



## SECTION-IV

**TECHNICAL SPECIFICATIONS OF  
METERING SKID FOR SHRIKRUPA FOOD  
INDUSTRIES, AHMEDABAD.**

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# TECHNICAL SPECIFICATIONS OF GAS PRESSURE REDUCTION AND METERING (GPRM) SKIDS

## GENERAL

- 1.1 This specification, together with the data sheets attached with the PR, cover the requirement for the design, materials testing and nameplate marking of pressure reducing and metering skid required for GAIL's gas consumer in Ahmedabad region.
- 1.2 In the event of any conflict between this specifications, data sheets, related standards codes etc., the Vendor shall refer the matter to the PURCHASER for clarifications and only after obtaining the clarification should proceed with the manufacture of the items in questions.
- 1.3 PURCHASER'S data sheets for pressure regulators, slam shut valves, RPD meter, pressure relief valves, pressure / differential pressure gauges and accessories indicate materials for body, internals etc, however, this does not absolve the Vendor of the responsibility for proper selection with respect to the fluid and its operating conditions. Proper sizing and selection of the pressure regulators slam shut valves, relief valves and accessories are Vendor's responsibility.

Process requirement for skid is attached. Vendor shall take single point responsibility for the design & performance of the skid based on the data sheets and the specifications furnished and taking into consideration successful operation, safety and the established International standards for the complete skid. As a part of the skid design & engineering following shall be done by vendor as per attached datasheet (and in consultation with purchaser)

- Fixing of Set point of PCVs & Slam Shut Valves.
  - Fixing Pressure drop across various elements.
  - Sizing of PCVs, Slam Shuts, RPD/RPD meter & PSV.
  - Noise calculations for PCVs, Slam Shut Valves
- 1.4 Vendor shall consider all the requirements of this specification along with those as per relevant standards and shall assume total responsibility including all aspects of engineering, design, certification etc for pressure reducing & metering skid.

- 1.5 Vendor to note that all items including SSV's, regulators, relief valves, Rotary positive displacement flow meter( RPD) , volume corrector, gas filter etc on the skid shall be supplied having proven track record of successful operation for at least 4000 hours till bid due date.

## 2.0 CODES AND STANDARDS

- 2.1 The metering skid shall meet the requirement of inline standards related to custody transfer of natural gas. Tentative list is given below:

ANSI B 2.1	ISO 6976	ISO 12213	EN-12186
ANSI B 16.5	OIML R6		EN -12405
ANSI B 16.104	OIML – TC8/SC8	OIML R32	EN- 12480
API 2534	AGA - 8	EN – 1776	EN 334

## 3.0 SCOPE OF SUPPLY

- 3.1 Vendor scope shall include complete design, engineering, integration, calibration, testing, supply and documentation of Gas pressure Reducing and Metering Skid (GPRM). The gas pressure reducing and metering skid shall comprise of following items complete in all respects including commissioning spares :

- i. Two filters with corresponding Differential Pressure Gauge.
- ii. Two active Pressure Control Valves & Two Monitor pressure control valves, fail open type.
- iii. Two Slam shut Valves with remote operation facility for closing on high pressure and fail to close type.
- iv. One Gas RPD Flow Meter with meter mounted direct flow Totalizer and Electronic Volume Corrector with PT and RTD inbuilt.
- v. **Two** Safety Relief Valves.
- vi. Three nos. Pressure Gauges. **Inlet (0-50kg)-1 nos, outlet of PCV (0-6kg) - 2 nos.**
- vii. Complete Piping, Fittings, Valves, Flanges, expanders, reducers, Vent arrangement etc. required as per P&ID to make the Skid complete in all respects and ready for installation.

3.2 Vendor shall supply all Drawings and Documents as per Vendor Data Requirement.

#### **4.0 BIDS**

4.1 Vendor's quotation shall include the detailed specifications for all items of pressure reducing & metering skid. The Vendor shall also offer any instrument/equipments required for safe and efficient operation of the system. The offer shall include:

- Make, Model no, Detailed specification for each slam shut valve, regulator, RPD meter, Electronic volume corrector, pressure relief valve, gauges etc, including type, construction material, CV data / capacity curves, regulation accuracy, set point spring ranges, details of the valve pilots etc.
- Sizing calculations for slam shut valves, Pressure regulator, RPD meter, and relief valve.
- All design & performance characteristics.
- Noise level calculations for pressure regulators.
- Set points for PCV slam shut valves and Relief valves.
- Pressure drop across various elements & Maximum pressure loss through the system.
- Overall dimension of each item and skid.

Vendor to furnish the Maximum Flow Rate (in SM<sup>3</sup>/hr) at Minimum Inlet Pressure for all the PCVs at Valve full open condition.

Vendor to furnish minimum Flow Rate (in Sm<sup>3</sup>/hr) through each PCV without damaging the Trim and Valve internals at minimum Inlet Pressure.

Vendor shall furnish the Flow Rate versus Trim Lift Curve to justify the Valve range ability and Valve regulation characteristics.

4.2 All units of measurements in Vendors specification sheets shall be same as those in Purchaser's data sheets.

4.3 All material specifications for the various parts in the Vendors specification sheets shall be to the same standards as those in Purchaser's data sheets.

4.4 Vendor shall enclose catalogues giving detailed technical specifications and other information for Self actuated pressure control valve, Slam shut valves, Pressure relief valve, Gauges, Gas filter and valves covered in the bid.

- 4.5 Vendor's quotation catalogues, drawing operating and maintenance manuals etc. shall be only in ENGLISH language.
- 4.6 Vendor shall submit subsequent to award of contract the sizing details & specifications of all the instruments and piping items, make & model, cabinet / skid details. The relevant catalogue, technical literature shall also be furnished. GAIL shall review the above and vendor to note that "No post order deviation shall be granted". Vendor shall correct the make & models of items & specifications to meet the requirement of contract without price and delivery implications.

## **5.0 DESIGN**

- 5.1 The skid shall be complete in all respect, ready for quick installation and commissioning of equipment with minimum work at site. All field-mounted instruments shall be mounted on the skid. Ease of transportation shall be one of the considerations in deciding the size of skid.
- 5.2 The skid shall be complete with piping, flanges, and fittings for pressure reduction and metering as required.
- 5.3 Complete skid shall be mounted in a cabinet with inlet and outlet flange connections and vent. The cabinet & skid shall be complete in all respect ready for alignment & grouting at site. The skid Inlet and Outlet connections shall be 2" Flanged. Matching flanges are to be supplied by the vendor.
- 5.4 All items shall be properly supported to avoid vibration. Special support if required shall be provided by vendor.
- 5.5 Vendor shall combine all the three vents (filter, skid depressurizing and Pressure relief (PSV) vent. the vent shall be provided 3 m above the skid with proper support, with rain cap and bug screen.
- 5.6 **TUBINGS AND FITTINGS:** All tubing and fitting used for impulse & piping shall be of SS 316. Tube fittings shall be flare less dual compression type of three-piece construction consisting of ferrule, nut and body suitable for use on SS tubes. Instrument valves and manifolds shall be of SS 316 construction of forged type. All impulse tubing shall be of 1/4" size minimum. SS tube shall be fully annealed, seamless and cold drawn SS 316 tubes as per ASTM A269. Hardness of the tubes shall be rock well RB 70-79, tubes shall be free from scratches and to be suitable for bending. Dimension tolerances shall be as per ASTM A 269.

SS tube fitting shall be hydrostatically tested and should be as follows:

¼" fitting at 80 Kg/cm<sup>2</sup>; ½" fitting at 153Kg/cm<sup>2</sup> and 3/8" fitting at 100 Kg/cm<sup>2</sup> at 38°C.

Vendor shall furnish material certificate and test certificate along with material.

- 5.7 The specifications of all the instruments shall be as per the attached typical Instrument Data Sheets, Job Specification and Standards Specifications. All piping materials including valves & flanges shall be supplied as per the piping material specification (PMS) for AIA class attached along with the package.
- 5.8 The entire Instrument enclosure mounted in the field shall be Weatherproof to IP65 as a minimum.
- 5.9 The flanges rating & materials of all instrument items shall be as per the PMS.
- 5.10 Set point of the PCVs Pilots and Slam Shut Valves shall be adjustable as per data sheet given. Vendor shall furnish the adjustable range of the offered Pilots and slam shut valves.
- 5.11 The regulator and slam shut valves shall be provided as primary and secondary. It is intended to provide slam shut valves on upstream of pressure regulators at gas receiving points for tight shut off at increasing pressure beyond a preset limit, to take care of pressure regulator failure. The slam shut valve of primary regulator shall close at its set pressure and the secondary regulator shall come in operation.
- 5.12 The set pressure for PCVs & SSVs (staggered set points) shall be fixed considering inlet pressure range and pressure drop across the skid up to the outlet flange to meet the outlet pressure range of 1-1.4 Kg/Cm2g
- 5.13 The set pressure of Slam Shut Valves to be fixed at pressure in between PCVs set point and PSV set point (4.5 Kg/Cm2g) for the proper skid operation.
- 5.14 Vendors can also offer integrated PCV and SSV device (in place of separate PCV and SSV).
- 5.15 Vendor to note that the noise level for each PCVs and Slam Shut Valves shall be less than 85 dBA, flange to flange of the Valve, including silencer/expander as applicable. Vendor shall provide noise treatment to limit the noise level and include silencers or expanders as required in the scope of supply.
- 5.16 The vendor shall include isolation Valves in Impulse Lines for the pressure regulators, slam shut valves, pressure & differential pressure gauges, pressure sensing impulse line for volume correctors.

- 5.17 Pressure regulators shall be fail to open type.
- 5.18 Slam shut off valve shall be self-contained type requiring external control line in that line pressure acts directly on the diaphragm.
- 5.19 All materials to be used in construction of valves shall be suitable for Natural Gas services.
- 5.20 Vendor shall be responsible for the design of filter for the successful operation of the meter on the skid. Filters shall be cartridge type with 5 micron filtration capacity and shall be provided with a differential pressure gauge.
- 5.21 Any soft material used in valves shall be able to retain its functional properties for a minimum period of 3 years.
- 5.22 Closing time of slam shut off valve shall be less than 2 seconds for all sizes of the valves. Actual closing time of the valves shall be furnished with the quotation.
- 5.23 Resetting of slam shut valves shall be only manual.
- 5.24 The cabinet for the skid shall be fabricated with minimum 2 mm thick MS sheet. The cabinet shall be duly painted. The cabinet shall be provided with lockable doors. Outside of the cabinet a nameplate shall be included for the process parameters and the valves / meter parameters descriptions. The cabinet front shall be provided with shatterproof / plexi glass window for the reading of the Electronic volume correctors, position of the slam shut valves, gauges reading etc with out opening the cabinet.
- 5.25 All the calculations and units of measurement shall be in SI standards only.
- 5.26 Vendor shall select the proper type and material of bearing for the service conditions indicated. It is recommended to use sealed bearings to avoid requirement of external lubrication.
- 5.27 RPD meter shall have over range protection of at least 120% of maximum flow. An additional properly sized SS orifice plate is to be provided after RPD so as to prevent damage to meter during sudden full opening of valves.
- 5.28 Flow direction shall be clearly marked on the meter body.



- 5.29 While selecting the meter, vendor to ensure that the velocity of the RPD meter shall not exceed 22 m/s.
- 5.30 The meter selected shall be of field proven quality with respect to design, material and application. Field mounted instruments shall be capable of working under high ambient Temperature and environmental condition without any degradation in accuracy and repeatability.
- 5.31 Skid instruments mounted shall be suitable for installation in tropical hot and humid climate considering :
- Temperature 0 – 50 deg. C
  - Relative Humidity 90%
- 6.0 The Vendor shall be responsible for taking all precautions related to HSE regulations while designing and fabricating the system. Approval from CCOE (if required for operating metering skid) will have to be arranged by vendor.

## 7.0 TESTING AND INSPECTION

- 7.1 Inspection of the metering skid shall be carried out by third party (to be approved by GAIL) which shall be in the scope of the supplier.
- 7.2 Material test certificate, Hydrostatic test certificate for Self-actuated Pressure Control Valves, Slam Shut Valves, Pressure Relieve Valve and for all piping / valves of skid.
- 7.3 Testing to demonstrate set-point accuracy and actuation time for Slam Shut Valves.
- 7.4 Testing to demonstrate the set point accuracy for self actuated Pressure Control Valves for the complete range of pressure and flow conditions.
- 7.5 Calibration certificate for Pressure Relief Valve for set pressure.
- 7.6 Seat tightness test for self actuated Pressure Control Valves, Slam Shut Valves, and Pressure Relief Valve.
- 7.7 Test certificate for PGs, DPGs.
- 7.8 Specification of pressure gauge as per IS 3624 and degree of protection minimum as per IS 2147.

- 7.9 Certificates from statutory body for limit switch being flame proof and Weather proof.
- 7.10 Skid piping material testing and NDT of weld as per PMS.
- 7.11 The skid hydro testing.
- 7.12 Leak test of complete skid with air / N2.
- 7.13 Proper earthing point at two distinctive points to be provided for the skid.
- 7.14 Skid functional testing considering metering, pressure regulation, limiting and safety characteristics.
- 7.15 SUPPLIER shall perform the usual standard tests to maintain quality control procedures. The tests certificates shall be submitted for review before starting inspection by PURCHASER, SUPPLIER shall be responsible for testing and complete integration of the system. Detailed procedures of test and inspection shall be submitted by the supplier for review before order mutually agreed upon.

Vendor shall include inspection by third party personnel at vendor's shop. For this inspection, labors, consumable, equipment and utilities as required shall be in vendor's scope. Tentative list of third party inspector includes – DNV, BV, Lloyds, SGS or any other reputed party approved by GAIL.

7.16 The skid shall be tested as per approved QAP & Engineering standards.

7.17 GAIL approved third party inspection of skid is required before dispatch.

## **8 DOCUMENTATION**

Detailed drawings, data and catalogues required from the Vendor are indicated by the PURCHASER in vendor data requirement sheets. The required number of reproducible and prints should be dispatched to the address mentioned, adhering to the time limits indicated.

Final drawings from the Vendor shall include dimensional details, weight, mounting details and any other special requirements etc for the skid. All dimensions in general shall be in millimeters.

Vendor shall furnish 3 sets of all documents in hard copies and 1 soft copy on CD of all manuals/certificates necessary to test, operate and maintain the system.

## **9.0 NAMEPLATE**

Each skid and all the instruments in the skid shall have a S.S. nameplate attached firmly to it at a visible place furnishing the following information:

- Tag number as per purchaser's data sheets.
- Body sizes in inches and the Valve Cg value or meter G rating.
- Set pressure range or flow range.
- Flow range in sm<sup>3</sup>/hr.
- Rating
- Manufacturer's model number

## **10.0 PAINTING**

The Painting specifications of the skid and skid's components shall be as given below:

- a. Shot blasting / Grit blasting to international standard.
- b. Two layers of epoxy zinc phosphate (DFT 140-170 micrometer shall be applied after sand blast cleaning the valve surface. Second layer of primer shall be applied after assembling of skid.
- c. One coating of polyurethane finishing (50-60 micrometer)

Vendor to ship supply of primer and the paint to permit on site repair of shipping damage to the factory supplied coatings.

The valves in Carbon steel body shall be painted light gray (RAL 7038). Skid piping shall be canary yellow.

## 11.0 SHIPPING

All threaded and flanged opening shall be protected to prevent entry of foreign material.

Meter, accessories shall be packed separately.

## 12.0 REJECTION

Vendor shall make his offer in detail, with respect to every item of the PURCHASER'S specification. Any offer not conforming to this shall be summarily rejected.

13.0 **Warranty:** All items of metering skid will be covered under warranty for 12 months from the date of commissioning or 18 months from date of supply of metering skid, whichever is earlier.

14.0 Service/support: Bidder will have to furnish certificate from original supplier of EVC, RPD, PCV and SSV that original supplier/manufacturer will support with supply of spares/service for next 10 years.

15.0 Testing and Commissioning: Supplied metering skid will be installed by GAIL. However final testing and commissioning will have to be done by vendor's representative. All expenses related to traveling/boarding of customer's representatives for this purpose will have to be borne by vendor.

## 16.0 Delivery Schedule:-

16.1 Supply portion: - 12 weeks to complete the total scope of work from the date of issue of Letter of Indent (LOI).

16.2 Installation & Commissioning of the Metering Skid:- Installation shall be done by GAIL, however commissioning of the system shall be done immediately after installation on mutual agreed date.

16.3 Place of Delivery:- Material shall be delivered at site ( M/S Shrikrupa Food Industries, Ahmedabad) & payment shall be released after inspection at site by EIC.

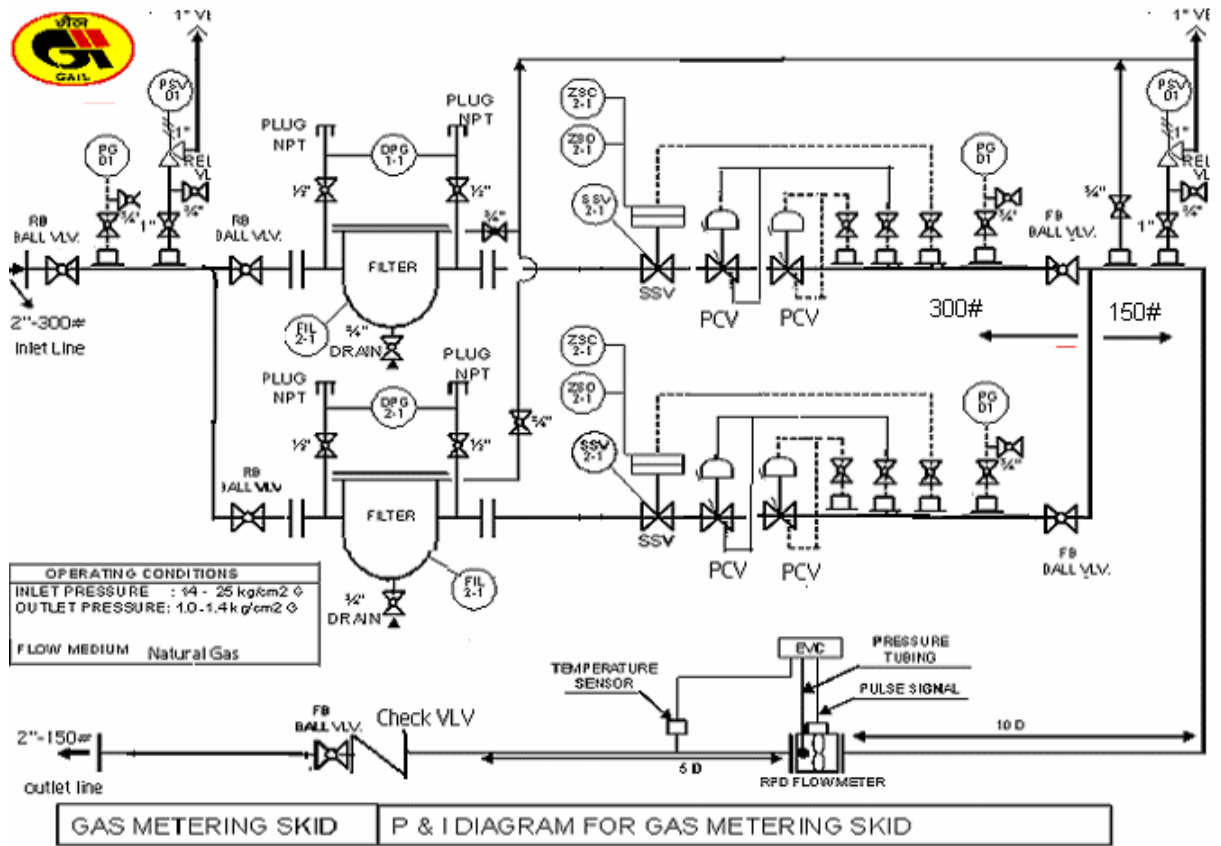
#### 17.0 **Terms of Payment**

The terms of payment shall be as under:-

17.1 90% (Ninety Percent) of item No.1 of Schedule Of rates shall be paid on receipt of material at site subject to submission of 10% CPBG as given in the tender document.

17.2 10% of item no.1 of schedule of rates shall be paid on commissioning of skid & acceptance thereof by EIC.

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## INDEX FOR TECHNICAL SPECIFICATIONS

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## 5A Process Data for the Pressure Reducing and Metering skid

<b>New Pressure Regulating &amp; Metering Skid</b>	
Name of Customer	Shrikrupa Food Industries Ltd
Address	Ahmedabad
<b>Flow , in SCMD</b>	
Normal	1000
Maximum	1400
Minimum	100
<b>Delivery Pressure, Kg/cm2</b>	
Normal	1.0
Minimum	1.0
Maximum	1.4
<b>Inlet Pressure, Kg/cm2</b>	
Normal	18
Maximum	25
minimum	14
<b>Delivery Temperature, Degree Centigrade</b>	
Normal	Ambient
Actual	0 to 25
Filter	5 Micron
Specific Gravity	0.60 to 0.75
Type of Skid	Low pressure
Type of Meter/Nos.	RPD / One
Number of filtration/Regulation stream	Two
Pressure sensor range	5 Kg/cm2
Calibrated Span	4 Kg/cm2
PCV Type	Self Regulating
SDV Type	Slam Shut Off
<b>Set Points</b>	
<b>Stream 1</b>	<b>Stream 2</b>
PCV-1 :- 1.5 Kg/cm2	PCV-2 :- 1.4 Kg/cm2
SSV :- 2.0 Kg/cm2	SSV :- 2.5 Kg/cm2

## 5B —SPECIFICATIONS FOR PRESSURE GAUGES

	<b>GAIL (India) Limited, Baroda</b>
	<b>Pressure Gauge</b>
TYPE	: DIRECT READING, GLYCERINE FILLED
SENSOR	: BOURDON
ACCURACY	: $\pm 1\%$ OF SPAN
TEMPERATURE LIMIT	: 60 °C
OVER PRESSURE LIMIT	: 130 % OF FSD
<b>DIAL SIZE</b>	: 100 mm
<b>MOUNTING</b>	: DIRECT
<b>ENTRY</b>	: BOTTOM 1/2" NPTM
<b>MATERIAL</b>	
SENSOR	: SS 316
SOCKET	: SS 316
MOVEMENT	: SS 304
CASE	: SS 304
BEZEL	: SS 304
WINDOW	: TOUGHENED GLASS
POINTER	: BLACK ALUMINIUM
<b>DIAL COLOR</b>	: WHITE WITH BLACK GRADUATIONS, POINTER STOP
<b>BEZEL RING</b>	: BAYONET LOCK TYPE
<b>END CONNECTION</b>	: REFER TAG WISE DATA BELOW
<b>BLOW OFF DISC</b>	: EPDM
<b>ENCLOSURE</b>	: IP 65
<b>PAINT</b>	: SELF COLOR
<b>ZERO / ADJUSTMENT</b>	: REQUIRED

## 5C —SPECIFICATIONS FOR DIFFERENTIAL PRESSURE GAUGES

1	Type	:	Direct
2	Mounting	:	Local
3	Dial size	:	100 mm
	Color	:	White with black numerals
4	Case Material	:	SS 316
5	Bezel ring	:	Screwed
6	Window material	:	Shatterproof Glass
7	Enclosure	:	Weatherproof to IP65
8	Pressure Element	:	Diaphragm
9	Element Material	:	SS 316
10	Socket material	:	SS 316
11	Accuracy	:	+1% OF FSD
12	Zero adjustment	:	Micrometer Pointer
13	Connection	:	1/4" NPTM
14	Connection location	:	SIDE BOTTOM
15	Movement	:	SS 304
16	Over range protection	:	Max. static pressure of 50 kg/cm <sup>2</sup>
17	Blow out protection	:	Gauge saver
18	Range	:	0 to 1 Bar

### Notes

- 1 Tapings (3/4" SW) for the DPG connections shall be provided on the Inlet and the Outlet nozzle of the gas filters.
- 2 Differential pressure gauge shall be suitable for the maximum static pressure in both legs and shall withstand full pressure in one side and other side connected to atmospheric.

## 5D — SPECIFICATIONS FOR SELF ACTUATED PRESSURE CONTROL VALVES.

1. PCV is required for regulation of pressure in downstream piping.
2. The offered PCV must meet requirement of standard EN 334.or equivalent international standards. Vendor must submit copy of this certificate with the offer.
3. Bidder also must attach detailed technical catalog from manufacturer.
4. Manufacturer's declaration that their products complies with directives / guidelines mentioned in type approval certificates and related standards to the products must be attached with the offer.
5. **Type** : **Self Actuated, Adjustable.**
6. **Service** : **Natural Gas**
7. **Inlet Pressure Range** : **14 to 25 Kg/cm2 (G)**
8. **Downstream Pressure Set Point Range** : **1.0 to 1.4 Kg/cm2 (G), Adjustable**
9. **Ambient Temperature** : **0 to 50 Deg. C**
10. **Gas Temperature Range** : **(-) 5 to 50 Deg. C**
11. **Leakage Class** : **API 6D**
12. **Accuracy Class** : **AC 2.5, 2.5 percent of set point as per EN 334.**
13. **Lock up Pressure Class** : **SG 5**
14. **Nominal Dia (approx.)** : **1" x 1" or 1" x 2"**
15. **End Connections** : **Flanged, 300 RF, ANSI B – 16.5**
16. **Facing & Finishing of end connections** : **RF Smooth (125 AARH)**
17. **Failure position** : **Open**
18. **Impulse connections** : **1/2" NPT / 3/8"**
19. **Maximum Noise Level** : **85 DBA**
20. **Maximum working pressure** : **50 Kg/cm2**
21. The construction of the PCVs shall be such that there will be no continuous gas bleeding.

Note: **Vendors can also offer integrated PCV and SSV device (in place of separate PCV and SSV)**

## 5E — SPECIFICATIONS FOR SLAM SHUT VALVES (SSV)

1. SSV is required for keeping metering skid safe in case of failure of PCV and not allow over pressurization of the metering skid.
2. The offered SSV should meet requirement of standard EN 14382. Vendor must submit type approval certificate.
3. Bidder also must attach detailed technical catalog from manufacturer.
4. Manufacturer's declaration that their products complies with directives / guidelines mentioned in type approval certificates and related standards to the products must be attached with the offer.
5. Type : Pilot operated.
6. SSV must trip within 2 second of sensing of high pressure.
7. Service : Natural Gas
8. Inlet Pressure Range : Upto 25 Kg/cm<sup>2</sup>
9. Shut of Pressure Range (HH) : 1 to 6 Bar
10. Ambient Temperature : 0 to 50 Deg. C
11. Gas Temperature Range : (-) 5 to 50 Deg. C
12. Leakage Class : API 6D
13. Nominal Dia (approx.) : 1" x 1"
14. End Connections : Flanged, 300 RF, ANSI B – 16.5
15. Facing & Finishing of
16. end connections : RF Smooth (125 AARH)
17. Manual resetting of SSV : Required
18. Failure position : Close
19. Impulse connections : 1/2" NPT / 3/8"
20. Accuracy Class : AC 2.5, 2.5 percent of set point.
21. maximum Noise Level : 85 DBA
22. Maximum working pressure : 50 Kg/cm<sup>2</sup>

## 5F — SPECIFICATIONS OF ROTARY POSITIVE DISPLACEMENT METER.

1. Offered gas flow meter shall be approved for custody transfer of natural gas by NMI or PTB or Measurement Canada or Directorate of Legal Metrology (India) under provision of OIML or related guidelines. Vendors to attach complete certificate along with test certificate (if applicable) along with the offer.
2. Detailed technical catalog from manufacturer of items must be attached with the offer.
3. Flow meter specifications should be compliant to following directives or standards: a) OIML – R6, R32, TC8/SC8, b) ATEX 94/9/EC. Manufacturer's declaration that their products complies to directives / guidelines mentioned in type approval certificate for (custody transfer),
4. All the flow meter will have to be calibrated with air at atmospheric condition. The calibration will have to be done by any NABL accredited agency authorized to carry out calibration of flow related to gas / air. The meter has to be calibrated at following flow rates –  $Q_{max}$ ,  $0.2Q_{max}$ ,  $Q_{min}$ .
5. Ambient Temperature - 0 – 50 Deg. C
6. Service Media - Natural Gas – Non-Corrosive
7. Gas Temperature Range - 0 – 50 Deg.C
8. Area Classification as per IEC-79 - Zone 2, IEC Gas Group I, T3
9. Protection Class of enclosure - IP 65
10. Pressure Tapping - 1 No. - ¼" NPTF
11. Temperature Tapping - 1No. - Thermo well SS316 to be provided with approx. 100 mm depth (not less than 50 mm) and 3/8" NPTF connection and suitable for insertion of 6 mm (OD) RTD probe.
12. Repeatability -  $\pm 0.2$  percent or better
13. End Connections - Flanged, 150 RF, ANSI B – 16.5
14. Facing and finishing of end connections - RF Smooth (125 – 200 AARH)
15. Nominal diameter of end connection furnished with individual type of meter.

- 16. Maximum Operating Pressure - 2 Bar (G)
- 17. Pressure Range, Working - 1-2 Bar (G)
- 18. Read out index - 8 digit mechanical index non-resettable.
- 19. Output **LF/HF** pulses will be sent to Electronic Volume Correcting Device complying with EN 12405 for measurement of corrected volume of gas supplied. Gas flow meter should be compatible with such EVC Devices.
  
- 20. Nominal diameter of meter - 50 mm
- 21. Qmax - 50 m<sup>3</sup>/hr.
- 22. Qmin - 5 m<sup>3</sup>/hr.
- 23. Accuracy Class - **Qmin to 0.2Qmax – Less than 2%**  
**0.2Qmax to Qmax – Less than 1%**
- 24. Outputs - **LF/HF** from standard index (Reed contract) 2 nos.,  
10 electrical pulse for 1 CM<sup>3</sup> of Gas.
  
- 25. **Original Calibration / Error curve of RPD meter shall be submitted by Vendor along with metering skid.**



## **5G — SPECIFICATIONS OF ELECTRONIC VOLUME CORRECTING DEVICES (EVCD)**

1.1 Offered EVCD shall be approved for custody transfer of natural gas by NMI or PTB or Measurement Canada or Directorate of Legal Metrology (India) under provision of OIML or related guidelines. Vendors to attach complete certificate along with test certificate (if applicable) along with the offer.

1.2 Detailed technical catalog from manufacturer of items must be attached with the offer.

2 Item should comply to and must have type approval for:

2.1 Permission to use in potentially explosive atmosphere as per Atex directive 94/9/EC or equivalent IEC guidelines and

2.2 Compliance with electromagnetic compatibility to EMC directive 89/336/EEC or equivalent IEC guidelines.

3 Internal battery operated EVC, suitable for mounting inside covered metering skid is required for measurement of corrected volume of gas on the basis of receiving pressure and temperature signals through built in sensors and LF signal from RPD meter.

4 Ambient Temperatures - 0 to 50 Deg. C

5 Service Media - Natural Gas - Non-Corrosive

6 Gas Temperature Range - 0 to 50 Deg. C

7 Area Classifications as per IEC-79 – Zone 2, IEC Gas Group I, T3

8 Product will be used in general open climate and medium level of vibration and shock, severity class - F

9 Measuring Temperature Range - 0 Deg. C to 60 Deg. C

Temperature will be measured through inbuilt RTD sensor, (4 wire PT 100) encapsulated inside 6 mm SS316 thermowell and necessary cabling. Immersion length of the sensing well will be over 100 mm and with suitable adaptors for connecting to thermo well with 3/4inch NPTF thread. There should be provision to adjust the immersion depth of temperature sensor.

10 Measuring Pressure Range - 0 to 5 bar (Gauge)

Pressure measurement is done through built in sensor and required cabling. The sensor is connected to pressure tapping point provided with above mentioned RPD. Tentative type of connector is 1/4 inch NPTM. Sensor must be capable of withstanding pressure upto 25 Bar without loss of its characteristics.

11 Accuracy of Pressure Measurement- (+/-) 0.2 percent of measured value or better.

12 Accuracy of Temperature Measurement - (+/-) 0.25 percent of measured value or better.

13 Compressibility Calculation - AGA8- details.

14 Maximum gross error of flow calculation should be better than (+/-) 0.5 percent of measured value.

15 **LF/HF** Pulse Input from above mentioned RPD.

16 Power Supply - Lithium Battery with suitable capacity, battery life should be minimum 5 years. Battery should be capable of working in hazardous area. No setup data should be lost while changing battery. It should be possible to change battery in field.

17 Local Display - 2 Lines Alfa Numeric Display, LCD

18 Data Connectivity - 1 port # Serial RS232/485 is required for connecting to GSM/Laptop (Local/Remote communication).

19.1 Scada System through GSM (GPRS) Modem using Modbus protocol. EVC should be supplied with GSM/GPRS modem. Modem shall be powered by solar power battery system with facility available to function on cloudy/rainy days. (12V, 10W, Battery should be capable of providing backup for 15 days on No Sun days). Battery should be capable of working in hazardous area.

EVC shall be capable of continuing with flow measurement even when downloading / uploading of data is going on.

20 Outputs Measurement and Display: Configurable.

20.1 Corrected Flow Rate # Sm<sup>3</sup>/hr.

20.2 Corrected Totalized Volume # Sm<sup>3</sup>.

20.3 Pressure # Kg/cm<sup>2</sup>

20.4 Temperature # Deg. Celsius.

20.5 Un-corrected Flow Rate # m<sup>3</sup>/hr.

20.6 Un-corrected Total Volume # m<sup>3</sup>.

20.7 Yesterday Flow # SCM.

20.8 Today's Flow # SCM.

20.9 Alarm output for unit malfunctioning

20.10 Low Battery Alarm.

21 Other features of EVC:

21.1 Data security through password.

21.2 Parameters and programmed constants shall be stored in EEPROM / non-volatile memory.

21.3 Facility for entry and accessing live and stored data through external Laptop / PC.

21.4 Must have facility to store at least 180 days data (on hourly basis) for pressure, temperature, corrected and uncorrected flows with date and time stamping.

21.5 The stored data above shall be retrievable by using Laptops. Suitable dedicated port shall be available on the EVC for Laptops connection. Software required shall be supplied without any additional charges.

21.6 Gas composition can be entered from key board, Laptop & GSM.

21.7 Must have facility to store at least auditable record of 200 events for 90 days.

21.8 Base parameters for calculation of corrected gas flow shall be as under or configurable:

21.8.1 Pressure: 1.03323Kg/cm<sup>2</sup>

21.8.2 Temperature: 15.56 Deg. C

21.9 EVCD should have provision to enter correction factor for compensating any error found in calibration of gas flow meter /Auto correction feature required.

21.10 EVC must be incorporated with three way manifold (Parker/Swagelock) at pressure tapping for online pressure calibration.

22: Note: 1 set of connecting cable along with interface software for connection of Laptop with EVC.

## 5H — SPECIFICATIONS FOR PRESSURE SAFETY RELIEF VALVE.

1. Type : Full Nozzle Full Lift
2. Service : Natural Gas
3. Inlet Pressure Range : 1) Upto 49 Bar 2) Upto 25 Bar
4. Set Point Range : 1 to 6 Bar
5. Ambient Temperature : 0 to 50 Deg. C
6. Gas Temperature Range : to 50 Deg. C
7. Leakage Class : API 6D
8. Nominal Dia (approx.) : (Vendor to furnish sizing calculation at the time of offer.)
9. End Connections : Flanged, 300 RF, ANSI B – 16.5
10. Facing & Finishing of
11. end connections : RF Smooth (125 AARH)
12. PSV discharges to vent pipe of 3 meter height to atmosphere.
13. The allowable tolerance in the set pressure is  $\pm 0.14$  Kg/cm<sup>2</sup>g for the pressure relief valves.
14. The maximum discharge capacity of relief valve shall be less than 10% of the skid flow design capacity / As per international standards.
15. Vendor must attach detailed technical catalog and sizing of the offered item.

## 51 — SPECIFICATIONS FOR CARTRIDGE FILTERS

 <b>GAIL(India) Limited, Baroda</b>	
SPECIFICATION SHEET FILTER	
GENERAL	
Service	Natural gas
Quantity	Two nos per skid
Standard Reference	ASME Sec.VIII Div.1
Type	CARTRIDGE
End Connection & Size	Vendor to Specify
End Connection & Rating	ANSI B16.5
Design Pressure	Vendor to specify as per skid details
Design Temperature	60 °C
SERVICE CONDITIONS	
Fluid & State	Natural Gas
Flow Rate	As per table
Operating Temperature	0 – 45 °C
Operating Pressure	As per table
Specific Gravity	0.56 to 0.72
Pressure Loss Clean	< 0.5 Kg/cm <sup>2</sup> g
MATERIAL OF CONSTRUCTION	
Shell	A106 Gr.B, Sch.40 / SA-516/517
Shell Flanges	A105
Head Flange	A105
Nozzles	A106 Gr.B
Nozzle Flanges	A105
Gasket / 'O' Ring	CAF / NITRILE
Fasteners	2H / B7
Filter Element	Borosilicate Fibre Glass
Element Type	Cartridge
Filtration size	5 microns
ACCESSORIES	
Drain Size	1"

**Note:-** Materials shall be selected according to class & rating of pipes

<b>5J — DATA SHEET FOR BALL VALVES, mm/inches (50(2”) to 100 (4”))</b>			
Valve Manufacturer			-
Valve Tag No.			-
Spec. No.		Piping Class	A1A
Design Standard	API 6D	ANSI Rating	300 #
Valve Size (NB), mm (inch)	50(2'0 to 100 (4'))	Valve Bore	Full/Reduced *
Valve Ends	Flanged, RF	Face Finish of Flanges	Smooth 125 to 200 micro inches AARH
<b>PIPING / PIPELINE DESIGN CONDITIONS</b>			
Pressure, Kg/Cm2 g	45	Temperature, °C	65
Corrosion Allowance, mm	0.5	Location	ABOVE GROUND
Fluid Handled	NATURAL GAS		
<b>ATTACHED PIPE SPECIFICATION</b>			
Material	Diameter (NB), mm (Inch) Wall thick (mm/sch).		
NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	
<b>VALVE STEM EXTENSION REQUIREMENT</b>			
Stem Extension Requirement	Note Required		
Length of Stem Extension, m	Note Applicable		
<b>VALVE OPERATOR REQUIREMENT</b>			
Type of Valve Operator	Manual		
Operator Specification No.	NA		
Operator Data Sheet No.	NA		
<b>VALVE MATERIAL SPECIFICATON</b>			
<b>Part</b>	<b>Specified Material</b>	<b>Material offered</b>	
Body	ASTM A216 Gr. WCB/ A105		
Ball (Floating)	13% Cr. Steel/CS+0.003" ENP/SS304/SS316		
Body Seal Rings	PIPE/RPTFE/WITH SECONDARY METAL TO METAL		
Stem (Anti Blowout)	13% Cr. Steel(No Casting) / SS 316		
Stem Seals	PTFE / VITON		
Stud Bolts/Nuts	ASTM A193 GR. B7/A194 GR 2 H		

**Notes :**

1. The wrench shall be provided for each valve.
2. Detailed dimensional drawings showing cross-section with part numbers and materials shall be submitted for company approval.
3. All valves shall be fire safe design.

\* Selection of Full / Reduced Bore is as per P&ID attached on page no. 15.

<b>5K — DATA SHEET FOR BALL VALVES, mm/inches (15(1/2") -40 (1-1/2"))</b>			
Valve Manufacturer			-
Valve Tag No.			-
Spec. No.	-	Piping Class	A1A
Design Standard	BS 5351	ANSI Rating	300 #
Valve Size (NB), mm (inch)	15(1/2") -40 (1-1/2")	Bore Size, mm	Full/Reduced *
Valve Ends	Flanged, RF	Flange Face Finish	NOT APPLICABLE
<b>PIPING / PIPELINE DESIGN CONDITIONS</b>			
Pressure, Kg/Cm2 g	45	Temperature, °C	65
Corrosion Allowance, mm	0.5	Location	ABOVE GROUND
Fluid Handled	NATURAL GAS		
<b>VALVE MATERIAL SPECIFICATON</b>			
Part	Specified Material	Material offered	
Body	ASTM A105 \ASTM A216 GR. WCB		
Ball	A182 GR. F304		
Body Seal Rings	G. PTFE		
Gland	A182 GR. F304		
Body Seal	PTFE		
Stem	A182 GR. F304		
Stem Seals	PTFE		
Stud Bolts/Nuts	ASTM A193 GR. B7/A194 GR 2 II		
<b>HYDRAOSTATIC AND AIR TEST PRESSURES</b>			
Hydrostatic Test Pressure (Kg/cm2 g)	Body: 30.0, Seat: 22. 0		
	6.0		

**Notes :**

- 1 All valves shall be provided with valve position indicator.
- 2 Painting of the valves shall be as per Manufacturer's Standard.
- 3 Material Test certificate and Hydro Test reports shall be furnished prior to dispatch.
- 4 All tests shall be as per BS 6755.
- 5 Details dimensional drawings showing cross section with part numbers and materials shall be submitted to company.
- 6 Stops shall be provided to ensure positive alignment of valve with ports and ensure proper installation of wrench.
- 7 Valve shall be of Long Pattern type.
- 8 Gland packing assembly shall permit repair of gland packing under full line pressure.
- 9 Each valve shall be supplied with one wrench.
- \* Selection of Full / Reduced Bore is as per P&ID attached on page no. 15.





## **STANDARD SPECIFICATION FOR FIELD PAINTING**

### **1.0 COLOUR CODE FOR PIPING**

- 1.1 For identification of pipelines & fittings, the color code as per International Color Coding Standard for Natural Gas shall be used.
- 1.2 The color code scheme is intended for identification of the individual group of the pipeline. The system of color coding consists of a ground color and color bands superimposed on it.
- 1.3 Ground colors shall be applied throughout the entire length for insulated pipes, on the metal cladding & on surfaces covered, ground color coating of minimum 2 m length or of adequate length not to be mistaken as color band shall be applied at places requiring color bands. Color band (s) shall be applied at the following location.
  - a. At battery limit points
  - b. Intersection points & change of direction points in piping ways.
  - c. Other points, such as midway of each piping way, near valves, junction joints of service appliances, walls, on either side of pipe culverts.
  - d. For long stretch / yard piping at 50 M interval.
  - e. At start and terminating points.

### **1.4 IDENTIFICATION SIGN**

- 1.4.1 Flow direction shall be indicated by an arrow in the location.
- 1.4.2 Colors of arrows shall be black or white and in contrast to the color on which they are superimposed.
- 1.4.3 Product names shall be marked at pump inlet, outlet and battery limit in a suitable size.

## 1.5 COLOUR BANDS

1.5.1 As a rule minimum width of color band shall conform to the following table :

Nominal Pipe Size	Width : L (mm)
3" NB and Below	25 mm
above 3" NB upto 6" NB	50 mm

1.5.2 Color band(s) shall be arranged as per flow direction of gas flow. The relative proportional width of the first color band to the subsequent bands shall be 4 : 1

## GAIL(India) Limited, Baroda Piping Materials

NOMINAL SIZE		IN	½	¾	1	1½	2	3	4	
		mm	15	20	25	40	50	80	100	
PIPES	SCHEDULE	SCH 40								
	MATERIAL	ASTM A106 GR.B, SEAMLESS								
	ENDS	BE -ANSI B 16.25								
	PIPE TO PIPE JOINT	BW								
	DIMENSION STANDARD	ANSI B 36.10								
FLANGES	TYPE	S. W. R. F.			W. N. R. F.					
	RATING	*			*					
	MATERIAL	ASTM A 105			ASTM A 105					
	DIMENSION STANDARD	ANSI B 16.5			ANSI B 16.5					
BLINDS	TYPE	R.F.								
	RATING	.								
	MATERIAL	ASTM A 105								
	DIMENSION STANDARD	ANSI B 16.5								
SPECTACLE BLINDS	TYPE	F.F.								
	RATING	.								
	MATERIAL	ASTM A 105 / ASTM A515 Gr. 70								
	DIMENSION STANDARD	ANSI B16.5								
FITTINGS	TYPE	B. W.								
	SCHEDULE	SCH 40								
	MATERIAL	ASTM A234 WPB								
	DIMENSION STANDARD	ANSI B 16.9								
THREDOLETS	TYPE	B. W. / NPTF								
	SCHEDULE	SCH 40								
	MATERIAL	ASTM A105								
	DIMENSION STANDARD	MANUFACTURER STD.								
HEX NIPPLES	TYPE	BOTH END THRD - MNPT								
	SCHEDULE	.								
	MATERIAL	A105								
	DIMENSION STANDARD	MANUFACTURER STD.								
NIPPLES	TYPE	ONE / BOTH END THRD - MNPT								
	SCHEDULE	SCH 40								
	MATERIAL	A 106 GR. B								
	DIMENSION STANDARD	ANSI - B36.10								
GASKETS	TYPE	SPRIAL WOUND								
	THICKNESS	3.0 MM THK								
	MATERIAL	WINDING AISI 304, PURE GRAPHITE FILLED, CENTERING RING CS.								
	DIMENSION STANDARD	ANSI B 16.21,								
BOLTINGS	STUD	FULL THREADED								
	MATERIAL	ASTM A 193 GR. B7								
	DIMENSION STANDARD	ANSI B 18.2.1								
	NUT	HEAVY HEXAGONAL NUT								
	MATERIAL	ASTM A 194 GR. 2H								
	DIMENSION STANDARD	ANSI B 18.2.2								
<b>Note:</b> * as per specified class & rating										
Materials shall be selected according to class and rating										

**List of Vendors for major equipments:**

SN	Items	Name of the vendor
1	Ball Valve	L&T, Microfinish, Virgo , Flow Chem.
2	PCV/SDV	RMG, tartarini, Gotter, Peitro, Fisher, Nirmal
3	Filter	Multitech, Grandprix, Nirmal
4	Instrument fitting, manifold,	Swaglock, parker
5	PSV/CRV	Sebim, Tyco, Nirmal
6	PG, TG, DPG	AN instrument, Bells control, General Instruments, WIKA, Altop Industries, WAREE , Indfoss/switzer , Hirlekar
7	RPD Meter	ROMET , RMG , ACTARIS, DANIEL, ROCKWIN, INSTROMET.

Note:- Any other make with good PTR and track record shall be accepted with prior approval from GAIL