



**TECHNICAL SCOPE FOR PE LAYING & DOMESTIC/
COMMERCIAL/ NON-COMMERCIAL/ NDEC/
INDUSTRIAL PNG INSTALLATIONS**

**GGL TECHNICAL SPECIFICATIONS FOR CONTRACTOR
PROCURED MATERIAL**

S. No.	DESCRIPTION	Document No.
4.01	PE 100 Pipes	GGL/TS/SPEC/PE-100 PIPES/009
4.02	Electrofusion Fittings	GGL/TS/EF FITTINGS/2015
4.03	GI Pipes with Powder Coating	GGL/TS/GI PIPES/2015
4.04	GI Fittings with Powder Coating	GGL/TS/GI FITTINGS/2015
4.05	Brass Fittings with head chrome plating	GGL/TS/METER ADAPTOR/2015
4.06	Warning Tapes / Mats	GGL/TS/WARNING TAPE-MAT/2018
4.07	Powder Coating of GI pipes and fittings	GGL/TS/POWDER COATING/2015
4.08	PVC Sleeve for Wall Crossing	GGL/TS/SPEC/SLEEVE/001
4.09	Weld End Transition Fitting	GGL/TS/SPEC/WE-TF/2016
4.10	Powder Coated GI Nipple	GGL/TS/GI NIPPLE/2016

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**TECHNICAL SPECIFICATION
FOR
PF – 100 GRADE PIPES**

Document No.: GGL/TS/SPEC/PE-100 PIPES/009,REV-01

02	Incorporated grade and manufacturer of PE pipes as per PE 100 grade and as per the existing procurement.	14/03/2019
01	Tender Bulletin clarification incorporated	06/06/2018
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1 GENERAL

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various Geographical Areas as per authorisation from PNGRB.

The intent of this specification is to establish minimum requirements to manufacture and supply of PE pipes for supplying natural gas.

The scope will include manufacture, supply, inspection, testing, marking, packaging, handling and despatch of PE pipes of ratings and grades as per IS: 14885: 2001 with latest amendments.

2 REFERENCE CODES AND STANDARDS:

2.1 Governing Standards

PNGRB T4S:	Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks.
ISO 4437:	Buried polyethylene (PE) pipes for the supply of gaseous fuels — Specifications
IS 14885:	Polyethylene pipes for the supply of Gaseous Fuels -- Specifications

2.2 Reference Standards

IS 7328:	High density polyethylene materials for moulding and extrusion — Specification
IS 2530:	Method of test for polyethylene moulding materials & polyethylene compound
EN 12099:	Plastic Piping Systems — Polyethylene piping materials and components — Determination of volatile content
ISO 18553:	Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds
ISO 8085-3:	Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Specifications — Part 3: Electrofusion fittings
ISO 11413:	Plastic pipes and fittings — Preparation of test piece assembly between a polyethylene (PE) pipe and an electro fusion fitting
ISO 1133:	Plastics- Determination of melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics
ISO 1167-1:	Thermoplastic pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method
ISO 1167-2:	Thermoplastic pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 2: Preparation of pipe test pieces
ISO 1183:	Plastics — Methods for determining the density of non cellular plastics
ISO 2505:	Thermoplastic pipes — Longitudinal reversion — Test method and parameters



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ISO 6259-1:	Thermoplastic pipes — Determination of Tensile properties — Part-1: General test method
ISO 6259-3:	Thermoplastic pipes — Determination of Tensile properties — Part-1: Polyolefin pipes
ISO 9080:	Plastics piping and ducting systems - Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation
ISO 11357-6:	Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)
ISO 13477:	Thermoplastic pipes for the conveyance of fluids — Determination of resistance to rapid crack propagation (RCP) — Small scale steady-state test (S4 test)
ISO 13478:	Thermoplastic pipes for the conveyance of fluids — Determination of resistance to rapid crack propagation (RCP) — Full-scale test (FST)
ISO 13479:	Polyolefin pipes for the conveyance of fluids — Determination of resistance to crack propagation — Test method for slow crack growth on notched pipes (notch test)

In case of conflict between the requirements of this specification and the Reference Codes & Standards, the requirements of the specification, having stringent requirement, shall govern. Vendor shall obtain prior permission from GGL in such cases.

3 DEFINITIONS

For this specification the following definitions shall apply:

OWNER/ CLIENT:	Gujarat Gas Limited (GGL)
CONSULTANT :	Consultant engaged by GGL for evaluation of vendor
MANUFACTURER:	Means the Manufacturer of PE pipes.
VENDOR:	The person(s), firm, company, organization from whom Client / Contractor procures materials
TPIA:	Third Party Inspection Agency to be appointed by Vendor/ Contractor for inspection of brought out items
EIC:	Engineer – in – charge

4 MATERIAL

The material grade of polyethylene PE Pipes shall be PE-100. Material shall conform to the requirement of Cl. No. 5 of IS 14885: 2001 with latest amendments. Raw material of PE pipe shall be virgin quality. Approved manufacturers for virgin raw material of PE -100 are as below:

S. No.	Manufacturer	Grade (PE-100)
1.	Borealis	Borsafe™ HE 3492-LS-H (orange)
2.	Borouge	Borsafe™ HE 3492-LS-H (orange)
3.	LyondellBasell	Hostalen CRP 100 orange
4.	INEOS O&P	ELTEX® TUB 125 N2025 (orange)
5.	Total Petrochemicals	Total HDPE XSC 50 (Orange)

- For PE compounds, the long term hydrostatic strength – calculated and classified according to the standardised method (ISO 9080 and ISO 12162) for a temperature of 20 °C, a period of 50 years and a reliability of 97.5% - must be at least 10 MPa.
- PE Compound Characteristics are as per the following:

Characteristics	Units	Requirement	Test Parameter	Test Method
Tested as PE Compound				
Conventional Density	kg / m3	930 (Base Polymer)	23 °C	ISO 1183 / IS 7328
Melt Flow Rate	g / 10 min	± 20% of the nominated value or ± 0.1g/10 min, whichever is the greatest	190 °C / 5 kg	ISO 1133 / IS 2530
Volatile Content	mg / kg	≤ 350	105± 2°C	EN 12099 / IS 14885 (Annex H)
Thermal stability	min	> 20	200 °C	ISO 11357-6/ IS 14885(Annex D)
Pigment Dispersion	Grade	≤3		ISO 18553/ IS 14885 (Annex E)
Tested in Pipe Form				
Resistance to gas constituents	Hour	≥20	80°C 2 MPa	ISO 4437 (Annex A) / IS 14885 (Clause 5.5)
Resistance to rapid crack propagation (RCP)	Bar	$P_c \geq 1.5X \text{ MOP}$ with $P_c = 3.6 \times P_c s4 + 2.6$ (in bar)	0 °C	ISO 13477
Resistance to slow crack growth	Hour	>500	80°C; 9.2 bar	ISO 13479
Resistance To Weathering (Exposure to sunlight)				IS 14885 (Annex A)
Hydrostatic Strength	–	≥ 1000 h	80°C; 5.0 MPa	ISO 11674 & 2 / IS 14885 (Annex A)
Elongation at Break of pipe	–	≥ 350 %	–	ISO 6259-1 & 3 / IS 14885 (Annex 1)
De-cohesion of an Electrofusion joint — brittle failure	–	≤33.3%	23 °C	ISO 13954/ISO 11413/ ISO-8085-3

5 PRESSURE RATING

The pressure rating of pipe shall be PE-100 shall be as per Table -7 of Clause 8.1 & 9.1 of IS: 14885: 2001 with latest amendments.

6 NOMINAL DIAMETER (DN)

The nominal diameter of pipes covered in this standard is DN 20, DN 32, DN 63, DN 90, DN 125 and DN 160.

7 DIMENSION, WALL THICKNESS, LENGTH OF PIPES

7.1 The Dimension of PE-100 shall be as per Table -3 of Clause 6.1 of IS: 14885 : 2001 with latest amendments

7.2 The wall thickness of PE-100 shall be as per Table -4 of Clause 6.2 of IS: 14885: 2001 with latest amendments

Nominal Diameter DN	SDR/thickness	Straight / Coil Length
20	9(3mm Minimum)	Coil – 200 mtr.
32	11	Coil – 200 mtr.
63	11	Coil – 100 mtr.
90	17.6	Coil – 100 mtr.
125	17.6	Coil – 50 mtr.
160	17.6	Straight – 12 mtr.

7.3 Minimum inner diameter of coil shall be as per table 13 Annexure K of IS: 14885:2001 with latest amendments.

8 TOLERANCE

- Tolerances for Length of Pipes
- Tolerances for each rolled pipes : - 0 / +0.5m
- Tolerances for Outside diameter shall be as per Table 3 of IS: 14885: 2001 with latest amendments.
- Ovality of Pipes shall be as per Table 3 of IS: 14885: 2001 with latest amendments.

9 COLOUR

Colour of PE – 100 pipes shall be orange as per Clause 4.4 of IS: 14885: 2001 with latest amendments

10 APPEARANCE/ FINISH

When viewed without magnification, the internal and external surfaces of the pipes should be smooth, clean and free from grooving, rings and poke marks and other surface defects which may affect the pipe performance. The ends shall be cut cleanly and square to the axis of the pipe and within the tolerance as per IS 14885.

11 SAMPLING, FREQUENCY OF TEST

- Type tests as defined in clause 9.1 and in Table 8 of IS 14885:2001 shall be done at least once in two



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years on each pressure rating for each grade/class of material. However, hydrostatic pressure resistance test at 80° C for 1000 h shall be done at least once in 4 years and at 20° C for 100 h once in two years in accordance with IS 14885.

- Three samples of the same pressure class and same size should be selected at random for each type test and shall be tested for compliance with the requirements as indicated against each tests mentioned in IS 14885 QAP.
- Scale of sampling for visual and dimensional requirements shall be in accordance with IS 14885.
- Scale of sampling for tests for hydraulic characteristics (including Notched pipes), Reversion test, Density, MFR, Thermal stability (O1T), Pigment dispersion and Tensile test shall be in accordance with IS 14885.
- These pipes shall be selected at random from the lot and in order to ensure the randomness of selection, a random number tables given in IS 4905 may be referred.

Note: type test +

12 MARKING

12.1 Owner name shall be marked on each pipe.

- All pipes shall be permanently and legibly marked along their length with a legend by inkjet marking or by embossing which shall be impressed to a depth of not more than 0.2 mm.
- Marking details shall be formed in such a way that marking does not initiate cracks or other type of failure and in such a way that with normal storage weathering and processing and permissible method of installation use legibility shall be maintained for the pipe.

12.2 Legends shall be repeated at intervals of 1 m and shall consist of following information:

- a) Owner Trade mark / Name or Brand (i.e. GUJARAT GAS)
- b) Material and designation (i.e. D-32, SDR-11, PE-100)
- c) Manufacturer's identity name or trade name
- d) Code & Standard (i.e. IS – 14885:2001)
- e) Batch no. or lot no
- f) Length of Coil at every meter.
- g) Manufacturing Date
- h) Service (i.e. GAS)

13 INSPECTION/DOCUMENTATION

- Inspection shall be carried out as per Owner Technical Specification.
- Owner Representative shall carry out stage wise inspection during manufacturing / final inspection.
- Manufacture /Vendor shall furnish all the material test certificates, proof of approval / licence from specified authority as per specified standard, if relevant, internal test / inspection reports as per Owner Tech. Spec. & specified code for 100% material, at the time of final inspection of each supply lot of material. All the codes / documents shall be made available for reference of TPIA at the time of inspection.
- For any control, test or examination required under the supervision of TPIA/Owner/Owner's representative, latter shall be informed in writing one (1) week in advance by vendor about inspection date and place along with production schedule.
- Manufacturer /Vendor shall hire TPIA from the TPIA list available on the website of National Accreditation Board of Certification Bodies under the category specified for PE pipe inspection for on-line (24.0 hrs.) production witnessing and testing as per approved QAP of Gujarat Gas. Approval

shall be taken from Gujarat Gas prior to finalisation of TPIA.

- Even after third party inspection, Owner reserves the right to select a sample of pipes randomly from each manufacturing batch & have these independently tested. Should the results of these tests fall outside the limits specified in Owner technical specification, then Owner reserves the right to reject all production supplied from the batch.
- Pipe shall be free from any sign of localized swelling, no leakage or bursting during hydro testing as well as delivery at site.
- Pipe shall be free from scoring, cavities and other surface defects and pipe end shall be cut cleanly and square to the axis.
- Pipe end shall cleanly cut, square with the axis of pipe and protected against shocks and ingress of foreign bodies by appropriate end caps.
- Pipe end shall cleanly cut, square with the axis of pipe and protected against shocks and ingress of foreign bodies by appropriate end caps.
- Manufacture /Vendor to submit QAP along based on indicative QAP enclosed in the tender. However, the same QAP shall be submitted for approval to the Owner / Owner's representative before manufacturing. Manufacturing shall start only after approval of QAP.
- The successful Manufacture /Vendor shall submit following for approval of Owner/Owner's Representative after placement of order:
 - The quality assurance plan
 - Material test report as per clause 5 of IS: 4984: 1995 with latest amendments.
 - Performance requirements as per clause 5, 8, & 9 of IS: 14885: 2001 with latest amendments.
 - Type test as per clause no. 9.1 of IS: 14885: 2001 with latest amendments.
- As per the requirement of Owner for meeting amendments if any, in IS 14885, QAP may be modified without any additional cost implication.

14 PACKAGING

- Packing shall be done for Pipe end cleanly cut, square with the axis of pipe and protected against shocks and ingress of foreign bodies by appropriate end caps.
- Both PE Films & hessian cloth packing to be done only for coils and only hessian cloth packing shall be sufficient for Straight length PE pipes, to avoid direct sunlight and facilitate out door storage and the ends shall be protected by proper end caps to prevent from shocks and ingress of the foreign body.
- Packing size to be mentioned to ensure uniformity in delivery conditions of the pipe being procured. Manufacturer shall submit the packaging details and also complied with at the time of delivery.
- Contractor or Manufacturer shall make an arrangement for unloading of pipes at Owner's premises.

15 ENCLOSURE:

- **ANNEXURE-1: QAP of PE 100 – Orange, Raw Material as per IS – 14885-2001**

ANNEXURE-1**Raw Material Properties:**

Sr. No.	Test Parameter	Specification / Tolerance	Unit	Instrument	Test Method	Sample size / Frequency for TPIA	Inspection by		Remarks
							Manufac turer	TPIA	
1	Conventional Density (Base Polymer)	≥ 928.4 at 23°C or ≥ 930 at 27°C	Kg/m ³	Electronic Weighing Balance	As per IS:14885 - 2001	One sample per batch of raw material	P	W	
2	Melt Flow Rate (MFR)	$\pm 20\%$ of values nominated by compound producer at 190°C & 5 kg load	gm/10 min.	Melt flow tester			P	W	
3	Thermal Stability (OIT)	≥ 20 @ 200°C	Minut es	OIT Tester			P	W	
4	Volatile Matter Content	≤ 350	mg/kg	Electronic balance, Oven			P	W	
5	Pigment Dispersion	≤ 3 grade	-	Microscope			P	W	
6	Resistance to gas constituents	> 20 hour at 80°C at an induced stress 2 Mpa	-	-			R	R	
7	Colour	Orange	-	--			R	R	
8	Anti Oxidant UV Stabilizer	The percentage of Antioxidant used shall not be more than 0.3 % by mass & the percentage of UV Stabilizer used shall not be more than 0.5% by mass of finished resin	%	--		--	R	R	
9	Material (PE Compound Quality Evaluation)	Minimum required strength of material shall be 10 Mpa at 20°C and material designation PE 100, For 10000 h shall be carried out once	-	--		--	R	R	Type Test certificate Review
10	Resistance to slow cracking (SCR)	As per ISO 13479	-	--	As per ISO 13479	≥ 500 hrs at 80°C	R	R	Raw material supplier



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									TC review
11	Resistance to Growth of Cleavage fracture (RCP)	As per ISO 13477	-	--	As per ISO 13477	$\geq 1.5 \times \text{MOP}$ bar at 0°C	R	R	Raw material supplier TC review
12	Resistance to Weathering	As per IS:14885 - 2001	-	--	As per clause no. 8.8 of IS:14885 - 2001		R	R	Raw material supplier TC review

QAP of PE 100 – Orange, Gas Pipe as per IS – 14885-2001

Sr. No.	Test Parameter	Specification / Tolerance	Unit	Instrument	Test Method	Sample size / Frequency for TPIA	Inspection by		Remarks
							Manuf acturer	TPIA	
1	Dimensions	As per IS 14885			As per IS:14885 – 2001/ GGL Technical Specification	As per clause No. 9.2.3 Table 10 of IS 14885:2001 % 100% on-line witness of all pipes by TPIA			
	a) Wall Thickness of pipe	Table 4 & 5	mm	Ball ended micrometer			P	W	
	b) Outer Diameter	Table 3, 4 & Annex L	mm	Vernier caliper/PI Tape			P	W	
	c) Ovality	Table 3	mm	Vernier caliper			P	W	
2	Visual Check	Internal surface of pipe shall be smooth, clean & free from grooving, rings & poke marks(As per clause No. 7 of Is 14885-2001)	----	---			P	W	
3	Length	20mm-200 Mtr. Length 32mm-200 Mtr. Length 63mm-100 Mtr. Length 90mm-100 Mtr. Length 125mm-50 Mtr. Length	Mtr.	Measuring Tape			P	W	Shorter length pipes shall not be accepted.
4	Marking	Printing shall be done by Inkjet printers in black Colour. Legends shall be repeated at intervals of 1 m and shall consist of following information: i) Owner Trade mark / Name or Brand (i.e. GUJARAT GAS) j) Material and		Visual		100%			



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		designation (i.e. D-32, SDR-11, PE-100) k) Manufacturer's identity name or trade name l) Code & Standard (i.e. IS – 14885:2001) m) Batch no. or lot no n) Length of Coil at every meter. o) Manufacturing Date p) Service (i.e. GAS)							
4	Density(Base Polymer)	≥928.4 at 23 Deg C or ≥930 at 27 Deg C	Kg/m ³	Electronic Balance		As per clause No. 9.2.2 table 11 of IS 14885-2001	P	W	
5	Melt Flow rate(MFR)	±20% of values nominated by compound manufacturer at 190 °C with normal load of 5 kgf	g/10 min	Melt flow tester			P	W	
6	Thermal stability(OIT)	≥20 at 200 Deg C	Min utes	Vendor to specify			P	W	
7	Internal Stresses(reversion Test)	Shall not be greater than 3 percent	%	Oven, vernier caliper			P	W	
10	Resistance to slow crack growth	≥ 500	Hrs	80°C	ISO 13479	ISO 13479	P	W	To be carried out on manufactured pipe once for each type of raw material and each manufacturer (Type Test)
11	Resistance To Weathering (Exposure to sunlight)				IS 14885		P	R	Review of Type test Certificates



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HYDRAULIC CHARACTERISTICS									
12	Plain Pipes	165 Hrs. at 80 Deg C & Induced stress 5.5 Mpa (No sign of localized swelling, leakage or weeping, and shall not burst during the prescribed test duration)	Hrs.	Hydraulic test machine with accessories	IS 14885-2001	All samples for hydro test will be taken from first batch Nos. of pipe, clause No. 9.2.2 Table 11 of IS 14885-2001	P	W	
13	Notched Pipes	165 Hrs. at 80 Deg C & Induced stress 4.6 Mpa (No sign of localized swelling, leakage or weeping, and shall not burst during the prescribed test duration)	Hrs.				P	W	
14	Plain pipes	Hydrostatic strength at 80 Deg C for 1000 h. Induced stress 5 mpa	Hrs.			As per IS 14885	P/R	R	Type test- Once in 4 years
14	Plain Pipes(Type Test)	100 Hrs. at 20 Deg C & Induced stress 12.5 Mpa (No sign of localized swelling, leakage or weeping, and shall not burst during the prescribed test duration)	Hrs			One sample per lot testing as per Table 7 of IS 14885-2001	P	W	
15	Squeeze off Test(Type Test)	165 Hrs. at 80 Deg C & Induced stress 5.5 Mpa (No sign of localized swelling, leakage or weeping, and shall not burst during the prescribed test duration)	Hrs				P	W	
16	Volatile content	≤350	mg/Kg	Electronic balance & Hot air oven		As per clause No. 9.2.2 Table 11 of IS: 14885-2001	P	W	
17	Tensile Test	Min 15	Mpa	Tensile tester			P	W	



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18	Elongation at break	Min 350	%	Tensile Tester			P	W	
19	Pigment Dispersion	≤3	Grade	Microscope			P	W	
20	Packing & transportation of coiled & plain pipes	Annex K of IS 14885-2001	---	Visual Check		Every coil or length of pipe extruded	P	W	PE film and hessian cloth wrapping shall be done after inspection

Note:-

- 1) TPIA-Third Party Inspection Agency, P-Perform, W-Witness, R-Review internal test record
- 2) Sample QAP for indicative purpose. On issuance of work order, vendor should furnish QAP in line with IS 14885: latest edition for final approval

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**TECHNICAL SPECIFICATION FOR PROCUREMENT OF
ELECTROFUSION FITTINGS (PE-100)**

Document No. : GGL/TS/EF FITTINGS/2015

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1.0 INTRODUCTION AND SCOPE

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various Geographical Areas as per authorisation from PNGRB.

The intent of this specification is to establish minimum requirements to manufacture, testing and supply of Polyethylene (PE) Electrofusion Fittings for the supply of Natural gas.

The scope of the tender will include manufacture, supply, inspection, testing, marking, packaging, handling and despatch of Polyethylene (PE) Electrofusion Fittings as per EN 1555-3 : 2002 / ISO 8085-3 with latest amendments.

All codes and standards for manufacture, testing, inspection etc shall be of latest edition.

Owner reserves the right to delete or order additional quantities during execution of order, based on unit rates and other terms & conditions in the original order.

Following PE Electro-fusion fittings shall be supplied under this specifications.

- Electro-fusion Coupler/Elbow/Eq. Tee/End Cap/Reducer fitting
- Electro-fusion saddle / Tapping Tee fitting

2.0 REFERENCE CODES AND STANDARDS:

12.1 Governing Standards

PNGRB T4S	Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks.
EN 1555-3	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-3 Fittings

12.2 Reference Standards

IS 14885	Polyethylene pipes for the supply of Gaseous Fuels -- Specifications
EN 1555-1	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-1 : General
EN 1555-1	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-2 : Pipes
EN 1555-5	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-5 : Fitness for the purpose of the system
EN 1555-7	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-7 : Guidance for assessment of conformity
EN 682	Elastomeric seals – Material requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids
EN 728	Plastic piping and ducting systems – Polyolefin pipes and fittings – Determination of oxidation induction time.
EN 921	Plastic piping systems – Thermoplastic pipes – Determination of resistance to internal pressure at constant temperature.

EN 1716	Plastic piping systems – Polyethylene (PE) tapping tees – test method for impact resistance of an assembled tapping tee.
EN 12117	Plastic piping systems – Fittings, valves and ancillaries – determination of gaseous flow rate/pressure drop relationship
EN 12099	Plastic Piping Systems — Polyethylene piping materials and components — Determination of volatile content
EN ISO 1133	Plastics- Determination of melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics
ISO 1183	Plastics — Methods for determining the density of non cellular plastics
ISO 13954	Plastics pipes and fittings -- Peel decohesion test for polyethylene (PE) electrofusion assemblies of nominal outside diameter greater than or equal to 90 mm
ISO 13955	Plastics pipes and fittings -- Crushing decohesion test for polyethylene (PE) electrofusion assemblies
ISO 13956	Plastics pipes and fittings -- Decohesion test of polyethylene (PE) saddle fusion joints -- Evaluation of ductility of fusion joint interface by tear test
ISO 13953	Polyethylene (PE) pipes and fittings -- Determination of the tensile strength and failure mode of test pieces from a butt-fused joint

3.0 DEFINITIONS

OWNER / CLIENT	Gujarat Gas Ltd., (GGL)
PNG	Natural Gas produced from Gas wells, Gas condensate wells or Oil wells and the residue Gas remaining after conditioning being metered, regulated / controlled, odorized & distributed through pipelines for various applications, i.e. for industrial, commercial and domestic.
Manufacturer	Manufacturer of PE Electro-fusion Fittings
Vendor	The person(s), firm, company, organization from whom Client/Contractor procures materials.
TPA	Third Party Inspection Agency
EIC	Engineer In Charge
PNGRB	Petroleum and Natural Gas Regulatory Board
T4S	Technical Standard and Specification including Safety Standards,

4.0 MATERIAL

Compound

The compound of PE 100 grade from which the fittings are made shall conform to EN 1555-1 (latest edition).

Material for non-polyethylene parts

PE pipes conforming to EN 1555-2:2002 and the requirements for the level of material performance of non-polyethylene parts shall be at least as stringent as that of the compound for the piping system

Elastomers

Elastomeric seals shall conform to EN 682 and other sealing materials are permitted if suitable for gas service.

Other Materials

Greases or lubricants shall not enter into fusion areas, and shall not affect the long-term performance of fitting materials

Other materials may be used provided that it is proven that the fittings conform to this standard.

5.0 MECHANICAL PROPERTIES / TESTING

- Fittings shall be tested using pipes, which conform to EN 1555-2.
- Jointed pipe and fitting test pieces shall be assembled in accordance with the technical instructions of the manufacturer and take into account the limit conditions of utilisation described in EN 1555-5.
- The sample test assemblies shall take account of manufacturing and assembly tolerances.
- In the event of modification of the jointing parameters, the manufacturer shall ensure that the joint conforms to the requirements given in clause 7.2 of as per EN 1555-3.
- Unless otherwise specified by the applicable test method, the test pieces shall be conditioned at (23 ± 2) °C before testing in accordance with Table 4 of as per EN 1555-3.
- When tested in accordance with the test methods as specified in Table 4 of EN 1555-3 using the indicated parameters, the fittings shall have mechanical characteristics conforming to the requirements given in Table 4, as applicable to the following types of fitting :
 - Electro-fusion socket fitting;
 - Electro-fusion saddle/Tapping fitting;

6.0 PHYSICAL CHARACTERISTICS

The physical characteristics of electro-fusion fittings shall conform to the requirements of Table 6 of clause 8.2 as per EN 1555-3.

7.0 PERFORMANCE REQUIREMENT

When electro-fusion fittings conforming to this standard are assembled to each other or to components conforming to other parts of EN 1555, the joints shall conform to EN 1555-5.

8.0 HYDROSTATIC PRESSURE TEST

Electro-fusion fittings shall confirm to the requirements of Table 4 of clause 7.2 as per EN 1555-3.

9.0 PNEUMATIC PRESSURE TEST

Electro-fusion fittings shall be leak tightness tested and confirm to the requirements of Table 4 of clause 7.2 as per EN 1555-3.

10.0 DIMENSIONAL TOLERANCES

Dimensions tolerances of various types of Electro-fusion fitting shall be as per EN 1555-3.

Measurement of dimensions

Dimensions shall be measured at 23 ± 2 °C, after being conditioned for at least 4 h. The measurement shall not be made less than 24 h after manufacture of fittings.

Diameters and lengths

The electro-fusion socket diameter and lengths shall conform to Table 1 and clause 6.2 of as per EN 1555-3.

Outlets from tapping tees and branch saddles shall conform to clause of 6.4 of as per EN 1555-3.

The dimensions of spigot end fittings shall conform to Table 3 and clause of 6.4 of as per EN1555-3.

Mechanical fittings with polyethylene spigot ends (Polyethylene spigot ends) shall conform to 6.4.

Mechanical fittings with polyethylene electro-fusion sockets shall conform to 6.2.

Wall Thickness

The minimum wall thickness of a fitting shall be SDR 11 in accordance as per Clause of 6.2.2 and Table 2 of as per EN 1555-3.

Wall thickness of the fusion end

The wall thickness of the fusion end shall be at least equal to the minimum wall thickness of the pipe, except between the plane of the entrance face and a plane parallel to it, located at a distance not greater than $(0.01 D_e + 1 \text{ mm})$, where a thickness reduction for e.g. a chamfered edge is permissible.

Wall thickness of the fitting body

The wall thickness of the fittings are as per SDR 11.

The permissible tolerance of the wall thickness at any point shall conform to those of the nominal wall thicknesses given in EN 1555-2.

Any changes in wall thickness of the fitting body shall be gradual in order to prevent stress concentrations.

Out-of-roundness of the bore of a fitting (at any point)

When a fitting leaves the site of the manufacturer, the out-of-roundness of the bore of a fitting at any point shall not exceed 0,015dn.

11.0 COLOUR

The colour of the PE parts of fittings shall be black.

12.0 QUALITY ASSURANCE (QA)

The Contractor/Manufacturer /Vendor shall manufacture, supply, inspection, testing, marking, packaging, handling and dispatch of Polyethylene (PE) Electrofusion Fittings as per EN 1555-3: 2002 with latest amendments and GGL QAP.

Quality Assurance of Company Procured Material

The Contractor/Manufacturer /Vendor shall submit QAP after getting firm order from Owner for their review and approval. Prior dispatching of materials, vendor shall offer material lot to TPA/Owner for inspection as per approved QAP at their premise following for review of TPA / EIC at the time of final inspection at vendor premise prior to dispatch of materials.

Quality Assurance of Contractor Procured Material

The Contractor/Manufacturer /Vendor after getting firm order from Contractor shall manufacture, supply, inspection, testing, marking, packaging, handling and dispatch Polyethylene (PE) Electrofusion Fittings as per EN 1555-3: 2002 / ISO 8085-3 with latest amendments and GGL QAP.

13.0 INSPECTION / DOCUMENTS

Inspection shall be carried out as per design codes/standards, OWNER Technical Specification and approved QAP.

Inspection of Company Procured Material

- i. Inspection of Company Procured Material TPA /GGL Representative shall carry out final inspection at vendor premise prior to dispatching of materials.
- ii. TPA / GGL Representative shall carry out inspection during manufacturing/ final inspection as per approved QAP.
- iii. Contractor / manufacturer / Supplier / Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per OWNER Technical Specification, at the time of final inspection of each supply lot of material.
- iv. Even after third party inspection, OWNER reserves the right to select a sample of items randomly from each manufacturing batch/ lot and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.
- v. Deputation of TPA is in the scope of the Vendor.

For any control test or examination required under the supervision of TPA/ GGL Representative, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

Inspection of Contractor Procured Material

- i. Vendor Representative shall carry out final inspection at his premise prior to dispatching of materials as per GGL QAP provided with the tender document.
- ii. For inspection at contractor premises by TPA/ GGL Representative, latter shall be informed in writing one (1) week in advance by contractor about inspection date & place along with inspection schedule.

- iii. Contractor shall furnish all the material test certificates, type test reports, internal test/ inspection reports as per OWNER Technical Specification and QAP, at the time of final inspection of each supply lot of material.
- iv. OWNER reserves the right to select a sample of items randomly from each batch/ lot and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.
- v. Inspection of the material shall be carried out as per GGL IMS procedure “ Quality Assurance for Contractor procured material”.

14.0 MARKING

Electro-fusion fittings marking shall confirm to the requirements of clause 10 as per EN 1555-3.

The minimum required marking shall conform to Table 7 of EN 1555-3.

Each packing containing fittings shall carry the following stamped or written in indelible ink.

- a) Number of the System Standard- EN 1555
- b) Manufacturer's name and/or trademark
- c) Bar code
- d) Nominal outside diameter(s) of pipe, dn (i.e. 20, 32, 63mm etc.)
- e) Material and designation (PE 100)
- f) Design application series
- g) SDR fusion range (SDR 11)
- h) Manufacturer's information
- i) Internal fluid (i.e. Gas)
- j) Month and year of manufacturing

15.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured.

Manufacturer / Supplier / Vendor shall submit the packaging details and also complied with at the time of delivery.

16.0 DOCUMENTS OF PRECEDENCE

In case of conflict between the requirements of this specification and the Reference Codes & Standards, the requirements of the specification, having stringent requirement, shall govern. Vendor shall obtain prior permission from GGL in such cases.

17.0 QUALITY ASSURANCE PLAN

S.No	Description	Quantum of check	Reference Document GGL Technical Specification	Acceptance Criteria	Inspection Methodology	Format of Record	INSPECTION		Remarks
							Manuf. / Supplier	TPA/ GGL	
1	Raw Material Inspection								
1.1	Density		As per EN 1555-Part 1 & EN ISO 1183	≥930 Kg / M ³ at 23°C			P	R	
1.2	Oxidation induction time (Thermal stability)		As per EN 1555-Part 1 & EN 728	>20 min at 200°C			P	R	
1.3	Melt mass flow rate (MFR)		As per EN 1555-Part 1 & EN ISO 1133	Min. 0.2 to 1.40 at 190°C & 5Kg. Load in gm/10 Min.			P	R	
1.4	Volatile Content		As per EN 1555-Part 1 & EN 12099	≤ 350 mg/kg			P	R	Not applicable if water content test reports are availbale.
1.5	Water Content (Moisture Content)		As per EN 1555-Part 1 & ISO 15512	< 300 mg/kg (Equivalent to < 0.03% by mass)			P	R	Only applicable, if the measured volatile content is not in conformity to its specified requirement. In case of dispute the requirement of water content shall be used. As an alternative method, ISO 760:1978 may apply
1.6	Carbon Black Content		As per EN 1555-Part 1 & ISO 6964	2 to 2.5% by mass			P	R	
1.7	Carbon Black Dispersion		As per EN 1555-Part 1 & ISO 18553	Grade ≤3			P	R	
1.8	Antioxidant and UV Stabilizer	-	PNGRB T4S- G.S.R. 612(E).	The Antioxidant used is not more than 0.3% and U V Stabilizer used are not more than 0.5% by mass of finished resin	Declaration from Raw Material Supplier and Fitting Manufacturer	Declaration from Raw Material Supplier and Fitting Manufacturer	P	R	
1.9	Cadmium Free Pigmented compound material			Material shall be cadmium free pigmented compound					
1.10	Polyethylene -Virgin Material			Polyethylene resin used for manufacture of thermoplastic fittings shall be virgin,					
2	Performance requirements								
2.1	Appearance	As per EN 1555-Part 7	Free from scoring, cavities and other surface defects and Cut cleanly and square to the axis. Smooth & clean Should be free grooves, scoring etc.	EN 1555-3/GGL Technical Spec.	Visual	Inspection Report	P	Rv	
2.2	Colour		GGL Technical Spec. / EN 1555-3	Black	Visual	Inspection Report	P	V	
2.3	Geometrical Characteristics		GGL Technical Spec. / EN 1555-3	EN 1555-3/GGL Technical Spec.	Vernier Calliper	Inspection Report	P	V	
2.4	Hydrostatic Strength (80° C, 165 h)	As per EN 1555-Part 7	EN 1555-Part 3 Clause No. 7.2 Table-4 & EN 921	EF fitting joint shall withstand the hydrostatic pressure throughout the test period. No leakages are allowed through fusion area.	Hydrostatic Pressure Test.	Inspection Report	P	R	
2.5	Oxidation induction time (Thermal stability)		EN 1555-Part 3 Clause No. 8.2, EN 12117 & EN 728	>20 min at 200°C		Inspection Report	P	R	
2.6	Melt mass-flow rate (MFR)		EN 1555-Part 3 Clause No. 8.2, EN 12117 & EN ISO 1133	After processing maximum deviation of ± 20 % of the value measured on the batch used to manufacture the fitting at 190°C & 5Kg. Load in gm/10 Min. Test Parameters as per Table 6 of EN 1555-3	Melt Flow Tester	Inspection Report	P	R	
2.7	Electric Resistance	EN 1555-Part 3 Clause No. 5.5	Resistance of the fitting at 23°C shall be as specified by the fitting manufacturer.	Resistance measurement	P		R		
2.8	Marking	As per EN 1555-Part 7	EN 1555-Part 3 Clause No. 10.2 & 10.3	a) Number of the System Standard- EN 1555 b) Manufacturer's name and/or trademark c) Barcode d) Nominal size of Fitting e) Material and designation f) Design application series (i.e SDR - 11) g) Applicable SDR fusion range of pipe (i.e SDR 11 to SDR 26) h) Manufacturer's information i) Internal Fluid (i.e. Gas) j) Month and year of manufacturing.(A code may be provided e.g batch No -- 16/02)	Visual	Inspection Report	P	Rv	
2.9	Packing		EN 1555-Part 3	EN 1555-Part 3	Visual	Inspection Report	P	V	
2.10	Documentation		EN 1555-Part 3	As per the term & conditions of GGL Technical Specification	Visual	Compliance Certificate	P	R	
LEGENDS: Rv- Random Verification, V- Verification, W - Witness, R - Review of Documents / test certificates, H - Hold, P - Perform, TPA - Third Party Agency									
Notes: -									
1 In addition to above tests, Vendor shall submit Type Test report as per Table-4 of EN 1555-7									
2 The Above Testing and acceptance criteria are minimum requirements, however, Vendor shall ensure that the execution of works shall also comply to the additional requirements as per GGL Technical specifications(TS) & EN 1555-1, EN-1555-3 & EN 1555-7									

GUJARAT GAS

TECHNICAL SPECIFICATION – Procurement of GI Pipes

Document No. : GGL/TS/GI Pipes/2015

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1.0 INTRODUCTION AND SCOPE

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various cities of Gujarat.

This present document covers the technical specification for the procurement of GI Pipes used in natural gas distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which needs to be fulfilled.

This specification covers the requirements for GI pipes of heavy steel tube. Unless modified by this specification, requirements of IS 1239 (Part-I): 2004 (Latest edition) & IS 10748 (Latest edition) shall be valid.

2.0 DEFINITIONS

OWNER / CLIENT	Gujarat Gas Ltd., (GGL)
PNG	Natural Gas produced from Gas wells, Gas condensate wells or Oil wells and the residue Gas remaining after conditioning being metered, regulated / controlled, odorized & distributed through pipelines for various applications, i.e. for industrial, commercial and domestic.
Manufacturer	Manufacturer of the GI pipes
Vendor	The person(s), firm, company, organization from whom Client/Contractor procures materials.
TPA	Third Party Inspection Agency
EIC	Engineer In Charge
PNGRB	Petroleum and Natural Gas Regulatory Board
T4S	Technical Standard and Specification including Safety Standards,

3.0 MATERIAL

The material used for the manufacturing of GI pipes confirming to IS 1239 (Part -1): 2004 (Latest edition).

4.0 PRESSURE TEST

Hydrostatic pressure test shall be carried out at a pressure of 5 Mpa for the duration of at least 3 second and shall not show any leakage in the pipe. Vendor to submit the internal pressure test certificate for the same. Owner Representative or Third party Inspection

Agency shall witness finish goods testing as per the sample procedure specified in IS: 1239 (Part-1) – latest edition.

5.0 DIMENSIONS, THICKNESS & DIMENSIONAL TOLERANCES

The dimensions & nominal mass of tubes shall be in accordance with Table 5 subject to the tolerances permitted in CL.8.1 & 9 of IS 1239 (Part-I) : 2004 (Latest edition). Length of each pipe shall be 3.0 mtr. with + 6, - 0 mm tolerance. However, pipe length shall be considered 3.0 mtr. only for measurement / payment purpose.

Nominal Diameter DN	15 mm (1/2")	25 mm (1")
Grade	Heavy	Heavy
Outer Dia. (Max. / Min.)	21.8 mm / 21.0 mm	34.2 mm / 33.3 mm
Thickness (mm)	3.2	4.0
Nominal weight (Kg / m) inclusive Galvanized coating	1.44	2.93
Tolerance on Thickness	-10% / + Not limited	-10% / + Not limited

6.0 END CONNECTION OF PIPE

GI Pipes shall be supplied with plain end.

7.0 FREEDOM FROM DEFECTS

On visual examination the outside & inside surfaces of pipes shall be smooth & free from defects such a cracks etc.

8.0 GALVANIZING

- Pipes shall be galvanized to meet the requirement of IS: 4736 – 1986 with latest amendment.
- Zinc conforming to any grade specified in IS: 13229- 1991 with latest amendment shall be used for the purpose of galvanizing.
- Galvanizing bath: The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.
- Mass of zinc coating: Minimum mass of zinc coating determined as per IS: 6745 shall be 400 gms/m².
- Uniformity of galvanized coating: The galvanized coating when determined on a 100 mm long test piece in accordance with IS 2633: 1986 with latest amendment shall withstand 5 one – minute dips.
- Freedom from defect: The zinc coating on internal & external surfaces shall be uniform adhered, reasonably smooth & free from such imperfections as flux, ash & drop inclusions, bare patches, black spots, pimples, lumpiness runs, rust stains,

bulky white deposits & blisters. Rejection & acceptance for these defects shall be as per Appendix - A of IS 2629: 1985 with latest amendments.

vii. **Samplings**

- a) All materials of the same type in coating bath having uniform coating characteristics shall be grouped together to continue a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be IS: 4711 1995 with latest amendment.
- b) The sample selected according to Clause 6.1 & 6.2 of IS: 4736 – latest edition.
- c) The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 5.1 of IS: 4736 – 1986 with latest amendment.
- d) Criteria for conformity: As per IS: 4736 – 1986 with latest amendments.

9.0 **QUALITY ASSURANCE (QA)**

The Contractor/Manufacture /Vendor shall manufacture, supply, inspection, testing, marking, packaging, handling and dispatch of GI Pipes as per GGL Technical Specification & GGL QAP.

Quality Assurance of Company Procured Material

The Contractor/Manufacturer /Vendor shall submit QAP after getting firm order from Owner for their review and approval. Prior dispatching of materials, vendor shall offer material lot to TPA/Owner for inspection as per approved QAP at their premise following for review of TPA / EIC at the time of final inspection at vendor premise prior to dispatch of materials.

Quality Assurance of Contractor Procured Material

The Contractor/Manufacturer /Vendor after getting firm order from Contractor shall manufacture, supply, inspection, testing, marking, packaging, handling and dispatch GI pipes as per GGL technical specification and GGL QAP.

10.0 **INSPECTION / DOCUMENTS**

Inspection shall be carried out as per design codes/standards, OWNER Technical Specification and approved QAP. The manufacturer shall have a valid licence to use ISI monogram for manufacturing of pipe in accordance with the requirement of IS:1239.

Inspection of Company Procured Material

- i. TPA /GGL Representative shall carry out final inspection at vendor premise prior to dispatching of materials.
- ii. TPA / GGL Representative shall carry out inspection during manufacturing/ final inspection as per approved QAP.

- iii. Contractor / manufacturer / Supplier / Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per OWNER Technical Specification, at the time of final inspection of each supply lot of material.
- iv. Even after third party inspection, OWNER reserves the right to select a sample of items randomly from each manufacturing batch/ lot and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.
- v. Deputation of TPA is in the scope of the Vendor.

For any control test or examination required under the supervision of TPA/ GGL Representative, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

Inspection of Contractor Procured Material

- i. Vendor Representative shall carry out final inspection at his premise prior to dispatching of materials as per GGL QAP provided with the tender document.
- ii. For inspection at contractor premises by TPA/ GGL Representative, latter shall be informed in writing one (1) week in advance by contractor about inspection date & place along with inspection schedule.
- iii. Contractor shall furnish all the material test certificates, type test reports, internal test/ inspection reports as per OWNER Technical Specification and QAP, at the time of final inspection of each supply lot of material.
- iv. OWNER reserves the right to select a sample of items randomly from each batch/ lot and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.
- v. Inspection of the material shall be carried out as per GGL IMS procedure “ Quality Assurance for Contractor procured material”.

Inspection shall be carried out as per Owner Technical Specification / approved QAP.

11.0 MARKING

Each pipe shall be embossed with manufacturer's / Owner's logo, manufacturer's name or trademark, size designation, class of pipe at the interval of not more than 1 meters.

Each packing containing pipes shall carry the following embossed, stamped or written by indelible ink.

- a) Manufacturers name or trademark.
- b) Owner's name – Gujarat Gas
- c) Class of pipe – Heavy
- d) Indian standard mark (ISI)
- e) Lot number / Batch no. of production

Each pipe conforming to this standard shall also be marked with BIS standard mark.

12.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured.

Contractor / Vendor / Bidder shall submit the packaging details and also complied with at the time of delivery.

13.0 DOCUMENTS OF PRECEDENCE

In case of conflict between the requirements of this specification and that of the referred codes, standards and specifications, the requirements of the referred codes, standards and specifications shall govern.

14.0 QUALITY ASSURANCE PLAN

ANNEXURE-1 Quality Assurance Plan for Company Procured Material

ANNEXURE-2 Quality Assurance Plan for Contractor Procured Material

ANNEXURE-1 QAP FOR COMPANY PROCURED MATERIAL

S. NO.	DESCRIPTION		TYPE OF CHECK	QUANTUM CHECK	REFERENCE DOC.	ACCEPTANCE CRITERIA	FORMATE OF RECORD	SCOPE OF INSPECTION	
								VENDOR	GGL/TPIA
1	PRE PRODUCTION CHECKS.	a	QUALITY ASSURANCE PLAN	100%	-----	ADHERANCE TO APPROVED QAP	GGL APPROVED QAP	R	R
		b	PERFORMANCE OF MEASURING INSTRUMENT & EQUIPMENT	INSTRUMENT	-----	CALIBRATED INSTRUMENT & EQUIPMENT CONDITION	CALIBRATION HISTORY REPORT & CERTIFICATE		
2	RAW MATERIAL HR COIL STEEL CONFIRMING TO IS:10748-2004	a	CHEMICAL ANALYSIS	ONE SAMPLE PER HEAT	IS:10748-2004 CL No.-6.2 & TABLE No.1/AND RELEVANT PARTS OF IS:228 & IS:513	IS:1239:2004 TABLE NO.-02	MTC & TEST REPORT	P	R
		b	TENSILE TEST		IS:10748-2004 TABLE No.-03 AND IS:1239:2004 CL. No.14.1 & IS:1608:1995	IS:1239:2004 TABLE NO.-14.1			
3	INPROCESS INSPECTION	a	OUTSIDE DIMENSIONS	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. 01 & 2	IS:1239:2004 CL. No.8.1 & TABLE No.3/4/5	IS:1239:2004 TABLE NO.-4 & GGL SPECIFICATION	TUBE MILL INSPECTION REPORT/FINAL INSPECTION REPORT	P	R
		b	THICKNESS		IS:1239:2004 CL. No.9.1(a)	15mm dia - 3.2mm 25mm dia - 4.0mm + NOT LIMIT/-10%			
		c	LENGTH		P.O. Requirement	3 Mtrs/ 6 Mtrs AS PER P.O. TOLERANCE :+6%/-0%			
		d	STARIGHTNESS		IS:1239:2004 CL. No.15	THE FINISH TUBES SHALL BE REASONABLY STRAIGHT			
		e	INTERNAL WELD FIN HEIGHT		IS:1239:2004 CL. No.6.5	THE HEIGHT OF THE INTERNAL WELD FIN SHALL NOT BE > 60% OF THE SPECIFIED WALL THICK.		P	R
		f	WORKMANSHIP, FINISH & APPEARANCE		IS:1239:2004 CL. No.15	TUBES SHALL BE CLEANLY FINISHED AND REASONABLY FREE FROM INJURIOUS AND SHALL BE CLEANLY CUT AND REASONABLY SQUARE WITH THE AXIS OF THE TUBE.			
		g	TENSILE TEST % EL		IS:1239:2004 CL. No.14.1 & 14.1.1/IS: 1608-1995	TENSILE STRENGTH MIN. -320 Mpa ELONG. MIN. 12%		P	R



		h	BEND TEST		IS:1239:2004 CL. No.14.2 & IS:1239:2004 CL. No.14.3 & IS:2328	THE BEND TEST WITHOUT SHOWING ANY SIGN OF FRACTURE			
		i	WEIGHT BARE PIPE		IS:1239:2004 CL. No.9.1(b)	15mm dia - 1.44 Kg/m (+/-10%) 25mm dia - 2.93 Kg/m (+/-10%)		P	R
		j	CHEMICAL COMPOSITION		IS:1239:2004 CL. No.7.1.1 table 1 & 2		Product Analysis	R	R
		k	TUBE ENDS	100%	IS:1239:2004 CL. No.3.3 & 10.2	Square Cut to Axis		P	R
		l	LEAK PROOF TEST	EACH TUBE	IS:1239:2004 CL. No.13	5MPA AND MAINTAINED FOR 3 secs Minimum NO LEAKAGE IN PIPE	HYDRO TEST REPORT	P 100%	R
		m	GALVANISING MASS OF ZINC COATING	ONE SAMPLE AT EVERY FOUR HOURS & AS PER IS:4736	IS: 1239: 2004 CL. NO. 12.1 TO 12.1.1 IS:4736 CL.5.1, 5.2, & 5.5 IS:2629, IS:2633	400 Gm /M2(MIN.)	GALVANISING REPORT	P	R
		n	UNIFORMITY OF ZINC COATING			NO RED SPOT, FREE FROM LUMPS, EXCESS ZINC, FREE FROM WHITE RUST			
		o	FREE BORE TEST			FREE PASSING OF MANDAREL/ROD THROUGH GALVANISING TUBE. 11MM ROD FOR 15MM & 21MM ROD FOR 25MM, ROD LENGTH 230MM MIN.			
4	FINAL INSPECTION	a	OUTSIDE DIMENSIONS	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. 01	IS:1239:2004 CL. No.8.1 & TABLE No.3/4/5	IS:1239:2004 TABLE NO.-4 + GGL SPECIFICATION	TUBE MILL INSPECTION REPORT/FINAL INSPECTION REPORT	P	W / H AS PER IS 4711:2008
		b	THICKNESS		IS:1239:2004 CL. No.9.1(a)	15mm dia - 3.2mm 25mm dia - 4.0mm + NOT LIMIT/-10%			
		c	LENGTH		P.O. Requirement	3 Mtrs/ 6 Mtrs AS PER P.O. TOLERANCE :+6%/-0%			
		d	STARIGHTNESS	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. 01	IS:1239:2004 CL. No.15	THE FINISH TUBES SHALL BE REASONABLY STRAIGHT	TUBE MILL INSPECTION REPORT/FINAL INSPECTION REPORT	P	W / H AS PER IS 4711:2008
		e	INTERNAL WELD FIN HEIGHT		IS:1239:2004 CL. No.6.5	THE HEIGHT OF THE INTERNAL WELD FIN SHALL NOT BE > 60% OF THE SPECIFIED WALL THICK.			
		f	WORKMANSHIP, FINISH & APPEARANCE		IS:1239:2004 CL. No.15	TUBES SHALL BE CLEANLY FINISHED AND REASONABLY FREE FROM INJURIOUS AND SHALL BE CLEANLY CUT AND REASONABLY SQUARE WITH THE AXIS OF THE TUBE.		P 100%	W/H 40%
		g	WEIGHT G.I. PIPE		IS:1239:2004 CL. No.9.1(b)	15mm dia - 1.44 Kg/m (+/-10%) 25mm dia - 2.93 Kg/m (+/-10%)		P	W/H



		h	TUBE ENDS PLAIN ENDS	100%	IS:1239:2004 CL. No.3.3 & 10.2	Square Cut to Axis		P	W / H AS PER IS 4711:2008
		i	SAMPLING TUBES	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. & 2	IS:1239:2004 CL. No.16.2/ IS:4711:2008 TABLE No.2	IS:4711: 2008 TABLE NO. 02	MECHANICAL TEST REPOPRT	P	(W) AS PER IS 4711: 2008 TABLE NO.2
		j	TENSILE TEST % EL		IS:1239:2004 CL. No.14.1 & 14.1.1/IS: 1608-1995	TENSILE STRENGTH MIN. -320 Mpa ELONG. MIN. 12%			
		k	BEND TEST	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. 2	IS:1239:2004 CL. No.14.2 & IS:1239:2004 CL. No.14.3 & IS:2328	THE BEND TEST WITHOUT SHOWING ANY SIGN OF FRACTURE		P	(W) AS PER IS 4711: 2008 TABLE NO.2
		l	GALVANISING MASS OF ZINC COATING	ONE SAMPLE AT EVERY FOUR HOURS & AS PER IS:4736	IS: 1239: 2004 CL. NO. 12.1 TO 12.1.1 IS:4736 CL.5.1, 5.2, & 5.5 IS:2629, IS:2633	400 Gm/M2(MIN.)	GALVANISING REPORT	P	W / H AS PER IS 4711:2008
		m	UNIFORMITY OF ZINC COATING			NO RED SPOT, FREE FROM LUMPS, EXCESS ZINC, FREE FROM WHITE RUST			
		n	FREE BORE TEST			FREE PASSING OF MANDREL/ROD THROUGH GALVANISING TUBE. 11MM ROD FOR 15MM & 21MM ROD FOR 25MM, ROD LENGTH 230MM MIN.			
		O	LEAK PROOF TEST	EACH TUBE	IS:1239:2004 CL. No.13	5MPA AND MAINTAINED FOR 3 secs Minimum NO LEAKAGE IN PIPE IS:1239:2004 CL. No.13	HYDRO TEST REPORT	----	H/W 10%
5	PRODUCT MARKING	a	VISUAL VERIFICATION OF MARKING	EACH TUBE	IS:1239:2004 CL. No.17 & P.O. REQUIREMENT	IS:1239:2004 CL. No.17 & P.O. REQUIREMENT MARKING SHALL BE AT THE INTERVAL OF NOT MORE THAN 1 METERS. EACH PIPE SHALL BE EMBOSSED WITH - (1) MANUFACTURER'S NAME/TRADEMARK (2) INDIAN STANDARD MARK (ISI) (3) CLASS OF PIPE	-----	P 100%	W 25%
6	BUNDLING & PACKING	a	P.O./SPECIFICATION REQUIREMENT	EACH REQUIREMENT	P.O. Requirement	MARKING DONE ON METAL TAG AND AFFIXED WITH EACH BUNDLE: (1) MANUFACTURER'S NAME/TRADEMARK (2) OWNER'S NAME- GUARAT GAS LIMITED (3) CLASS OF PIPE- HEAVY (4) LOT NUMBER/BATCH NUMBER OF PROD. (5) SIZE DESIGNATION	TEST CERTIFICATE	R	R

R = REVIEW OF RECORDS W = WITNESS BY BUYER/ TPI AGENCY H = HOLD POINT P = PERFORM (BY VENDOR)



ANNEXURE-2 QAP FOR CONTRACTOR PROCURED MATERIAL

S. NO.	DESCRIPTION		TYPE OF CHECK	QUANTUM CHECK	REFERENCE DOC.	ACCEPTANCE CRITERIA	FORMATE OF RECORD	SCOPE OF INSPECTION	
								VENDOR	GGL/TPIA
1	Calibration	b	PERFORMANCE OF MEASURING INSTRUMENT & EQUIPMENT	INSTRUMENT	-----	CALIBRATED INSTRUMENT & EQUIPMENT CONDITION	CALIBRATION HISTORY REPORT & CERTIFICATE	R	R
2	RAW MATERIAL HR COIL STEEL CONFIRMING TO IS:10748-2004	a	CHEMICAL ANALYSIS	ONE SAMPLE PER HEAT	IS:10748-2004 CL No.-6.2 & TABLE No.1/AND RELEVANT PARTS OF IS:228 & IS:513	IS:1239:2004 TABLE NO.-02	MTC & TEST REPORT	P	R
		b	TENSILE TEST		IS:10748-2004 TABLE No.-03 AND IS:1239:2004 CL. No.14.1 & IS:1608:1995	IS:1239:2004 TABLE NO.-14.1			
3	FINAL INSPECTION	a	OUTSIDE DIMENSIONS	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. 01	IS:1239:2004 CL. No.8.1 & TABLE No.3/4/5	IS:1239:2004 TABLE NO.-4 + GGL SPECIFICATION	TUBE MILL INSPECTION REPORT/FINAL INSPECTION REPORT	P	Rv
		b	THICKNESS		IS:1239:2004 CL. No.9.1(a)	15mm dia - 3.2mm 25mm dia - 4.0mm + NOT LIMIT/-10%			
		c	LENGTH		P.O. Requirement	3 Mtrs/ 6 Mtrs AS PER P.O. TOLERANCE :+6%/-0%			
		d	STARIGHTNESS	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. 01	IS:1239:2004 CL. No.15	THE FINISH TUBES SHALL BE REASONABLY STRAIGHT	TUBE MILL INSPECTION REPORT/FINAL INSPECTION REPORT	P	Rv
		e	INTERNAL WELD FIN HEIGHT		IS:1239:2004 CL. No.6.5	THE HEIGHT OF THE INTERNAL WELD FIN SHALL NOT BE > 60% OF THE SPECIFIED WALL THICK.			
		f	WORKMANSHIP, FINISH & APPEARANCE		IS:1239:2004 CL. No.15	TUBES SHALL BE CLEANLY FINISHED AND REASONABLY FREE FROM INJURIOUS AND SHALL BE CLEANLY CUT AND REASONABLY SQUARE WITH THE AXIS OF THE TUBE.		P	Rv
		g	WEIGHT G.I. PIPE		IS:1239:2004 CL. No.9.1(b)	15mm dia - 1.44 Kg/m (+/-10%) 25mm dia - 2.93 Kg/m (+/-10%)		P	Rv
		h	TUBE ENDS PLAIN ENDS	100%	IS:1239:2004 CL. No.3.3 & 10.2	Square Cut to Axis		P	Rv



		i	SAMPLING TUBES	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. & 2	IS:1239:2004 CL. No.16.2/ IS:4711:2008 TABLE No.2	IS:4711: 2008 TABLE NO. 02	MECHANICAL TEST REPOPRT	P	R
		j	TENSILE TEST % EL	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. & 2	IS:1239:2004 CL. No.14.1 & 14.1.1/IS: 1608-1995	TENSILE STRENGTH MIN. -320 Mpa ELONG. MIN. 12%			
		k	BEND TEST	SCALE OF SAMPLING FOR TESTING AS PER IS 4711:2008 TABLE NO. 2	IS:1239:2004 CL. No.14.2 & IS:1239:2004 CL. No.14.3 & IS:2328	THE BEND TEST WITHOUT SHOWING ANY SIGN OF FRACTURE		P	R
		l	GALVANISING MASS OF ZINC COATING	ONE SAMPLE AT EVERY FOUR HOURS & AS PER IS:4736	IS: 1239: 2004 CL. NO. 12.1 TO 12.1.1 IS:4736 CL.5.1, 5.2, & 5.5 IS:2629, IS:2633	400 Gm/M2(MIN.)	GALVANISING REPORT	P	R
		m	UNIFORMITY OF ZINC COATING			NO RED SPOT, FREE FROM LUMPS, EXCESS ZINC, FREE FROM WHITE RUST			
		n	FREE BORE TEST			FREE PASSING OF MANDAREL/ROD THROUGH GALVANISING TUBE. 11MM ROD FOR 15MM & 21MM ROD FOR 25MM, ROD LENGTH 230MM MIN.			
		O	LEAK PROOF TEST	EACH TUBE	IS:1239:2004 CL. No.13	5MPA AND MAINTAINED FOR 3 SECS Minimum NO LEAKAGE IN PIPE	HYDRO TEST REPORT	----	R
5	PRODUCT MARKING	a	VISUAL VERIFICATION OF MARKING	EACH TUBE	IS:1239:2004 CL. No.17 & P.O. REQUIREMENT	IS:1239:2004 CL. No.17 & P.O. REQUIREMENT MARKING SHALL BE AT THE INTERVAL OF NOT MORE THAN 1 METERS. EACH PIPE SHALL BE EMBOSSED WITH - (1) MANUFACTURER'S NAME/TRADEMARK (2) INDIAN STANDARD MARK (ISI) (3) CLASS OF PIPE	-----	P	Rv
6	BUNDLING & PACKING	a	P.O./SPECIFICATION REQUIREMENT	EACH REQUIREMENT	P.O. Requirement	MARKING DONE ON METAL TAG AND AFFIXED WITH EACH BUNDLE: (1) MANUFACTURER'S NAME/TRADEMARK (2) OWNER'S NAME- GUARAT GAS LIMITED (3) CLASS OF PIPE- HEAVY (4) LOT NUMBER/BATCH NUMBER OF PRODUCTION (5) SIZE DESIGNATION	TEST CERTIFICATE	R	R

R = REVIEW OF RECORDS Rv =RANDOM VERIFY P = PERFORM (BY VENDOR)

GUJARAT GAS

**TECHNICAL SPECIFICATION FOR PROCUREMENT OF POWDER
COATED GI FITTINGS**

Document No. : GGL/TS/GI Fittings/2015

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1.0 INTRODUCTION AND SCOPE

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various cities of Gujarat.

This present document covers the technical specification for the procurement of GI fittings used in natural gas distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which need to be fulfilled.

This specification covers the requirements for Malleable Cast Iron Fittings unless modified by this specification, requirements of IS 1239 (Part-I), latest edition and IS 1879 – latest edition shall be valid.

2.0 DEFINITIONS

OWNER / CLIENT	Gujarat Gas Ltd., (GGL)
PNG	Natural Gas produced from Gas wells, Gas condensate wells or Oil wells and the residue Gas remaining after conditioning being metered, regulated / controlled, odorized & distributed through pipelines for various applications, i.e. for industrial, commercial and domestic.
Manufacturer	Manufacturer of the GI Fittings
Vendor	The person(s), firm, company, organization from whom Client/Contractor procures materials.
TPA	Third Party Inspection Agency
EIC	Engineer In Charge
PNGRB	Petroleum and Natural Gas Regulatory Board
T4S	Technical Standard and Specification including Safety Standards

3.0 MATERIAL

The material used for the manufacturing of GI fittings shall conform to IS 1239 (Part-I): 2004 (Latest edition) or IS 14329 – 1995 with latest amendments Grade BM 300.

4.0 PRESSURE TEST

Vendor shall carry out pneumatic pressure test as per Clause 11.1b of IS 1879 – 1987 with latest amendments on each & every fittings. Vendor to submit the Internal Quality control certificate for the same. Owner shall witness pneumatic testing as per the sampling procedure specified in IS 1879 – 1987 with latest amendments.

5.0 COMPRESSION TEST

This test shall be conducted to judge the malleability of the pipe fittings & shall be carried out as per Clause 12 of IS 1879 – 1987 with latest amendments.

6.0 SAMPLING

Owner Representative or Third Party Inspection Agency shall witness the tests as per clause 14 of IS 1879 – 1987 with latest amendments/ as per approved QAP. However, vendor to perform 100% inspection of visual, dimensional & pressure test. Vendor shall furnish Internal test certificates at the time of final inspection to the Owner.

7.0 DIMENSIONS & DIMENSIONAL TOLERANCES

- i. Dimensions of various types of fittings shall be as specified in sections 2 to 10 of IS 1879 – 1987 with latest amendments, as applicable.
- ii. Wall thickness of fittings and tolerances on them shall be as given in Table 1.2 of IS 1879 – 1987 with latest amendments,
- iii. In case of reducing fittings, the dimensions at each outlet shall be those appropriate to the nominal size of the outlet.
- iv. Elbows, Tees, Sockets and caps shall be of reinforced type.

8.0 WEIGHT & WALL THICKNESS

Weights of various types of fittings shall be as specified in sections 2 to 10 of IS 1879 – 1987 with latest amendments, as applicable.

Nominal Diameter DN	15 mm (1/2")	25 mm (1")
Grade	Heavy	Heavy
Outer Dia. (Max. / Min.)	21.8 mm / 21.0 mm	34.2 mm / 33.3 mm
Thickness (mm)	2.5	3.0
Tolerance on Thickness	-0.5 mm/ + Not limited	-0.7 / + Not limited

9.0 THREADS

Threads shall be BSPT, Female type.

10.0 FREEDOM FROM DEFECTS

On visual examination, the outside & inside surfaces of fittings shall be smooth & free from any defects such as cracks, injurious flaws, fine sand depth etc.

11.0 GALVANIZING

- i. Fittings shall be galvanized to meet the requirement of IS: 4759 – 1996 with latest amendments.
- ii. Zinc conforming to any grade specified in IS: 13229-1991 with latest amendments shall be used for the purpose of galvanizing.
- iii. Galvanizing bath: The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.
- iv. Coating requirements: Mass of coating shall be 610 - 700 gms/m².
- v. Freedom from defect: The zinc coating shall be uniform adhered, reasonably smooth & free from such imperfections as flux, ash bare patches, black spots, pimples, lumpiness runs, rust stains, bulky white deposits & blisters.
- vi. Samplings
 - a) All materials of the same type in coating bath having uniform coating characteristics shall be grouped together to continue a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be given in Table 2 of IS 4759 – latest edition.
 - b) The sample selected according to Column 1 & 2 of Table 2, IS: 4759 – latest edition shall be tested for visual requirements as per Clause 6.2 of IS:4759 – latest edition
 - c) The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 9.2 of IS: 4759 – latest edition.
 - d) Criteria for conformity: As per Clause 8.3 of IS: 4759-latest edition.
 - e) Test procedure shall be as per Clause 9 of IS: 4759-latest edition.

12.0 QUALITY ASSURANCE (QA)

The Contractor/Manufacture /Vendor shall manufacture, supply, inspection, testing, marking, packaging, handling and dispatch of Fittings as per GGL Technical Specification and GGL QAP.

13.0 INSPECTION / DOCUMENTS

- i. Inspection shall be carried out as per Owner Technical Specification/approved QAP.
- ii. GGL Representative shall ensure the manufacturer / vendor monogram on accepted GI fittings during inspection of materials.
- iii. Contractor / Manufacture /Vendor shall furnish all the material test certificates, proof of approval / licence from specified authority as per specified standard, if relevant, internal test / inspection reports as per Owner Tech. Spec. & specified code for 100% material, at the time of final inspection of each supply lot of material.
- iv. For any control, test or examination required under the supervision of TPA/EIC, latter shall be informed in writing one (1) week in advance by vendor about inspection date and place along with production schedule.
- v. Owner reserves the right to select a sample of items / materials randomly from each manufacturing batch / lot & have these independently tested. Should the results of these

tests fall outside the limits specified in Owner technical specification, then Owner reserves the right to reject all production supplied from the batch.

14.0 MARKING

Each fitting shall be embossed with manufacturer's name or trademark or monogram and the size designation.

Each packing containing fittings shall carry the following embossed, stamped or written by indelible ink.

Manufacturer's name or trade mark or monogram

- a. Designation of fittings.
- b. Lot number.

15.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured.

Contractor / Vendor / Bidder shall submit the packaging details and also complied with at the time of delivery.

16.0 DOCUMENTS OF PRECEDENCE

In case of conflict between the requirements of this specification and that of the referred codes, standards and specifications, the requirements of the referred codes, standards and specifications shall govern.

17.0 QUALITY ASSURANCE PLAN

Sr. No.	Name of test/Features	Referred Standard	Inspection Methodology	Inspection by TPA
1	Chemical Properties	IS 1239 (Part-I): 2004 (Latest edition) or IS 14329 – 1995 with latest amendments Grade BM 300	Manufacturers test certificate of Raw material	R
2	Mechanical Properties	IS 14329 – 1995 with latest amendments Grade BM 300	Manufacturers test certificate	R
3	Physical Verification			
3.1	Dimensions	IS :1879, as per table shown below.	Vernier Calliper	Rv
3.2	Wall Thickness			
3.3	Thread	IS :554,	Test Certificate	Rv
4	Powder Coating	Coating thickness – Min.60 Micron	Test Certificate	R

R- Review of Documents

Rv- Random Verification

GUJARAT GAS

**TECHNICAL SPECIFICATION – PROCUREMENT OF BRASS METER
ADAPTOR**

Document No. : GGL/TS/Meter Adaptor/2015

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1.0 INTRODUCTION AND SCOPE

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various cities of Gujarat.

This specification covers the requirements for materials of Brass and it's fittings. Unless modified by this specification, requirement of IS 559 / IS 319: 2007/ BS 864 / EN 1254 Part 1 shall be valid. However, Latest Edition of IS/BS/EN shall be governing for Specification, if applicable.

2.0 DEFINITIONS

OWNER / CLIENT	Gujarat Gas Ltd., (GGL)
PNG	Natural Gas produced from Gas wells, Gas condensate wells or Oil wells and the residue Gas remaining after conditioning being metered, regulated / controlled, odorized & distributed through pipelines for various applications, i.e. for industrial, commercial and domestic.
Manufacturer	Manufacturer of the Brass Fittings with Head Chrome Plating
Vendor	The person(s), firm, company, organization from whom Client/Contractor procures materials.
TPA	Third Party Inspection Agency
EIC	Engineer In Charge
PNGRB	Petroleum and Natural Gas Regulatory Board
T4S	Technical Standard and Specification including Safety Standards

3.0 MATERIAL

- i. The material used for the manufacturer of Brass fittings shall conform to IS 319 :2007 (Latest edition)
- ii. Material used for Brass Fitting shall be Clean, Smooth, and free from the surface defects like blisters, Silvers, Scales, Fins, Spills, Cracks etc. and Free From internal defects like Porosity, Piping etc.
- iii. Threading on the Brass fittings shall be done as per BS 21 / IS554.

4.0 CHEMICAL PROPERTIES

Chemical composition of free cutting brass rods of Brass and it's fittings shall be as mentioned in IS 319 : 2007 with Head Chrome Plating.

Copper (Cu)	:	56.0 % to 59.0 %
Lead (Pb)	:	2.0 % to 3.5 %
Iron (Fe)	:	0.35 % Max
Other Impurities (Excluding Iron)	:	0.70 % Max
Zinc (Zn)	:	Remaining

5.0 HYDROSTATIC / PNEUMATIC PRESSURE TEST

All Brass fittings shall be sustaining the pressure of 3.5 bars for 30 minutes holding time during testing at site after installation and no leakage is permitted.

The test shall be performed on each size of the fittings at site after installation.

6.0 DIMENSIONAL TOLERANCES OF FREE CUTTING BRASS BARS, RODS AND SECTION

Sizes

The materials of Brass Fitting (Free Cutting Brass Rods) shall be supplied in sizes as specified in IS 319: 2007 or IS 2826 or as per Purchaser requirement.

Tolerances

The tolerances on sizes of bars/rods shall be as specified in IS 2826.

7.0 DIMENSION, WALL THICKNESS & TOLERANCE OF BRASS FITTINGS

Dimensions tolerances of various types of brass shall be as per drawing enclosed with tender.

The minimum wall thickness of a fitting shall be in accordance with Table 3 of EN 1254 Part 1

8.0 END CONNECTION

End connection of the brass fitting must be capable of end feeding to the BSPT and as per drawing enclosed with tender

Internal solder ring type fitting is not acceptable.

9.0 FREEDOM FROM DEFECT

The fittings shall be free from internal fins, blow holes, skin defects etc. or other irregularities which might restrict the free flow of fluid, and shall be designed that resistance to the flow of fluid through the fittings is minimized.

10.0 QUALITY ASSURANCE (QA)

The Contractor/Manufacturer /Vendor shall manufacture, supply, inspection, testing, marking, packaging, handling and dispatch of Fittings as per GGL Technical Specification and GGL QAP.

11.0 INSPECTION / DOCUMENTS

Inspection shall be carried out as per design codes/standards, OWNER Technical Specification and approved QAP.

- i. Contractor / manufacturer / Supplier / Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per OWNER Technical Specification, at the time of final inspection of each supply lot of material.
- ii. OWNER reserves the right to select a sample of items randomly from each manufacturing batch/ lot and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.
- iii. Vendor Representative shall carry out final inspection at his premise prior to dispatching of materials as per GGL QAP provided with the tender document.
- iv. For inspection at contractor premises by TPA/ GGL Representative, latter shall be informed in writing one (1) week in advance by contractor about inspection date & place along with inspection schedule.

Each fittings shall be embossed with manufacturers name / trade mark

Each packing containing fittings shall carry the following stamped or written in indelible ink.

- a) Manufacturer's name or trade mark.
- b) Designation of fittings.
- c) Month and year of manufacturing

12.0 PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured.

Contractor / manufacturer / Supplier / Vendor shall submit the packaging details and also complied with at the time of delivery.

13.0 DOCUMENTS OF PRECEDENCE

In case of conflict between the requirements of this specification and that of the referred codes, standards and specifications, the requirements of the referred codes, standards and specifications shall govern.

14.0 QUALITY ASSURANCE PLAN

Sr. No.	Characteristics	Referred Standard	Inspection Methodology	Inspection by TPA
1	Material (Chemical and Mechanical Properties)	IS 319 : 2007	Manufacturers test certificate of Raw material	R
2	Thread	IS 554	Test Certificate	R
3	Dimensions & Thread	Approved drawing of GUJARAT GAS	Dimension verification- ("GO" – "NO GO" Gauge)	Rv
4	Marking	Manufacturers name or trade mark	Visual	Rv

R- Review of Documents

Rv- Random Verification

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GUJARAT GAS

TECHNICAL SPECIFICATION FOR WARNING MAT/ TAPE

Document No. : GGL/TS/Warning Tape-Mat/2018

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1.0 INTRODUCTION AND SCOPE

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various cities of Gujarat.

The present document covers the technical specifications for the procurement of Warning Mat / Tape. Warning mats/tape shall be laid in the ground above the gas main line.

2.0 DEFINITIONS

OWNER / CLIENT	Gujarat Gas Ltd., (GGL)
PNG	Natural Gas produced from Gas wells, Gas condensate wells or Oil wells and the residue Gas remaining after conditioning being metered, regulated / controlled, odorized & distributed through pipelines for various applications, i.e. for industrial, commercial and domestic.
Manufacturer	Manufacturer of the Warning Mat/tape
Vendor	The person(s), firm, company, organization from whom Client/Contractor procures materials.
TPIA	Third Party Inspection Agency
EIC	Engineer In Charge
PNGRB	Petroleum and Natural Gas Regulatory Board
T4S	Technical Standard and Specification including Safety Standards
LDPE	Low density Polyethylene
HDPE	High Density Polyethylene

3.0 REFERENCE CODE

IS 2508	Specification for Low Density Polyethylene Films
ASTM D-638	Standard test method for Tensile Properties of plastics.
ASTM D-882	Standard test method for Tensile Properties of thin plastic sheeting
ASTM D-792	Standard test method for Density and Specific gravity of plastics by Displacement
IS 10889	High density Polyethylene films

4.0 MATERIAL

The material grade of Warning Mat shall be Virgin Low density polyethylene (PE) material with warning sticker / stamp. The LDPE material shall be having the density as per IS 2508 and HDPE as per IS 10889.



The tape shall be uniform in colour, texture and finish and shall be free from holes and foreign Materials.

The material and colour, if used, for printing shall have no detrimental effects on the environment.

a) Mechanical properties

Description	Properties of Warning Mat/tape (Thickness- 300 micron)	Properties of Warning Mat/tape (Thickness- 1000 micron)
Minimum Tensile strength at break (Machine direction)	120 Kgf / cm ²	185 Kgf/cm ²
Minimum Elongation at break Length wise direction Crosswise	200 % 400 %	200%

5.0 RECOMMENDED MANUFACTURER FOR RAW MATERIAL

1. SOLVAY
2. BOREALIS
3. FINA
4. DOW
5. ELENAC
6. RELIANCE
7. GAIL
8. HALDIA
9. IOCL
10. OPAL

However any other reputed national or international Manufacturer may also be consider for supply of Raw material with approval of Owner / Owner's representative.

6.0 DIMENSION AND WALL THICKNESS

Warning Mat/Tape shall have following dimensions:

Description	For PE-PNG	For steel Laying
Width	200 mm ± 5 mm	300 mm ± 5 mm
Thickness (Minimum)	300Micron	1000 Micron
Length of Roll	250 mtrs.	100 mtrs.

Negative tolerance on thickness is not allowed.



7.0 TESTING

Testing of warning mat /tape shall be performed as below.

a) Colour - Fast test

Test specimen 100 mm to 150 mm wide shall be immersed in a 20% solution of ammonium sulphide at 15 to 20 °C temperature for 15 days. The colour fastness shall be evaluated by comparing the test specimen with a sample specimen. The comparison shall be made by placing the two specimens on a white back ground in day light, but without exposing them directly to sun light. Test shall be accepted satisfactory, if the colour of the strip remains intact.

b) Other tests shall be carried out as per relevant national / international standard enclosed in QAP.

8.0 COLOUR

The Mat /Tape shall be of bright golden yellow colour. This colour must not take any appreciable alteration in the course of time.

9.0 WARNING MAT/TAPE VIRGINITY TEST

Differential Scanning Calorimeter (DSC) Scan test along with the temperature of melting (T_m) shall be performed for the Warning Mat/ Tape and its raw polymer i.e. virgin low density polyethylene (LDPE) or High Density Polyethylene (HDPE).

The Differential Scanning Calorimeter (DSC) Scan curve of the Warning Mat / tape obtained from its DSC Scan test along with its Temperature of Melting (T_m) shall then be compared with the DSC

Scan curve and the Temperature of Melting (T_m) of its raw polymer (i.e. virgin LDPE). To ensure the virginity of the Warning mat / tape , the DSC Scan curve and T_m of the Warning Mat / tape (finished product manufactured from the raw polymer) shall match on overlapping with its corresponding raw polymer's DSC Scan curve and T_m .

10.0 QUALITY ASSURANCE (QA)

The Contractor/Manufacture /Vendor shall submit QAP after getting firm order from Owner for their review and approval. Prior dispatching of materials, vendor shall offer material lot to TPIA/Owner for final acceptance test as per approved QAP at their premise following for review of TPIA / EIC at the time of final inspection at vendor premise prior to dispatch of materials.

11.0 INSPECTION / DOCUMENTS

- i. Inspection shall be carried out as per design codes/standards, OWNER Technical Specification and QAP enclosed in this tender by TPIA / EIC.
- ii. TPIA /EIC may carry out final inspection at contractor store at the time of material acceptance / clearance before installation / work execution at site.
- iii. TPIA / EIC may carry out random inspection during manufacturing/ final inspection.



- iv. Contractor / manufacturer / Supplier / Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per OWNER Technical Specification, at the time of final inspection of each supply lot of material.
- v. Even after inspection, OWNER reserves the right to select a sample of items randomly from each manufacturing batch/ lot and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.
- vi. For any control, test or examination required under the supervision of TPIA/EIC against approved QAP, vendor shall intimate through letter/mail To TPIA/EIC one (1) week in advance about inspection date and place along with production schedule Marking

Marking on the Mat/Tape shall be approved by owner. The warning mat must be engraved with "Caution: High pressure gas pipeline below" in both English and Hindi or local language along with Owner's Logo at a frequency of every meter.

Contractor / manufacturer shall submit proposed Artwork to be marked on the Mat for the approval from Owner / Owner's representative.

12.0 PACKING

The warning mat shall be delivered in rolls as mentioned in clause no. 6.0 .

Packing size to be mentioned to ensure uniformity in delivery conditions of the materials being procured

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured.

Contractor / manufacturer / Supplier / Vendor shall submit the packaging details and also complied with at the time of delivery.

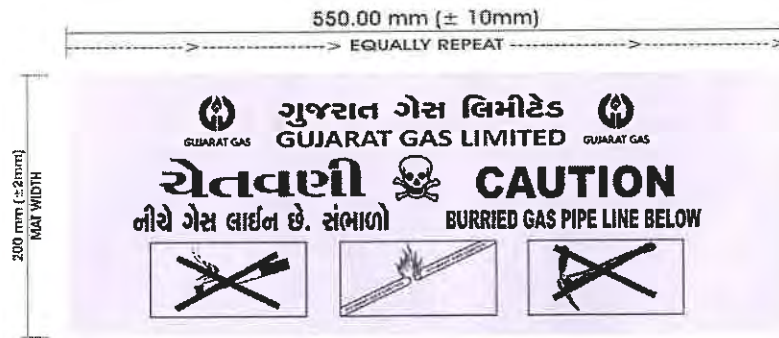
13.0 DOCUMENTS OF PRECEDENCE

Where any portion of the GTS is repugnant or variance with any provisions of the GGL Technical Specification, unless a different intention appears, the provision(s) of GGL Technical Specification shall be deemed to govern the provision(s) of GTS of contract. If there is no variance or repugnance between GTS and GGL Technical Specification both clauses shall be applicable.

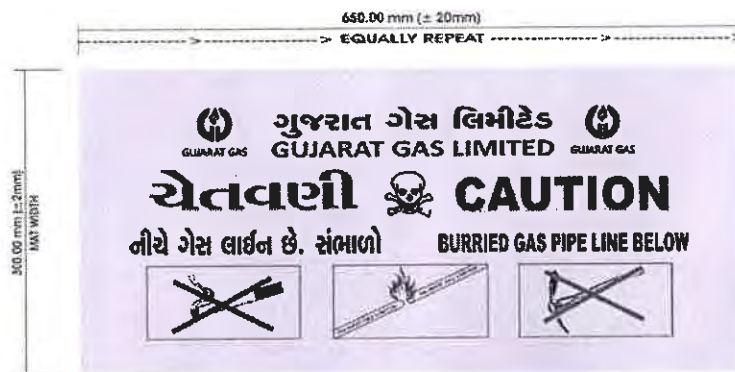
In case of conflict between the requirements of this specification and that of the referred codes, standards and specifications, the requirements of the referred codes, standards and specifications shall govern.

14.0 DRAWING:

Warning Tape for PE-PNG:



Warning Tape for Steel Laying:



15.0

QAP:

Sr. No.	Name of test/Features	Unit	Requirement	Inspection Methodology	Inspection by TPA
1	Material	-	LDPE as per IS 2508 / HDPE as per 10889	Material Test Certificate	Rw
2	Tensile strength at break	kgf/cm ²	For LDPE - 120 (min) FOR HDPE – 185 (Min)		
3	Elongation	%	For LDPE – Length wise direction - 200 Crosswise - 400 FOR HDPE – 200	Material Test Certificate	Rw
4	Virginity Test		GGL Tech. Spec. Clause no. 9.0	Test Certificate	Rw
5	Impact Strength Test		LDPE as per IS 2508 / HDPE as per 10889	Test Certificate	Rw
6	Colour	-	Bright Golden Yellow	Visual	Rw
7	Dimensions				
7.1	Width	mm	200 ± 5mm / 300 ± 5 mm	Scale	Rv
7.2	Thickness	micron	LDPE - 300 micron (Min) HDPE – 1000 micron (Min)	Vernier/Micro Meter	Rv
6	Marking	-	*As shown in the drawing	Visual	Rv
7	Colour- Fast test (Type Test)		Temp. 15 to 20°C & Duration 15 days	Material Test Certificate	Rw

Rw- Review of document

V- Verify

Rv – Random Verification

GUJARAT GAS

**TECHNICAL SPECIFICATION – POWDER COATING ON GI PIPES &
FITTINGS**

Document No. : GGL/TS/Powder Coating/2015

01	QAP included	06/06/2018
REV. NO	REVISION DESCRIPTION	DATE OF ISSUE

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1.0 INTRODUCTION AND SCOPE

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various cities of Gujarat.

This present document covers the minimum technical specification for the powder coating on GI Steel Pipes & Fittings used in high pressure natural gas transportation and distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which need to be fulfilled.

This specification covers the requirements for powder coating on GI Steel Pipes & Fittings. Unless modified by this specification, requirements of IS/ISO /EN with Latest edition shall be valid.

2.0 DEFINITIONS

OWNER / CLIENT	Gujarat Gas Ltd., (GGL)
PNG	Natural Gas produced from Gas wells, Gas condensate wells or Oil wells and the residue Gas remaining after conditioning being metered, regulated / controlled, odorized & distributed through pipelines for various applications, i.e. for industrial, commercial and domestic.
Manufacturer	Manufacturer of PE Electro-fusion Fittings
Vendor	The person(s), firm, company, organization from whom Client/Contractor procures materials.
TPA	Third Party Inspection Agency
EIC	Engineer In Charge
PNGRB	Petroleum and Natural Gas Regulatory Board
T4S	Technical Standard and Specification including Safety Standards,

3.0 MATERIAL

The material used for the powder coating confirming to pure polyester.

4.0 REQUIREMENTS FOR THE FABRICATED ELEMENTS

The section shall be suitable for powder coating, defects in construction which lead to corrosion, e.g. inappropriate combinations of materials, spaces which cannot be ventilated, cracks and components which are not suitable for powder coating, should be avoided.

The quality of the powder coating on galvanized Pipes & Fittings shall be primarily determined by the quality of the galvanization. The hot galvanization guidelines in IS apply only when the hot galvanized pipes & Fittings shall not be coated afterward.

5.0 PREPARATION & PRE-TREATMENT

To obtain a suitable powder coated surface, grinding down of the uneven areas on the galvanized surface may be required. Brushing or the use of abrasive paper, grain size 60, is recommended before initial preparation or pre-treatment.

Galvanized surfaces shall be powder coated immediately after preparation or pre-treatment and before the products of zinc corrosion, or white rust, can develop.

PREPARATION

Sweep blasting shall be used to prepare a clean and even surface on the zinc / galvanize coating which is ideal for adhesion of the powder coating.

The hot galvanized parts shall have a Rz mean surface roughness according to DIN 4768 of between 15 and 30 μm and a high degree of coverage.

After the sweeping process is completed, any dust must be removed thoroughly from the entire surface, which should have a uniform matte gray appearance.

PRE-TREATMENT

Yellow chromating has become the most common wet-chemical process. This method uses either immersion or spraying techniques; zinc-phosphating shall be also used.

This shall rinse the conversion layer thoroughly with de-ionized water. The conversion layers must be sufficiently clean and dry before powder coating to ensure that surface irregularities do not form when the powder coating shall be cured.

6.0 COATING SYSTEM

Due to the excellent corrosion resistance of zinc coatings, powder coatings are usually applied to galvanized pipes and Fittings in a single coat.

The minimum thickness of powder coatings is 60 μm .

All coat thicknesses shall be measured according to ISO 2360.

REQUIREMENTS FOR THE COATING & COATING MATERIAL

The powder coating shall satisfy the requirements of the voluntary quality guidelines of aluminum substrates and in addition qualify for the use on galvanized pipes & Fittings.

The powder coating shall meet the requirements of BS 6497 & EN 12206-1.

The quality of other materials must be equivalent, especially with regard to the following points:

- Color and effect
- Gloss and surface characteristics such as flow properties and texture
- Resistance to weathering and anti-corrosion protection
- Mechanical properties
- Glossy at 60° C, with a gloss level of 85–95 %
- Smooth Flow Surface

7.0 TESTING

The powder coating shall be confirmed to the following test results and quality characteristics with regard to weathering, corrosion protection and mechanical properties

Owner Representative or Third party Inspection Agency appointed by Owner shall witness finish goods testing as per the sample procedure specified in relevant ISO /IS latest edition.

Test	Norm	Results
Weathering	conforms to EN 12206-1	As Per EN 12206-1
Resistance to Humidity	ISO 6270 [hrs]	720
Enrichson Cupping	Min. 8mm	Depth of cupping 10.38mm
Impact Resistance	Direct – 150kg. Min. In Direct – 150kg. Min. ASTM D-2794	No removal of coating observed
Salt Spray Resistance	1000 Hrs. ASTM-B 117	No rusting observed upto 1000 Hrs.
Coating Thickness	ISO 2360 [µm]	60 µm Min.
Porosity	DIN 55 670	non-porous
Film Type	Glossy	Satisfactory
Gloss at 60° C	86-95 %	Satisfactory
Cross hatch Adhesion (ASTM D-5870)	GT = 0/100	Satisfactory
Pencil Hardness. (min.)	2 H	Satisfactory
Scratch Resistance (Kg. Min.)	3	Satisfactory

8.0 QUALITY ASSURANCE (QA)

The Contractor/Manufacturer /Vendor shall carry out internal inspection as per testing requirements mentioned in this specification

9.0 INSPECTION / DOCUMENTS

- i. Inspection shall be carried out as per design codes/standards, OWNER Technical Specification and QAP enclosed in this tender.
- ii. Contractor / manufacturer / Supplier / Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per OWNER Technical Specification, at the time of final inspection of each supply lot of material.
- iii. OWNER reserves the right to select a sample of items randomly from each manufacturing batch/ lot and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.

10.0 MARKING

Each packing containing materials / items shall carry the following stamped or written in indelible ink.

- a) Powder coating firm or trade mark.
- b) Month and year of Powder coating

11.0 PROTECTION DURING TRANSPORT AND PACKAGING

Packing size to be mentioned to ensure uniformity in delivery conditions of the material being procured.

Contractor / manufacturer / Supplier / Vendor shall submit the packaging details during QAP and also complied with at the time of delivery.

Suitable packaging materials shall be used to protect coated components against mechanical and chemical agents such as those in mortar, plaster, cement and concrete and during storage, transport and assembly.

The supplier /Contractor / Vendor make sure that packaging materials and all other materials shall be used as intended and shall be removed without difficulty. To avoid damage to the coated surface check adhesive tapes, etc. for their suitability.

It shall be ensured that incorrect storage shall not lead to milky white spots on the surface, e.g. under packing materials, caused by a combination of moisture and warmth.

Sealing compounds and other materials such as glazing aids, drilling, cutting and other kinds of lubricants which shall come into contact with coated surfaces shall be pH neutral and free of any substances which shall damage the coating.

12.0 DOCUMENTS OF PRECEDENCE

In case of conflict between the requirements of this specification and that of the referred codes, standards and specifications, the requirements of the referred codes, standards and specifications shall govern.

13.0 QUALITY ASURANCE PLAN

Sr. No.	Name of test/Features	Requirement	Inspection Methodology	Inspection By TPA/GGL
1	Powder Material	Pure Polyester	Material Test Certificate	Rw
1.1	Application	Electrostatic Spraying (40-90 KV Manual / Automatic)		
1.2	Backing Schedule	180°C to 200°C for 10mm (Metal Temperature)		
1.3	Coating Thickness	60 Microns Min.		
1.4	Colour	Golden Yellow		
2	Testing		Material Test Certificate	Rw
2.1	Film Type	Glossy		
2.2	Gloss 60 deg	86 – 95 %		
2.3	Cross hatch Adhesion (ASTM-D -5870)	GT = 0/100		
2.4	Cylindrical bending Test (ASTM D-522) 5mm Rod dia.	Passes		
2.5	Enrichsen cupping (min.)	8 Passes (Min. 8 mm), Depth of cupping 10.38 mm		
2.6	Pencil Hardness. (min.)	2 H		
2.7	Scratch Resistance (Kg. Min.)	3		
2.8	Impact Resistance (Kg. Min.) ASTM D-2794)	Direct:150 kg. min Indirect : 150 kg. Min No removal of coating observed		
2.9	Resistance to humidity	720		
2.10	Salt Spray Resistance	No rusting observed up to 1000 Hrs		
2.11	Porosity	Non-Porous as per DIN 55670		

Rw - Review of Documents



GUJARAT GAS

**TECHNICAL SPECIFICATION
FOR
PVC SLEEVE FOR WALL CROSSING OF PNG CONNECTION**

Document No.: GGL/TS/SPEC/SLEEVE/001,REV-02

03	QAP revised	20/02/2020
02	Pre-bid clarification incorporated	06.06.2018
REV. NO	REVISION DESCRIPTION	DATE OF ISSUE

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1 GENERAL

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various Geographical Areas as per authorisation from PNGRB.

The intent of this specification is to establish minimum requirements for supply of PVC Sleeve for wall crossing of PNG connection.

The scope will include supply, inspection, testing, marking, packaging, handling and despatch of PVC Sleeve of ratings and grades as per IS: 4985 with latest amendments.

2 REFERENCE CODES AND STANDARDS:

PNGRB T4S: Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks.

IS 4985: Unplasticized PVC pipes for potable water supplies - Specifications

In case of conflict between the requirements of this specification and the Reference Codes & Standards, the requirements of the specification, having stringent requirement, shall govern. Vendor shall obtain prior permission from GGL in such cases.

3 DEFINITIONS

For this specification the following definitions shall apply:

OWNER/ CLIENT: Gujarat Gas Limited (GGL)

CONSULTANT : Consultant engaged by GGL for evaluation of vendor

MANUFACTURER: Means the Manufacturer of PE pipes.

VENDOR: The person(s), firm, company, organization from whom Client / Contractor procures materials

4 MATERIAL

Material shall conform to the requirement of Cl. No. 6 of IS 4985: 2000 with latest amendments.

5 SPECIFICATION

Parameter Description	Specification
Material	PVC (Composition shall be as per the requirement of IS 4985 (latest edition))
Reference Standard	IS 4985
Pipe Dia	For 1/2" GI Pipe - Sleeve Size - 32mm For 1" GI Pipe - Sleeve Size - 40mm
Thickness	Dia 32mm - 1.5 to 1.9 mm (Class 4) Dia 40mm – 1.4 to 1.8 mm (Class 3)
Length	3 meter
End Type	Plain end
Pressure Rating	Class 4 - 8.0 kg/cm ² Class 3 – 6.0 kg/cm ²
Colour	Grey
Maximum Operating Temperature (Working Pressure)	27° C
Combustion Participation	No
Marking	As per IS 4985 (latest edition)
Inspection & Testing	As per IS 4985 (latest edition)

6 QUALITY ASSURANCE (QA)

The manufacturer/supplier/ Vendor is entirely responsible for the quality of the material.

All control checks prescribed above do not relieve him of his responsibility.

7 INSPECTION

Inspection shall be carried out as per design codes/standards, OWNER Technical Specification and standard.

Manufacturer / Supplier / Vendor shall furnish all the material test certificates as per QAP.

OWNER reserves the right to independently test the PVC Pipes. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject the material.

8 MARKING, PACKAGING AND SHIPMENT

Marking must be permanently legible for the product life under standard stocking condition, exposure to external weather condition, installation and use.

All the items shall be suitably wrapped and packaged to withstand rough handling during inland journey.

Each item shall be properly tagged and packaged separately to facilitate easy identification.

Packaging note shall carry easily identifiable name or code of the physical item.

9 QUALITY ASSURANCE PLAN

Sr. No.	Characteristics	Acceptance criteria and certificate	Inspection Methodology	Inspection by Manufac./ Supplier	Inspection by TPA/GGL
1.	Grade of pipe	Dia 32 mm – Class 4 Dia 40 mm – Class 3	Material TC	R	R
2.	Mean Outside diameter	32mm = 32.00 – 32.30 mm 40mm = 40.00 – 40.30 mm	Vernier Caliper	R	Rv
3.	Wall Thickness	Dia. 32mm = 1.50 – 1.90 mm Dia. 40mm = 1.4 to 1.8 mm			
4.	Effective Length of Pipe	3 Mtr. (or as per GGL requirement)	Measuring Tape	R	Rv
5.	Pipe End	Clean cut and square to axis	Visual	R	Rv
6.	Colour	Light Grey	Visual		
7.	Surface (Internal & External)	Smooth	Visual		
8.	Pressure Rating	Class 4 – 8.0 kg/cm ² Class 3 – 6.0 kg/cm ²			

Rv – Random Verification

R- Review of Test Reports / Test Certificates

GUJARAT GAS

TECHNICAL SPECIFICATION – WELD END TRANSITION FITTINGS**Document No. : GGL/TS/WE-TF/2016 REV. 00**

01	QAP included	06/06/2018
REV. NO	REVISION DESCRIPTION	DATE OF ISSUE

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1.0 INTRODUCTION AND SCOPE

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various Geographical Areas as per authorisation from PNGRB.

The scope of the tender will include manufacture, supply, inspection, testing, marking, packaging, handling and despatch of Transition Fittings.

All codes and standards for manufacture, testing, inspection etc. shall be of latest edition.

Owner reserves the right to delete or order additional quantities during execution of order, based on unit rates and other terms & conditions in the original order.

2.0 REFERENCE CODES AND STANDARDS:

Governing Standards

PNGRB T4S	Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks.
EN 1555-3	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-3 Fittings
IS 14885:	Polyethylene pipes for the supply of Gaseous Fuels – Specifications
API 5L	Specification for Line Pipe

Reference Standards

EN 1555-1	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-1 : General
EN 1555-1	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-2 : Pipes
EN 1555-5	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-5 : Fitness for the purpose of the system
EN 1555-7	Plastic piping systems for the supply of gaseous fuels - Polyethylene (PE) Part-7 : Guidance for assessment of conformity
EN 682	Elastomeric seals – Material requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids
EN 728	Plastic piping and ducting systems – Polyolefin pipes and fittings – Determination of oxidation induction time.
EN 921	Plastic piping systems – Thermoplastic pipes – Determination of resistance to internal pressure at constant temperature.
EN 1716	Plastic piping systems – Polyethylene (PE) tapping tees – test method for impact resistance of an assembled tapping tee.
EN 12117	Plastic piping systems – Fittings, valves and ancillaries – determination of gaseous flow rate/pressure drop relationship

EN 12099:	Plastic Piping Systems — Polyethylene piping materials and components — Determination of volatile content
EN ISO 1133:	Plastics- Determination of melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics
ISO 1183:	Plastics — Methods for determining the density of non cellular plastics
ISO 13954	Plastics pipes and fittings -- Peel decohesion test for polyethylene (PE) electrofusion assemblies of nominal outside diameter greater than or equal to 90 mm
ISO 13955	Plastics pipes and fittings -- Crushing decohesion test for polyethylene (PE) electrofusion assemblies
ISO 13956	Plastics pipes and fittings -- Decohesion test of polyethylene (PE) saddle fusion joints -- Evaluation of ductility of fusion joint interface by tear test
ISO 13953	Polyethylene (PE) pipes and fittings -- Determination of the tensile strength and failure mode of test pieces from a butt-fused joint

3.0 DEFINITIONS

OWNER / CLIENT	Gujarat Gas Ltd., (GGL)
Manufacturer	Manufacturer of Transition Fittings
Vendor	The person(s), firm, company, organization from whom Client/Contractor procures materials.
TPA	Third Party Inspection Agency
EIC	Engineer In Charge
PNGRB	Petroleum and Natural Gas Regulatory Board
T4S	Technical Standard and Specification including Safety Standards

4.0 MATERIAL

To make connection between steel pipe and PE 100 pipe specially fabricated transition fittings consisting of steel and PE 100 pipes should conform to the requirement described below.

PE 100 Pipe

The PE 100 pipe with one end plain should conform to the specification of SDR 11, black of IS: 14885 or ISO: 4437 of latest edition.

Steel Pipe

Black ERW steel pipe should conform to the specification as laid in API 5L / ASTM A 106 (latest edition).

Steel Pipe Nominal Bore	1" NB	2" NB	3" NB	4" NB
Steel Pipe Wall Thickness (mm)	4.0	4.5	4.8	5.4
Tolerance on Steel pipe Wall Thickness	-10% / + Not limited	-10% / + Not limited	-10% / + Not limited	-10% / + Not limited

End of the steel pipe should be bevelled for welding angle and bevel should be 30° +5°.

Jointing between Steel and PE 100 Pipes

Steel and PE 100 Pipes should be so jointed in the factory so as to have a monolithic joint which is leak free and should be mechanically as strong or stronger than the PE pipe.

5.0 MECHANICAL PROPERTIES / TESTING

Soundness Test - No leakage from any part of the body and joint at 10 kg/cm² Pneumatic Pressure

Test of Strength of Mechanical Crimping – Min 250 kg/cm²

Free from defects - Free from crack, porosity, tear mark, blowholes, zinc lumpiness, deep gauges on PE pipes, crimping of sleeves and other defects

Other Materials - Greases or lubricants shall not enter into fusion areas, and shall not affect the long-term performance of fitting materials

Test Certificate Requirement – Yes

Other tests shall be carried as per the approved QAP

6.0 COLOUR

The colour of the PE parts of Transition fittings shall be black.

7.0 QUALITY ASSURANCE (QA)

The Contractor/Manufacturer /Vendor shall manufacture, supply, inspection, testing, marking, packaging, handling and dispatch of Polyethylene (PE) Electrofusion Fittings as per GGL technical specification and GGL QAP.

Quality Assurance of Company Procured Material

The Contractor/Manufacturer /Vendor shall submit QAP after getting firm order from Owner for their review and approval. Prior dispatching of materials, vendor shall offer material lot to TPA/Owner for inspection as per approved QAP at their premise following for

review of TPA / EIC at the time of final inspection at vendor premise prior to dispatch of materials.

Quality Assurance of Contractor Procured Material

The Contractor/Manufacturer /Vendor after getting firm order from Contractor shall manufacture, supply, inspection, testing, marking, packaging, handling and dispatch Polyethylene (PE) Electrofusion Fittings as per EN 1555-3: 2002 / ISO 8085-3 with latest amendments and GGL QAP.

8.0 INSPECTION / DOCUMENTS

Inspection shall be carried out as per design codes/standards, OWNER Technical Specification and approved QAP.

Inspection of Company Procured Material

- i. TPA /GGL Representative shall carry out final inspection at vendor premise prior to dispatching of materials.
- ii. TPA / GGL Representative shall carry out inspection during manufacturing/ final inspection as per approved QAP.
- iii. Contractor / manufacturer / Supplier / Vendor shall furnish all the material test certificates, proof of approval/ license from specified authority as per specified standard, if relevant, internal test/ inspection reports as per OWNER Technical Specification, at the time of final inspection of each supply lot of material.
- iv. Even after third party inspection, OWNER reserves the right to select a sample of items randomly from each manufacturing batch/ lot and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.
- v. Deputation of TPA is in the scope of the Vendor.

For any control test or examination required under the supervision of TPA/ GGL Representative, latter shall be informed in writing one (1) week in advance by vender about inspection date & place along with production schedule.

Inspection of Contractor Procured Material

- i. Vendor Representative shall carry out final inspection at his premise prior to dispatching of materials as per GGL QAP provided with the tender document.
- ii. For inspection at contractor premises by TPA/ GGL Representative, latter shall be informed in writing one (1) week in advance by contractor about inspection date & place along with inspection schedule.
- iii. Contractor shall furnish all the material test certificates, type test reports, internal test/ inspection reports as per OWNER Technical Specification and QAP, at the time of final inspection of each supply lot of material.

- iv. OWNER reserves the right to select a sample of items randomly from each batch/ lot and have these independently tested. If the results of these tests fall outside the limits specified in OWNER Technical specification, then OWNER reserves the rights to reject all production supplied from the batch.
- v. Inspection of the material shall be carried out as per GGL IMS procedure Quality Assurance for Contractor procured material”.

9.0 MARKING

Marking must be permanently legible for the product life under standard stocking condition, exposure to external weather condition, installation and use.

At least the information given below shall be printed on each Transition Fitting.

- a) Number of the system standard-EN 1555/API 5L
- b) Manufacturer's name and/or trademark
- c) Barcode
- d) Nominal size of fitting
- e) Material and designation of steel and PE
- f) Design application series
- g) SDR fusion range (SDR 11)
- h) Manufacturer's information
- i) Internal fluid (i.e. Gas)
- j) Month and year of manufacturing

10.0 PACKAGING

Transition Fitting shall be packaged individually in plastic bag in order to prevent deterioration. Both ends (Steel and PE) shall be protected with external temporary caps.

The cartons and/or individual bags shall bear at least label with the manufacturer's name, type and dimensions of the transition fitting, number of fittings in the box and any special storage conditions and storage time limits.

11.0 QUALITY ASSURANCE PLAN

S.No.	Description	Quantum of check	Reference Document GGL Technical Specification	Acceptance Criteria	Inspection Methodology	Format of Record	INSPECTION		Remarks
							Manuf. / Supplier	TPA/GGL	
1	Raw Material Inspection								
1.1	Steel Pipe	EN 1555-7	As per API 5L Gr. B / ASTM A 106 Gr B	Mechanical and Chemical properties as per API 5L Gr. B	MTC	MTC of supplier / manufacture	P	R	
1.2	Density		As per EN 1555-Part 1 & EN ISO 1183	≥930 Kg / M ³ at 23°C			P	R	
1.3	Oxidation induction time (Thermal stability)		As per EN 1555-Part 1 & EN 728	>20 min at 200°C			P	R	
1.4	Melt mass flow rate (MFR)		As per EN 1555-Part 1 & EN ISO 1133	Min. 0.2 to 1.40 at 190°C & 5Kg. Load in gm/10 Min.			P	R	
1.5	Volatile Content		As per EN 1555-Part 1 & EN 12099	≤ 350 mg/kg			P	R	Not applicable if water content test reports are available.
1.6	Water Content (Moisture Content)		As per EN 1555-Part 1 & ISO 15512	< 300 mg/kg (Equivalent to < 0.03% by mass)			P	R	Only applicable, if the measured volatile content is not in conformity to its specified requirement. In case of dispute the requirement of water content shall be used. As an alternative method, ISO 760:1978 may apply
1.7	Carbon Black Content		As per EN 1555-Part 1 & ISO 6964	2 to 2.5% by mass			P	R	
1.8	Carbon Black Dispersion		As per EN 1555-Part 1 & ISO 18553	Grade ≤3			P	R	
1.9	Antioxidant and UV Stabilizer	-	PNGRB T4S- G.S.R. 612(E).	The Antioxidant used is not more than 0.3% and U V Stabilizer used are not more than 0.5% by mass of finished resin	Declaration from Raw Material Supplier and Fitting Manufacturer	Declaration from Raw Material Supplier and Fitting Manufacturer	P	R	
1.10	Cadmium Free Pigmented compound material			Material shall be cadmium free pigmented compound					
1.11	Polyethylene -Virgin Material			Polyethylene resin used for manufacture of thermoplastic fittings shall be virgin,					
2	Performance requirements								
2.1	Soundness Test	Each Batch	GGL Technical Specification	No leakage from any part of the body and joint at 10 kg/cm ²	Pneumatic test	Inspection Report	P	R	
2.2	Test of Strength of Mechanical Crimping	Each Batch	GGL Technical Specification	Min 250 kg/cm ²	Mechanical Test.	Inspection Report	P	R	
2.3	Bevel End Angle		GGL Technical Spec	Bevel End Angle shall be 30 deg. + 5 deg.	Visual	Inspection Report	P	Rv	
2.4	Appearance	As per EN 1555-Part 7	Free from scoring, cavities and other surface defects and Cut cleanly and square to the axis. Smooth & clean Should be free grooves, scoring etc.	EN 1555-3/GGL Technical Spec.	Visual	Inspection Report	P	Rv	
2.5	Colour		GGL Technical Spec. / EN 1555-3	Black	Visual	Inspection Report	P	V	
2.6	Geometrical Characteris		GGL Technical Spec. / EN 1555-3	EN 1555-3/GGL Technical Spec.	Vernier Calliper	Inspection Report	P	V	
2.7	Hydrostatic Strength (80° C, 165 h)	As per EN 1555-Part 7	EN 1555-Part 3 Clause No. 7.2 Table-4 & EN 921	EF fitting joint shall withstand the hydrostatic pressure throughout the test period. No leakages are allowed through fusion area.	Hydrostatic Pressure Test.	Inspection Report	P	R	
2.8	Oxidation induction time (Thermal stability)		EN 1555-Part 3 Clause No. 8.2, EN 12117 & EN 728	>20 min at 200°C		Inspection Report	P	R	
2.9	Melt mass-flow rate (MFR)		EN 1555-Part 3 Clause No. 8.2, EN 12117 & EN ISO 1133	After processing maximum deviation of ± 20 % of the value measured on the batch used to manufacture the fitting at 190°C & 5Kg. Load in gm/10 Min. Test Parameters as per Table 6 of EN 1555-3	Melt Flow Tester	Inspection Report	P	R	
2.10	Electric Resistance		EN 1555-Part 3 Clause No. 5.5	Resistance of the fitting at 23°C shall be as specified by the fitting manufacturer.	Resistance measurement		P	R	
2.11	Marking	As per EN 1555-Part 7	EN 1555-Part 3 Clause No. 10.2 & 10.3	a) Number of the System Standard- EN 1555 b) Manufacturer's name and/or trademark c) Barcode d) Nominal size of Fitting e) Material and designation f) Design application series (i.e SDR - 11) g) Applicable SDR fusion range of pipe (i.e SDR 11 to SDR 26) h) Manufacturer's information i) Internal Fluid (i.e. Gas) j) Month and year of manufacturing.(A code may be provided e.g batch No -- 16/02)	Visual	Inspection Report	P	Rv	
2.12	Packing		EN 1555-Part 3	EN 1555-Part 3	Visual	Inspection Report	P	V	
2.13	Documentation		EN 1555-Part 3	As per the term & conditions of GGL Technical Specification	Visual	Compliance Certificate	P	R	

LEGENDS: Rv- Random Verification, V- Verification, W - Witness, R - Review of Documents / test certificates, H - Hold, P - Perform, TPA- Third Party Agency

Notes: -

1 In additional to above tests, Vendor shall submit Type Test report as per Table -4 of EN 1555-7

2 The Above Testing and acceptance criteria are minimum requirements, however, Vendor shall ensure that the execution of works shall also comply to the additional requirements as per GGL Technical specifications(TS) & EN 1555-1, EN-1555-3 & EN 1555-7

GUJARAT GAS

TECHNICAL SPECIFICATION FOR POWDER COATED GI NIPPLE

Document No. : GGL/IS/GI NIPPLE/2016

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1.0 INTRODUCTION AND SCOPE

Gujarat Gas Ltd., is a Group Company of Gujarat State Petroleum Corporation Ltd., (State Government undertaking) is supplying natural gas to automobile, industrial, commercial and domestic consumers including CNG stations in various cities of Gujarat.

This present document covers the technical specification for the procurement of Powder Coated GI Nipple used in natural gas distribution systems. It describes the general requirements, controls, tests, QA/QC examination and final acceptance criteria which needs to be fulfilled.

This specification covers the requirements for Powder Coated GI Nipples of heavy steel tube. Unless modified by this specification, requirements of IS 1239 (Part-I): 2004 (Latest edition) & IS 10748 (Latest edition) shall be valid for pipes used in preparing the GI Nipples.

2.0 DEFINITIONS

OWNER / CLIENT	Gujarat Gas Ltd., (GGL)
PNG	Natural Gas produced from Gas wells, Gas condensate wells or Oil wells and the residue Gas remaining after conditioning being metered, regulated / controlled, odorized & distributed through pipelines for various applications, i.e. for industrial, commercial and domestic.
Manufacturer	Manufacturer of the GI Nipple
Vendor	The person(s), firm, company, organization from whom Client/Contractor procures materials.
PNGRB	Petroleum and Natural Gas Regulatory Board
T4S	Technical Standard and Specification including Safety Standards,

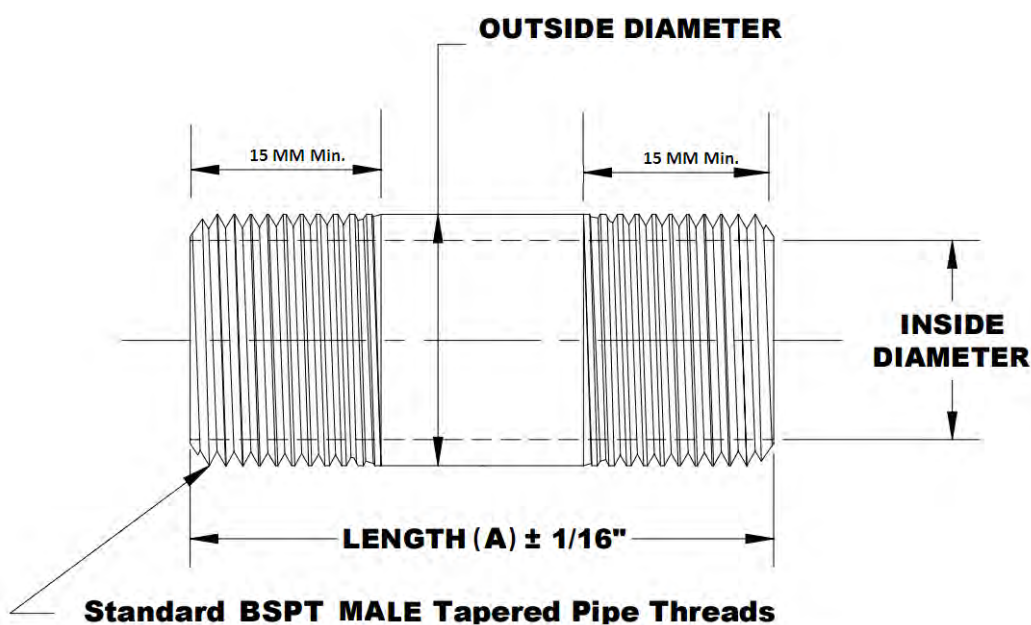
3.0 MATERIAL

The material used for the manufacturing of GI pipe Nipples confirming to IS 1239 (Part -1): 2004 (Latest edition).

4.0 DIMENSIONS, THICKNESS & DIMENSIONAL TOLERANCES

The dimensions & nominal mass of GI Nipples shall be in accordance with table given below

Nominal Diameter DN	15 mm (1/2")	25 mm (1")
Grade	Heavy	Heavy
Outer Dia. (Max. / Min.)	21.8 mm / 21.0 mm	34.2 mm / 33.3 mm
Thickness (mm)	3.2	4.0
Nominal weight (Kg / m) inclusive Galvanized coating without powder coating	1.44	2.93
Tolerance on Thickness	-10% / + Not limited	-10% / + Not limited



Nominal Diameter DN	Length (A)			
15 mm (1/2")	2"	3"	4"	6"
25 mm (1")	2"	3"	4"	6"

5.0 END CONNECTION OF GI NIPPLE

GI NIPPLE shall be supplied with BSPT Male thread.

6.0 FREEDOM FROM DEFECTS

On visual examination the outside & inside surfaces of GI Nipples shall be smooth & free from defects such a cracks etc.

7.0 GALVANIZING

- i. GI Nipples shall be galvanized to meet the requirement of IS: 4736 – 1986 with latest amendment.
- ii. Zinc conforming to any grade specified in IS: 13229- 1991 with latest amendment shall be used for the purpose of galvanizing.
- iii. Galvanizing bath: The molten metal in the galvanizing bath shall contain not less than 98.5% by mass of zinc.
- iv. Mass of zinc coating: Minimum mass of zinc coating determined as per IS: 6745 shall be 400 gms/m².
- v. Uniformity of galvanized coating: The galvanized coating when determined on a 100 mm long test piece in accordance with IS 2633: 1986 with latest amendment shall withstand 5 one – minute dips.
- vi. Freedom from defect: The zinc coating on internal & external surfaces shall be uniform adhered, reasonably smooth & free from such imperfections as flux, ash & drop inclusions, bare patches, black spots, pimples, lumpiness runs, rust stains, bulky white deposits & blisters. Rejection & acceptance for these defects shall be as per Appendix - A of IS 2629: 1985 with latest amendments.
- vii. Samplings
 - a) All materials of the same type in coating bath having uniform coating characteristics shall be grouped together to continue a lot. Each lot shall be tested separately for the various requirements of the specification. The number of units to be selected from each lot for this purpose shall be IS: 4711 1995 with latest amendment.
 - b) The sample selected according to Clause 6.1 & 6.2 of IS: 4736 – latest edition.
 - c) The sample found conforming to above requirements shall then be tested for mass of zinc coating in accordance with Clause 5.1 of IS: 4736 – 1986 with latest amendment.
 - d) Criteria for conformity: As per IS: 4736 – 1986 with latest amendments.

8.0 POWDER COATING

Powder coating shall be carried out as per the ***GGL Technical specification for Powder Coating***. Powder coating shall be done on pipe nipple excluding thread.

9.0 QUALITY ASSURANCE (QA)

The Contractor/Manufacture /Vendor shall carry out internal inspection and prepare internal reports as per GGL Technical specification requirement at their premise and submit the report to GGL for dispatch clearance from GGL prior to dispatch of materials.

10.0 DOCUMENTS OF PRECEDENCE

In case of conflict between the requirements of this specification and that of the referred codes, standards and specifications, the requirements of the referred codes, standards and specifications shall govern.

11.0 QUALITY ASSURANCE PLAN

Sr. No.	Name of test/Features	Referred Standard	Inspection Methodology	Inspection by Manufacturer /Vendor	Inspection by GGL/TPA
1	Chemical and Mechanical Properties	As per IS 1239 (latest Standard)	Material TC	P	R
2	Physical Verification				
2.1	Dimensions	IS : 1239 part I	Vernier Caliper	P	Rv
2.2	Wall Thickness				
2.3	Thread				
2.4	Powder Coating	Coating thickness – Min.60 Micron	Test Certificate	P	Rw

Note: In case Nipple is prepared by Contractor at site. Only Dimensions, Wall Thickness and Thread verification is applicable. However, it is to be ensured that Nipple is manufactured from GI pipe which are already approved by GGL/TPA as per the QAP of GI pipes.

R- Review of Documents

Rv- Random Verification