied laminate tapes.
- Product Group 4 – Grease based tapes

Particular test requirements for certain applications and or service conditions are also given.

These test methods are not exclusive but should be used wherever possible, especially when claiming compliance with this specification or in cases of dispute. Other equivalent proven tests specified in national or international standards may be proposed as a variant for consideration.

The GIS/CW2 product groups and ISO 21809-3 coating types correspond as shown in the table below:

CW2 Product Group	ISO 21809-3 Coating Type
Cold applied self-adhesive overwrap tapes	There is no separate provision for specifying mechanical protection layers in ISO 21809-3 because these are considered as part of the applied system.
Light duty cold applied laminate tapes	Cold applied polymeric tape coatings Type 12
Heavy duty cold applied laminate tapes	Cold applied polymeric tape coatings Type 12
Grease based tapes	Petrolatum tape coatings Type 11A

2. Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

2.1 International Organisation for Standardization

ISO 527-3, *Plastics -Determination of tensile properties – Part 3: Test conditions for films and sheets*

ISO 1523, *Determination of flash point – Closed cup Equilibrium method*

ISO 2431, *Paints and varnishes — Determination of flow time by use of flow cups*

ISO 2811-1, *Paints and varnishes – Determination of density – Part 1: Pyknometer method*

ISO 3251, *Paints, varnishes and plastics – Determination of non-volatile-matter content*

ISO 4591, *Plastics – Film and sheeting – Determination of average thickness of a sample, and average thickness and yield of a roll, by gravimetric techniques (gravimetric thickness)*

ISO 4593, *Plastics – Film and sheeting – Determination of thickness by mechanical scanning*

ISO 6383-1, *Plastics — Film and sheeting — Determination of tear resistance — Part 1: Trouser tear method*

ISO 9001, *Quality Systems*

ISO 21809-3, *Petroleum and natural gas industries – External coatings for buried or submerged pipelines used in pipeline transportation systems – Part 3: Field joint coatings*

ISO 21809-3, *Petroleum and natural gas industries – External coatings for buried or submerged pipelines used in pipeline transportation systems – Part 3: Field joint coatings*

2.2 ASTM International

ASTM G8, *Standard Test Methods for Cathodic Disbonding of Pipeline Coatings*

ASTM G13, *Standard Test Method for Impact Resistance of Pipeline Coatings (Limestone Drop Test)*

ASTM G14, *Standard Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)*

ASTM G17, *Standard Test Method for Penetration Resistance of Pipeline Coatings (Blunt Rod)*

ASTM G42, *Standard Test Method for Cathodic Disbonding of Pipeline Coatings Subjected to Elevated Temperatures*

ASTM G95, *Standard Test Method for Cathodic Disbondment Test of Pipeline Coatings (Attached Cell Method)*

ASTM D638, *Tensile Properties of Plastics*

ASTM D903, *Standard Test Method for Peel or Stripping Strength of Adhesive Bonds*

ASTM D1000, *Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications*

ASTM D1004, *Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting*

ASTM D1475, *Standard Test Method for Density of Liquid Coatings, Inks, and Related Products*

ASTM D2369, *Standard Test Method for Volatile Content of Coatings*

ASTM D2794, *Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)*

ASTM D3941, *Standard Test Method for Flash Point by the Equilibrium Method with a Closed-Cup Apparatus*

ASTM D4321, *Standard Test Method for Package Yield of Plastic Film*

ASTM D5125, *Standard Test Method for Viscosity of Paints and Related Materials by ISO Flow Cups*

ASTM D6577, *Standard Guide for Testing Industrial Protective Coatings (and standards referenced therein)*

ASTM D6988, *Standard Guide for Determination of Thickness of Plastic Film Test Specimens*

2.3 Gas Industry Standards

GIS/CW5, *Field applied external coatings for buried pipework and systems*

3. Terms and Definitions

For the purposes of this document, the following definitions apply.

Batch: quantity of coating material as defined by the manufacturer

Certificate of compliance: one of the types of documents defined by ISO 10474 that is issued in accordance with the purchase requirements

Engineer: The Engineer appointed from time to time by Gas Transporter and notified in writing to the Contractor to act as Engineer for the purposes of the contract

Holiday: coating discontinuity that exhibits electrical conductivity when exposed to a specific voltage

Manufacturer: company responsible for the manufacture of tape systems and tapes

Manufacturer's specification: document that specifies the characteristics, test requirements and application recommendations for the cold applied tape systems materials

Maximum design temperature: maximum temperature that the tape system can be exposed to during operation

Pipe diameter length: any length along the pipe axis equal to the specified outside diameter of the pipe

Pipeline: those facilities through which fluids are conveyed, including pipe, pig traps, components and appurtenances, up to and including the isolating valves

Purchaser: company responsible for providing the product order requirements

Test report: document that provides the quantitative test results for tests conducted in accordance with the requirements of this Specification

Test ring: sample taken from production wrapped pipe

3.1 Abbreviations

ASTM American Society for Testing and Materials

CLP Classification, Labelling and Packaging of substances and mixtures

CP cathodic protection

ISO International Organization for Standardization

MSDS material safety data sheet

PE polyethylene

SSPC The Society for Protective Coatings

3.2 Units

Internationally accepted (SI) units shall be used

Gas Transporter requirements are that metric Système International (SI) units shall be used. If there is a requirement to use other units then SI units will be stated followed by the local requirement in brackets. The following exceptions shall apply:

- Temperature - degrees Celsius (ºC)
- The definition of Standard Conditions for pressure and temperature that shall be applied is 1 atmosphere pressure (or 1.01325 bara) and 15.5556ºC (rather than 1 atmosphere and 273.15 degrees Kelvin (0ºC)

NOTE - *Any deviations to this definition to be consistent with local standards shall be discussed and agreed with the Gas Transporter.*

4. Quality

The manufacturer shall have an accredited Quality and Environmental Management System that complies with a National or International Standard applicable to their service or supply. The quality system shall be based upon recognised quality standards of which ISO 9001 is a suitable example.

Test procedures, which comprise the quality system and reference to the appropriate standard test protocol shall be submitted to the Gas Transporter for agreement.

The Gas Transporter shall if required make any investigation necessary in order to be assured of compliance by the manufacturer and third parties and to reject any material and/or tape system that does not comply.

4.1 Test reports and certificates

The manufacturer shall issue qualification test reports, certificates of compliance for the tape and tape system in accordance with the requirements of this specification and cited parts of ISO 21809-3; and any other requirements specified in the purchase order.

5. Information from the Manufacturer

Table 1 - Requirements for tape data sheet

Parameter	Unit	Test Method
Trade name	-	-
Description of tape/tape system		
Colour		
Minimum total thickness	mm	ISO 4591 and ISO 4593 SSPC-PA 2 ASTM D4321 and D6988
Polymeric film/reinforcement • Type of film • Type of reinforcement • Thickness	 - - mm	 ISO 4591 and ISO 4593 ASTM D4321 and D6988
Adhesive • Type • Thickness	 mm	 ISO 4591 and ISO 4593 ASTM D4321 and D6988
Mechanical properties • Tape strength • Elongation at break • Tear resistance	 N/mm % N	 ISO 527-3 or ASTM D638 ASTM D1004 or ISO 6383-1
Storage conditions • Temperature, minimum • Temperature, maximum • Maximum storage period	 °C °C Months	 - - -
Biological attack • Statement of resistance based on service history	 -	 -

Table 2 Requirements for primer data sheet

Parameter	Unit	Test method
Trade name	-	-
Type	-	-
Solid content	%	ISO 3251 ASTM D2369
Solvent type	-	-
Flash point	°C	ISO 1523 ASTM D3941
Density	g/cm^3	ISO 2811-1 ASTM D1475
Coverage area	m^2/l	-
Viscosity (4 mm nozzle)	sec	ISO 2431 ASTM D5125
Storage conditions • Temperature, minimum • Temperature, maximum • Maximum shelf life	 °C °C Month	 - - -
Biological attack • Statement of resistance based on service history	-	-

6. Test Requirements

6.1 General

The function of a wrapping tape applied to a buried pipeline or fitting is to provide a protective barrier coat which will prevent corrosion processes by excluding moisture, air, bacteria, etc. When the pipe or fitting is to be installed above ground, the tape system must also resist natural weathering. In order to assess the capability of the tape systems to perform these functions, the supplied tape/tape system (Product Groups 1, 2 and 3) should be shown by testing to meet the requirements specified in Table 3.

Table 3 Tests and requirements for cold applied tape systems

Parameter	Test Temp.	Unit	Requirement	Acceptable Test Methods
Thickness	-	mm	≥0.9 of nominal value	Magnetic, electromagnetic or ultrasonic thickness meter with ±10% accuracy.
Impact resistance	23°C	J/mm	≥4	ISO 21809-3 Annex D ASTM D2794 ASTM G14 ASTM G13

Parameter	**Test Temp.**	**Unit**	**Requirement**	**Acceptable Test Methods**
Adhesion (Peel strength to steel)	23ºC	N/mm	≥1	ISO 21809-3 Annex H ASTM D903 ASTM D1000
Adhesion (Peel strength to pipeline coating or PE)	23ºC	N/mm	≥0.4	ISO 21809-3 Annex H ASTM D903 ASTM D1000
Adhesion (Peel strength between tape layers) • Inner/inner • Outer/inner • Outer/outer	All 23ºC	All N/mm	• ≥1.5 • ≥1.5 • ≥0.2	ISO 21809-3 Annex L ASTM D1000
Water resistance Measure peel strength after 28 day hot water immersion at 50ºC • To pipeline coating/PE • To steel surface	Test at 23ºC	N/mm	• ≥0.4 • ≥0.4	ISO 21809-3 Annex I ASTM D1000
Holiday detection	-	-	No holidays	Holiday detector set at 5 kV/mm + 5kV, max. 25 Kv
Thermal aging Ratio of: • Elongation at break • Peel strength to steel	-	-	$1.25 \geq E_{100}/E_0 \geq 0.75$ $E_{100}/E_{70} \geq 0.8$ $P_{100}/P_0 \geq 0.75$ $P_{100}/P_{70} \geq 0.8$	ISO 21809-3 Annex M Aging temperature 50ºC Aging period 70 and 100 days ASTM D1000
Cathodic disbonding	23ºC 50ºC	mm mm	≤15 By agreement	ISO 21809-3 Annex G ASTM G8 ASTM G42 ASTM G95

Parameter	Test Temp.	Unit	Requirement	Acceptable Test Methods
Penetration resistance Residual thickness	23°C	mm	≥0.6	ISO 21809-3 Annex E with pressure 10 N/mm^2 ASTM G17
Natural weathering	-	-	Documented satisfactory service history in UK type climate for a minimum 12 months	

Grease based tapes (Product Group 4) should be shown by testing to meet the requirements specified in Table 4.

Table 4 Tests and requirements for grease based tapes

Parameter	Test Temp.	Unit	Requirement	Acceptable Test Methods
Thickness	-	mm	≥0.9 of nominal value	Magnetic, electromagnetic or ultrasonic thickness meter with ±10% accuracy.
Impact resistance	23°C	J/mm	≥0.8	ISO 21809-3 Annex D ASTM D2794 ASTM G14 ASTM G13
Adhesion (Peel strength to steel)	23°C	-	Leave a film of compound on the substrate	ISO 21809-3 Annex H ASTM D903 ASTM D1000
Adhesion (Peel strength to pipeline coating)	23°C	-	Leave a film of compound on the substrate	ISO 21809-3 Annex H ASTM D903 ASTM D1000
Water resistance Measure peel strength after 28 day hot water immersion at 30°C • To pipeline coating • To steel surface	Test at 23°C		Leave a film of compound on the substrate	ISO 21809-3 Annex I ASTM D1000

Parameter	Test Temp.	Unit	Requirement	Acceptable Test Methods
Holiday detection	-	-	No holidays	Holiday detector set at 5 kV/mm max. 25 kV
Cathodic disbonding	23°C	mm	≤20	ISO 21809-3 Annex G ASTM G8 ASTM G42 ASTM G95
Penetration resistance Residual thickness	23°C	mm	≥0.6	ISO 21809-3 Annex E with pressure 0.1 N/mm^2 ASTM G17
Natural weathering	-	-	Documented satisfactory service history in UK type (temperate) climate for a minimum 12 months	

7. Quality Control

The manufacturer shall provide the data sheets as specified in Table 1 and Table 2 for each tape/tape system.

In addition to the tape/tape system sheets, the manufacturer shall provide the following information:

- Batch certificates certifying that the tape/tape system materials delivered meet the characteristics as claimed in the data sheets
- Material safety data sheet (MSDS)

8. Marking

Wrapping tapes are usually supplied in rolls or similar form of unit quantities. Where appropriate, the marking requirements also apply to primers.

A system of marking or labelling on cartons must be adopted which must contain the following information:

a) Manufacturers identity and place of manufacture.

b) Type or trade name of tape.

c) The mass, width and length of tape in the unit.

d) A reference number or batch number, the date of manufacture and shelf life.

e) The type or trade name of primer to be used with the tape (if any).

f) Labelling of hazards according to the CLP regulation or the United Nations' Globally Harmonised System

Details of the storage conditions for the tape/tape systems and primers must be clearly displayed.

The system of marking must remain fast under transportation, storage and site conditions.

9. Packaging

All materials must be supplied in unit quantities which can be reasonably handled by the applicators.

The tapes must be suitably packaged so that, during stocking and transport, full quality of performance is retained.

10. Approval Scheme for New Materials

The Contractor must, in the first instance, submit a general description of the proposed coating system or modified coating system to the Gas Transporter. This submission must include details of the duties for which the coating has been developed and the performance figures determined in accordance with the test methods specified in this specification (Tables 1, 2 and 3).

The Contractor must supply with his submission information concerning material and any toxic hazards (e.g. MSDS) before any testing commences. This information must be considered strictly confidential.

10.1 The type approval scheme is divided into two stages:

a) **Phase 1 approval** - allows the Contractor to market the coating system to Gas Transporter for a period of 18 months, following the successful completion of either short-term testing or supply of a certificate of compliance to ISO 21809-3 for coating type 12. The Gas Transporter may require field trials during the phase 1 period.

b) **Phase 2 approval** - is granted following the successful completion of the test programme as defined in Table 3 and field trials if deemed necessary by the Gas Transporter during the period of Phase 1 approval.

Failure to complete Phase 2 approval tests will result in Phase 1 approval being withdrawn.

10.2 Procedure for modifications to approved tape Systems

Any changes in formulation of the tape or tape systems supplied and tested in accordance with the methods specified in this specification may be proposed as a variant for consideration by Gas Transporter. The manufacturer must produce evidence confirming that the proposed changes will have no detrimental effect on the safety, effectiveness and practicability of the tape system.

When a manufacturer wishes to assess properties of his tape or tape system by an alternative method to those referred to in this specification, it may be proposed as a variant for consideration by Gas Transporter.

11. Compliance

In order to claim compliance with this specification, the manufacturer is required to declare, for each type of tape, values and limits of the relevant properties listed in this specification. It will be the responsibility of the manufacturer to maintain the quality of the tape within the agreed limits.

Should the manufacturer wish to make any changes to his formulation or manufacturing process, such changes or processes may be proposed as a variant for consideration by Gas Transporter.

12. Variants

A manufacturer must only propose variants to this specification where the text indicates that variants would be considered by the Gas Transporter.