HPOIL GAS PRIVATE LIMITED

(A Joint Venture of HPCL & OIL)

SUPPLY OF DECOMPRESSION SKIDS AT KOLHAPUR GA

TECHNICAL VOLUME

TENDER NO. HOGPL/2025-26/C&P/035

DATE: 23.01.2026

SECTION-I
TECHNICAL SPECIFICATION FOR CNG DECOMPRESSION SKID

1. Scope of Work

HOGPL is intended to supply PNG to customers, where there is no regular supply through pipelines. For this HOGPL is planning to install a CNG Decompression unit, which will reduce the pressure from 250 bar (g)- 20bar(g) (CNG Cascades) to 2.0 - 4.0 bar(g) in MDPE Pipeline network. The scope of work is limited to the CNG Decompression skid, which is consisting of Twin stream Regulators, Slam shut valves, and Isolation Valves, Piping/Tubing, etc.The detailed scope of work is as follows:

The Scope includes Design, Detail Engineering, manufacturing, assembly, calibration of instruments, factory testing / inspection, supply of skid mounted CNG Decompression Skid including packaging, insurance, handling, transportation, at HOGPL Stores, trial run, Commissioning, performance testing along with all accessories, consumables & Commissioning spares onsite training of Operation & Maintenance personnel of HOGPL.

The size of the skid shall be strictly limited to an area of 3 mtrs x 2 mtrs and there is no requirement of canopy. The details of the scope are as follows:

Gas receiving from 250 Bar(g) through CNG cascade system

Pressure Reduction unit to reduce the pressure from 250bar (g)-20bar (g) to an outlet pressure of 2-4 Bar (g) with the help of Pressure Regulators along with Slam Shuts. Pressure will be de-compressed into two stages; proper heating arrangements should be incorporated so cooling should not be done.

Heating system -

Electrical Water Bath heating with interconnecting Piping of Regulators and equipment/ Heat Tracing Wire system/ Hot Water Bath with Instrumentation and controls. Electrical items including local panel.

Vendor shall provide the Power requirement calculations for Gas Heating system.

The components and equipments being installed shall be of a reputed make and the equipments shall conform in all respects to high standards of engineering, design, workmanship and shall meet all requirements as per the relevant standards. All the components and equipments should also meet the Technical Standards/Specifications notified by Petroleum Natural Gas Regulatory Board (PNGRB).

The Bidder shall submit all Design calculations to the client for information/approval. Inspection,

testing and performance testing as per specifications. The performance test to be conducted at vendor's works as well as at site in the presence of HOGPL or his representative.

The bidder has to submit all the technical details of all the components. Bidder has to submit the operation & maintenance manuals of the skid.

2. Gas Specification:

The gas composition of the feed gas is given below. The CNG equipment should be designed to meet the changes in the gas compositions.

Component	Design case
Methane (mol%)	91
Ethane (mol%)	5.83
Propane (mol%)	2.3
i-Butane (mol%)	0.4
n-Butane (mol%)	0.4
i-Pentane (mol%)	0.01
n-Pentane (mol%)	0.01
Nitrogen (mol%)	0.05
GCV (Kcal/Sm3)	9876
NCV (Kcal/Sm3)	8921

NOTES:

GCV for Design case is 9876 Kcal/SCM, O2 not more than 0.5% mole. Total non-hydrocarbon not more than 2.0% Total S including H2S not more than 10 ppm by weight H2S not more than 4 ppm by volume.

Moisture content in the range 112 to 114 kg/mmscm Temp of gas shall be 20-40oC.

3. Design parameters of Decompression Skid:

Flow –Refer table below

Inlet Temperature – Nominal 30 ^{o}C to Maximum 50 ^{o}C.

Inlet Design Pressure: 250 Bar (g)
Inlet Pressure –20 bar(g) to 250Bar (g)
Pipe/ Tube size: 2500# x 150#
Outlet Design Pressure: 18.0 Bar (g) Outlet Pressure – 3.0-4.0 bar (g)

4. Painting:

For carbon steel components:

Equivalence of below paint system shall be supplied. Final DFT shall be max. 300 microns.

Surface Preparation: SA 2.5

CODES & STANDARDS

The design shall be made in accordance with latest Codes & Standards and statutory requirements

In the event that there is no applicable Indian Standard, a corresponding International Standard may be applied to the design, as long as use of substitute standard is approved in writing by principal. Latest revisions of following standards are applicable for the package.

International Electro technical Commission Standards	
IEC 617-12	Graphical symbols for diagrams - Binary logic diagrams
IEC 751	Industrial platinum resistance thermometers sensors.
IEC 801	Electromagnetic Compatibility for Industrial Process
IEC-60529	Classification of Degrees of Protection Provided by Enclosures (IP code)
IEC-60079	Electrical Apparatus for Explosive Gas Atmosphere.
American Petroleum Institute Standards	
API RP 520	Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries
API RP 551	Process Measurement Instrumentation
API 555	Process Analyzers
API 526	Flanged Steel Pressure Relief Valves
API 527	Seat Tightness of Pressure Relieving Valves
API 12 K	Indirect Water Bath Heater
ISA Standards	
ISA S5.1	Instrument Symbols and Identification
ANSI/ISA S75.01	Flow Equations for Sizing Control valves

ANSI/1SA S75.03	Face to Face Dimensions for Flanged Globe Valves
ANSI/ISA S75.04	Face-to-face dimensions for flangeless control valve bodies

OTHER CODES	
PNGRB	Petroleum and Natural Gas Regulatory Board
ASME PTC 19.3	Temperature Measurement Instruments and Apparatus
EN 12482	Gas meters — Rotary Displacement Gas Meters
AGA 11	Gas meters — Coriolis Mass Flow meter
EN 334	Gas Pressure Regulators for inlet pressures up to 100 Bar
EN 837	Part-1, 2, 3 for Pressure Gauges.
OISD-STD-226	Natural gas transmission Pipeline and City Gas Distribution Network
OISD-STD-220	Distribution of Piped Natural Gas
PED 2014/68/EU	Gas Pressure Regulators and Slam Shut off valve for inlet pressures greater than 100 Bar

5. Finish Colour:

a) Pipes - Light Yellow

b) Valves - Blue

c) Safety equipment - Red

d) Pressure Vessel and structures – Grey

6. Inspection:

The final inspection of the equipment/FAT shall be carried either by HOGPL or by Third party agencies appointed by HOGPL as per approved QAP by HOGPL.

7. Salient Points:

a. Outlet Temperature of the skid shall be 10-15 Deg.C.

b. Heater shall be started if temperature drops below 15 deg C & shall be closed if it exceeds beyond 35 deg C. The range of ambient temperature is from 25 deg C to 40 deg C. Heater shall be designed accordingly.

c. There is no pneumatic supply available; all the valves are to be self-

actuated valves.

d. Upstream velocity of gas shall be 20 m/s of the Regulating System and that of downstream is 30 m/s.

e. Inlet Size – ½ inch OD , Outlet size – 1"NB Flange – 150#

f. Over Pressure / Under Pressure Slam shuts are required for 2nd stage SSV to meet regulations.

g. Power supply (230V, 1 phase, 50 Hz) upto JB is in HOGPL's scope.

h. Bidder to submit P&ID & GAD at the time of bid submission (size strictly within the area of 3 mtrs x 2 mtrs).

i. All customer interface connections, gas Inlet & outlet piping connections shall be brought out to approximately 3.0m from the skid edge and terminated with flange connection. Hookup with the customer interface connections, gas inlet and out let piping connections with companion flange and isolation valves are included in bidder's scope.

j. Water for make-up purpose can be arranged by HOGPL.

k. 2500# class to be used for 1st stage; 2nd stage shall be 300#

l. Heat load calculations to be provided along with bid document.

8. Skid Components:

1. Pressure Regulators:

The purpose of the pressure regulators is to regulate the pressure at the outlet of the high pressure cascade to 4 bar (g). The maximum pressure in the cascade shall be 250 bar (g) which will gradually reduce depending upon the consumption of the downstream network. The regulation shall be done in multiple stages and the first stage regulator shall be designed to operate at inlet pressure ranging from 250 bar (g) to 20 bar (g). Regulator should be proved as satisfactory pressure vessels by hydrostatic and pneumatic tests and test certificates should be provided by manufacturers / Third party Inspection agency appointed by HOGPL.

Pressure shut-off device should be provided to protect against excess downstream

pressure at each stage of pressure regulation. Accuracy of slam shut operation should be as per the requirements of EN 14382: 2009 or better.

Relief valve should be provided to protect against downstream over pressure at low flows or in the event of seat malfunction. Creep relief valves shall not have a capacity larger than 1% of stream fault capacity.

The burst pressure of a diaphragm should be at least three times the maximum working differential pressure.

The regulator shall be marked with the details of Sr. No., Type, year of manufacture, flow range & flow at set outlet pressure, inlet pressure range, outlet pressure range and set point, over pressure shut off range and set point, under pressure shut off range and set point, relief pressure range and set point, and orifice size.

The following performance characteristic curves should be furnished:

- Outlet pressure v/s flow (for various inlet pressures), and
- Inlet pressure v/s flow (for various outlet pressures).

Pressure regulator type – 1st stage regulator shall be self-actuated and 2nd stage shall be pilot operated.

1st stage PCV and SSV conforms to PED/2014/68/EU certified

2nd stage PCV and SSV conforms to PED/2014/68/EU and EN 334 and EN 14382 respectively.

MOC of 1st stage SSV & Pressure regulator – Body shall be SS316 material

Vendor to provide Approved Datasheet (against respective PO copy as per Technical BEC) for 1st stage PCV and SSV for not later than 05 years and not earlier than 02 years.

9. **Heating System**:

In view of the throttling of gas from very high pressures, a large temperature drop is envisaged in the process. To prevent the occurrence of abnormally low gas temperatures, the gas coming into the first stage regulator shall be preheated and reheated after each stage of regulation. The gas temperature at the outlet shall be in the range of 10 to 15°C.
Power consumption and water requirement shall be provided by the vendor at the time of bidding. We require level gauge with the water tank and level switch for low water indication in panel. An inlet water connection with valve shall be provided by the

manufacturer. The Qty. and quality of water to be used should be given at the time of bid submission.

10. Strainer:

High pressure Filter to be provided.

11. Pipe work, Fittings & General Construction

PRS skid construction / fabrication, reinforcement pads, etc. shall meet the requirements of codes ASME B31.8: 2010 and or ASME BPV Code, Section VIII: 2010. The design and assembly of all the equipment shall be such that there is no difficulty in the operation and maintenance of the same.

Pipe work and fittings shall be of seamless type and as per ASTM A106 Gr. B: 2010 / API 5L Gr. B: 2007 and ASTM A 234 Gr. WPB: 2011 & ASTM A105: 2010.
All branch connections should be of weldolet type up to d\D ratio less than 0.3 and sweepolet type up to d\D ratio less than 0.6. All valves for pressure / vent, pressure gauge and bleed should have positive blind arrangement.
Welders and welding procedures have to be qualified in accordance with ASME BPV Code Section IX: 2010 / API 1104: 2005. All the welded joints should be radio graphically examined and acceptance criteria should comply with ASME BPV Code, Section VIII: 2010 / API 1104: 2005.
The direction of flow of gas in the piping system of the skid shall be indicated on the pipes on both the streams.
Painting shall be carried out by application of one coat (DFT 35-50 microns) of zinc phosphate primer followed by two coats (DFT 60 microns each) of chloro-rubber high build paint of colour canary yellow. Before painting, surfaces shall be thoroughly cleaned by applying mechanical methods.
1.5

12. Tests:

1. **Hydrostatic test**:

Hydrostatic test should be carried out upto the test pressure as detailed in the specific requirements. Wherever necessary, regulators, relief valves and similar components that have been tested independently should be removed from the line. Blind flanges or double flange pipes should be installed temporarily in their place. All small bore connections and impulse lines should be disconnected and suitable plugs or blank flanges should be installed.

2. Leakage Testing:

Pneumatic testing using air or an inert gas should be undertaken on all installations and should include all equipment and associated small bore pipe work. Care must be taken to disconnect equipment, which might get damaged at the testing pressure. All joints, flanges and glands on valves and fittings should be tested for leakage with a suitable foaming fluid.

3. Test Certificates:

A record of all hydrostatic testing and pneumatic testing carried out should be prepared for every installation. A material test certificate for all components of PRS should be furnished at the time of inspection by third party / HOGPL representative. HOGPL reserves the right to witness all the tests.

PED 2014/68/EU for 1st stage PCV and SSV

PED 2014/68/EU for 2nd stage PCV and SSV + EN 334 and EN 14382 for PCV and SSV respectively

13. Spares List:

The spare parts required in the warranty period should be supplied free of cost. Also, a separate detailed list in addition to the spare parts mentioned below (with the rates valid for 2 years after the warranty period) for the requirement of spare parts after the warranty period should be submitted along with the technical bid. However, HOGPL may or may not or defer the purchase of spare parts.

1. <u>List of spare parts:</u>

- Regulators: Standard spare kit containing diaphragms springs, 'O' rings and gaskets.
- Slam shut valve: Standard spare kit containing diaphragms, springs, 'O' rings and gaskets.
- Relief valve: Standard spare kit containing diaphragms springs, 'O' rings and gaskets.

14. <u>Documentation required (minimum 3 sets):</u>

Vendor shall furnish the complete set of documents in hard copy.

- Performance specification and test certificate.
- 2nd stage SSV shall be EN14382 & PRV shall be EN334 certified.
- PED 2014/68/EU certificate for 1st stage PCV and SSV.
- Type test certificate for 2nd stage PCV and SSV
- Proven Track record for 1s stage PCV and SSV in line to Technical Evaluation and Datasheets.
- Construction drawings, material specifications and technical data sheets. (In English language only)
- Instructions and recommendations regarding installation, operation, and

maintenance of all the components of the unit.

- Parts list.
- Material test certificate for all the pipe and fittings material.
- Hydrostatic & pneumatic test certificate.
- Confirmation of weight of the skid.

15. Performance and Inspection:

Adequate data on capacity, range ability, lock-up, minimum and maximum operating pressure differentials, dynamic performance characteristics and predicted noise level emissions, set points of slam-shut valve, relief valve, active and monitor regulators, etc., should be given by the manufacturer in order to determine the performance of the regulators under various operating conditions. Results of such tests carried out by the manufacturer to determine operational performance and thereby confirm these design data and Manufacturing Test Certificates (MTC) for all components / parts, NDT results, Welding Procedure Specification (WPS), Welder's Performance Qualification Record (WPQR), Welding Procedure Qualification Record (PQR), etc., should be made available prior to offering the complete skid for witnessing the performance testing by HOGPL / Third party Inspection agency appointed by HOGPL.

The final performance test of complete PRS skid shall be carried out in presence of third party inspecting agency / HOGPL representative before accepting the skid and giving clearance for dispatch. Inspection shall be carried out by HOGPL appointed TPI &charges shall be borne by HOGPL. Inspection is to be carried out as per the inspection plan stated below.

1. **Inspection plan**

Inspection shall be carried our as per EN 10204, type 3.1

Review / checking of all test certificates which includes but not limited to, as stated in clauses '5' and documents as per clause '7'.

Visual inspection of the PRS assembly:

Witnessing of:

- Hydrostatic & pneumatic testing of the assembly, as per the parameters given in 'Specific requirements'.
- Performance testing of regulator: Outlet pressure v/s flow (for various inlet pressures), inlet pressure v/s flow (for various outlet pressures), checking of lock up pressure to be within limits, slam shut operation & its setting, regulator and relief valve operation & its setting.
- Stage-wise inspection to be carried out for inspection of workmanship quality and for inspection of surface preparation and primer coat / intermediate coats to ensure proper adhesion / paint quality.

LIST OF VENDORS FOR BOUGHT-OUT ITEMS

I) PRESSURE REGULATOR AND SLAM SHUT VALVE & CREEP RELIEF VALVE-

1) M/s Pietro Fiorentini S.P.A. (Italy)

2) M/s Emerson Process Management (USA/Italy)

3) M/s RMG-Regel Messtechnik / Bryan Donkin (Germany)

4) M/s Nirmal Industrial Controls (India)

II) CONTROL AND SIGNAL CABLES

1) M/s ASSOCIATED CABLES
2) M/s ASSOCIATED FLEXIBLES
3) M/s DELTON Cables Ltd, India
4) M/s BROOK
5) M/s KEI Industries Ltd INDIA
6) M/s Suyog Electricals Ltd, India
7) M/s Thermo Cables Ltd
8) M/s Udey Pyrocables Pvt Ltd, India

III) STRAINER/ FILTER

1) M/s Grand Prix Fab (Pvt.) Ltd. (New Delhi)

2) M/s Multitex Filteration Engineers Ltd. (New Delhi)
3) M/s Perry Equipment Corp. (USA)
4) M/s Siirtec NIGI SPA (Italy)
5) M/s Axsia Howmar Ltd. (UK)
6) M/s Faudi Filters Systems GmbH (Germany)
7) M/s Filtan Filter Anlagenbau GmbH (Germany)
8) M/s Plenty Filters (UK)
9) M/s Forain S.r.l. (Italy)
10) M/s Nirmal Industrial Controls (India)
11) Parker Hannifin Filters
12) Delta Filters

IV) BALL VALVES

1) M/s Hopkinsons Limited (UK)
2) M/s O.M.S. Saleri (Italy)
3) M/s Pibi Viesse SPA (Italy)
4) M/s Nuovo Pignone (Italy)
5) M/s Perar SPA (Italy)
6) M/s Larsen & Toubro Ltd. (Audco India Limited, Chennai)

7) M/s Microfinish Valves Ltd. (Hubli)
8) M/s Pietro Fiorentini (Italy)
9) M/s Raimondi Valve S.P.A. (Italy)
10) M/s Virgo Engineers (Pune)
11) M/s Flow Chem
12) M/s Hina
13) M/s Sivashakti Valves

V) PLUG VALVES

1) Breda Energia Sesto Industria Spa, Italy
2) Fisher Xomox Sanmar India Ltd., New Delhi
3) Larsen & Toubro Ltd. (Audco India Limited, Chennai)
4) Nordstrom Flowserve Valves Inc., USA
5) Serck Audco Valves, UK

VI) GLOBE VALVE

1) M/s BDK(New Delhi)
2) M/s Datre Corporation(Kolkota)
3) M/s L & T, New Delhi
4) M/s Neco Schubert & Salzer Ltd.(New Delhi)
5) M/s Niton valve (Mumbai)
6) M/s Ornate valves(Mumbai)
7) M/s Panchvati valves(Mumbai)
8) M/s Siva Shakti Valves

VII) CHECK VALVES

1) M/s Malbranque (France)
2) M/s Mannesmann Demag (Germany)
3) M/s Petrol Valve (Italy)
4) M/s True Flow Rona (Belgium)
5) M/s AV Valves Ltd., Agra
6) M/s BDK Engineering India Ltd. Hubli, Karnataka
7) M/s Neco Schubert & Salzer Ltd. New Delhi
8) M/s BHEL, OFE & OE Group New Delhi
9) M/s Precision Engg. Co., Mumbai
10) M/s Leader Valves Ltd., Jalandhar
11) M/s Niton Valves Industries (P) Ltd., Mumbai
12) M/s Larsen & Toubro Ltd. (Audco India Limited, Chennai)
13) M/s Aksons & Mechanical Enterprises, Mumbai
14) M/s Datre Corporation Ltd., Calcutta
15) M/s Advance Valves Pvt. Ltd., Noida

16) M/s Sivashakti Valves

VIII) PRESSURE GAUGES, D. P. GAUGES & TEMPERATURES GAUGES

e) M/s AN Instruments Pvt. Ltd., New Delhi
f) M/s General Instruments Ltd., Mumbai
3) M/s WIKA
4) M/s Forbes Marshall
5) M/s Hirelkar
6) M/s Baumer

IX) RTD

1) M/s General Instruments Ltd., Mumbai
2) M/s Toshniwal Industries
3) M/s Tempsens
4) M/s Pyro Electric

X) TEMPERATURE SWITCH

1) M/s Wika
2) M/s General Instruments Ltd.
3) Switzer
4) Ashcroft

XI) LEVEL GAUGE

1) M/s Pune Techtrol
2) M/s General Instruments Ltd.
3) M/s Waree
4) M/s Chemtrol

XII) LEVEL SWITCH

1) M/s Pune Techtrol
2) M/s Baumer
3) M/s E&H
4) M/s Wika

XII) THERMOSTAT

1) M/s Wika
2) M/s Honeywell
3) M/s Verma Trafag

XIII) SS VALVES, SS TUBE & SS TUBE FITTINGS

1) M/s Parker (USA)/ M/s Swagelok (USA)/ M/s Hoke/ M/s SSP / M/S Hylok– SS fittings
2) M/s Sandvik , Sweden, M/s Tubacex –SS tubes
3) M/s Parker , M/s Swagelok, M/s Hylok,–SS valves
4) M/s DK-LOK- Valves, Manifolds

5) M/s Ratnamani – SS 316 Tubes

XIV) JUNCTION BOXES AND CABLES GLANDS

1) M/s EX-PROTECTA
2) M/s FLAMEPROOF CONTROL GEARS
3) M/s BALIGA
4) M/s FLEXPRO ELECTRICAL

XV) DATALOGGER

1) M/s TECHNOLOG

Notes:

1) For items listed above, the successful bidders shall supply from the approved makes only.

2) For any other item(s) for which the vendor list is not provided, bidders can supply those item(s) from reputed vendors/ suppliers who have earlier Supplied same item(s) for the intended services in earlier projects and the item(s) offered is in their regular manufacturing/ supply range is acceptable.

Section II

A) TECHNICAL SPECIFICATION FOR SS TUBES

1.0 SCOPE OF WORK

The scope of the tenderer will include manufacture/ supply, inspection / Testing / marking/ packing, handling and dispatch of SS tubes as indicated meeting the requirements of ASTM A269

2.0 CODES & STANDARDS

Items	Applicable Codes and Standards
Tubes	ASTM A269, ANSI B31.3

3.0 SAFETY

1. All tubes shall be designed as per applicable code & standards.
2. All part/ component shall meet the requirement for the specified area's classification.
3. Area classification shall be Class-I, Division-I ; Group-D as per NEC or Zone-I Group IIA/ IIB as per IS/ IEC Specification or equivalent specifications.

4. **SPECIFICATION**

1. All the items shall be suitable for compressed natural gas service and meet following specifications.
2. Tube material shall be stainless steel as per ASTM A269 (Grade TP 316).
3. Tubing material shall have minimum molybdenum content 2.5%, carbon content of max. 0.030%.
4. Tube shall be bright annealed.
5. Tubes shall be seamless
6. Tube hardness shall be less than Rb 80. Tubes shall be NACE MR 0175 certified for hardness. Hardness test shall be carried out on each tube.
7. Each tube shall be hydro tested as per requirement of ASTM A450 clause 22.3, at a hydro test pressure of 350 kg/cm2 (g). However, it shall be ensured that the test pressure does not result in stresses exceeding the yield strength at test pressure.
8. All S.S.tubes shall be online 100% eddy current Tested as per ASTM A450.
9. Tolerance on outer diameter shall be ± 0.005".
10. Tube shall be of 5 to 6 meter in length.
11. Minimum thickness shall be as per following table.
12. Tube shall be seamless.

Tube OD	Minimum Wall Thickness	Maximum Allowable Working Pressure psig
1"	0.120"	4700
¾"	0.095"	4700
½"	0.083"	4700
3/8"	0.065"	4800
¼"	0.035"	4800

Note: Bidder to reconfirm maximum allowable working pressure for each tube size.

Following documents/ certificates to be submitted.

i) Chemical composition for heat
ii) Chemical composition for products
iii) Tensile test
iv) Hardness test
v) Flaring test

vi) Leak test
vii) Visual inspection and dimensional check

13. Tubing should be clearly marked with the specifications given in the inspection Certificate with heat code, lot code, outer diameter and wall thickness with inspection certificate no.

14. Tubes should be supplied with both ends plugged.

B) TECHNICAL SPECIFICATION FOR SS FERRULE FITTINGS

1.0 SCOPE OF WORK

1.1. The scope of this specification covers the requirement of design, manufacture/ inspection/ testing at works/ marking/ packaging/ and supply of high pressure SS Ferrule Fittings.

2.0 CODES & STANDARDS

The latest edition of the following standards is referred to in this specification.

Items	Applicable Codes and Standards
Bar Stock	ASME SA-479-316 or DIN 4401 or BS:970-316-S31
Forging	ASME SA-182-316 or DIN 4401 or BS:970-316-S31
Thread	NPT ANSI B 1.20.1

3.0 SPECIFICATION

All the items shall be suitable for compressed Natural Gas service and meet following specifications.

3.1. **Materials**

Fittings shall be manufactured from the following materials :-

1. Bar stock shall be as per BS:970-316-S31, DIN 4401 or ASME 479- 316 but with carbon content less than 0.05% to provide increased resistance to corrosion. Forgings shall be as per BS:970-316-S31, DIN 4401 or ASME SA-182-316.

2. The fittings end connections shall be compatible to tube of hardness dRb80.

3. All component parts of the fittings shall be of the same material.

4. The ferrule material shall be able to withstand an atmosphere of Natural Gas, oil and

moisture without rusting.

3.2 Design & Manufacture

a) All fittings shall be designed in conformance with the requirements of ASME B31.3 and applicable standards. Area classification applicable for all items shall be Class-1, Division-1, Group-D as per NEC or Zone-1 Group IIA/ IIB as per IS/ IEC specification or equivalent specification. All fittings shall be designed so that all parts/ components meet the requirements for the specified area classification.

b) The SS fittings shall be of flareless design and four piece construction, consisting of front and rear ferrules, nut and body suitable for use on SS tubes conforming to ASTM A269 TP316.

c) Fittings shall be rated for at least the design pressure as stipulated in the material requisition. The design of fittings shall ensure that they shall be capable of holding full tube burst pressure after only one and a quarter turn pull up of the nut.

d) The threaded ends of fittings shall be NPT as per ANSI B1.20.1.

e) The fittings shall hold the tube with collecting action producing a firm grip on the tube without substantially reducing the tube wall thickness.

f) Fittings shall not torque the tubing during original or subsequent make-up of the connection and should use geometry for inspection before and after make up the fittings shall not require disassembly for inspection before or after makeup.

g) All tube fittings shall be guageable for sufficient pull up after one and a quarter turn. Alltube fittings shall have a guageable shoulder and there will be no radius at the point where the shoulder meets the neck of the fitting body.

h) The gap inspection gauge shall be easily insertable at finger tight position of nut. The gap inspection gauge shall not be insertable between the nut and shoulder of the fitting after completing only one and a quarter turn pull up of the nut.

i) The tube seat counter bore in the body shall be faced flat 90° to the axis of the tubing to minimize tube expansion and subsequent galling.

j) The sealing and gripping power of the fitting shall be controlled such that he action between ferrules will overcome commercial variations in tubing wall thickness, hardness, diameter and installer skill.

k) The seal contact areas of the fittings body shall have a machined finish of 32 Ra

or better.

l) The fittings body shall have no machined stop or shoulder to preclude additional tightening in subsequent make-up.

m) Front Ferrule

1. The front ferrule shall effect a long, smooth repeatable seal by contact with body and a grip hold on the tube surface.
2. The front ferrule shall always remain in a sprung condition to compensate for thermal stresses and to accomplish repeated make and break.

n) Rear Ferrule

1. The rear ferrule shall collect the tubing surface, improving the performance of the tubing in systems of high impulse or vibration.
2. The rear ferrule shall have a machine recess on the inside diameter and shall have complete surface hardening so as to substantially reduce the required pull up torque. Both the requirements i.e. complete surface hardness and machined recess shall be met for all rear ferrules.

Nuts shall have silver plated threads to act as a lubricating agent to avoid galling and to reduce tightening torque.

3.3 Inspection and Testing

The manufacturer shall submit typical type test reports for the following test carrier out on random samples of two ferrule fittings :-

i) Hydraulic burst pressure test.
ii) Helium leak test under 0.0002 PSIA negative pressure, leaks into assembly greater than 4.0×10^{-9} atm-cc/sec being unacceptable.
iii) Gas pressure test for 25 remarks at 5000 Psig. No leakage should be detectable even after 25 remarks.
iv) Impulse & vibration testing by “rotary beam method” for 5,00,000 impulse cycles and 20 million vibration cycles with no detectable leakage at full working pressure throughout till the end of the test.

3.4 Test Reports and Certificates

1. The manufacturer shall supply material compliance certificates conforming that the raw material for fittings conforms to the requirements of ASME Section-II and ASME Section-III sub section NB, NC and ND.

2. The manufacturer shall furnish test procedure and typical test reports of all tests conducted on fittings as per the requirements

C) TECHNICAL SPECIFICATIONFOR SS BALL VALVES

1.0 SCOPE OF WORK

1.1 The scope of this specification include design, manufacture/ supply, inspection/ testing/ marking/ packaging/ handling and dispatch of SS Ball Valves as per relevant codes.

1.2. Purchaser 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 CODES & STANDARDS

Items	Applicable Codes and Standards
Valves	MSS-SP-99

3.0 MATERIALS

1. The valve body shall be made out of material conforming to ASTM A479 Type 316.
   Material of construction of ball shall conform to ASTM A276 Type 316.
   Material of construction of seat springs shall be Alloy X-750.

4.0 DESIGN & MANUFACTURE

1. All ball valves shall be designed in conformance with the requirements of ASME B31.3, MSS-SP-99 and other applicable code and standards. Area classification applicable for all items shall be Class-1, Division-1, Group-D as per NEC or Zone-1 Group-IIA/ IIB as per IS/ IEC specification or equivalent specification. all fittings shall be designed so that all parts/components meet the requirements for the specified area classification.

2. Valves shall be rated for a maximum working pressure of 5000 psig and shall be capable of operation between a temperature range of (-40)° to 250°F.

3. Valves shall have spring loaded PEEK seats allowing seal-ability over the full pressure range at any port and low operating torque over the full range of pressures and temperatures.

4. Elastomeric seals, which require no packing adjustment, shall be used.

5. Valves stem shall be of bottom loaded and blow out proof design.

6. Ball shall be blow out proof and trunnion mounted.

7. Valves shall have positive wrench/ handle stops, Phenolic black wrench / handle shall be provided. Wrench/ handle shall indicate the direction to flow. In the case of three way valves the stem shall also provide a visual indication of flow direction if the handle is removed.

5. INSPECTION AND TESTING

The valve manufacturer shall submit typical type test reports for the following test carrier out on similar valves :-

i. Hydrostatic seat leak test shall be carried out with de-ionised water. There shall be no detectable set leakage at 1.1 times the rated pressure of the valve.

ii. Gas pressure test for seat and shell shall be carried out with nitrogen at 1000 psig. There shall be no detectable external leakage. Maximum allowable seat leakage shall be 0.1 atm-cc/min.

6. TEST REPORTS & CERTIFICATES

1. The manufacturer shall supply material compliance certificates.
2. The valve manufacturer shall provide test procedure and valve inspection and test report for type tests carried out on similar valves as per the requirements of clause 7.0.

SECTION-III

INSTRUMENTATION SPECIFICATIONS

1.0 Vendor shall take single point responsibility for the engineering, design, certification, procurement, inspection, testing, supply & performance of the CNG Decompression skids along with all instruments, equipment and valves of the skids based on the data sheets and the specifications furnished and taking into consideration successful operation, safety and the established International standards for the complete skids. As a part of skid design & engineering, the following shall be undertaken/ decided/furnished by vendor:

a) Design Sizing of self-actuated Pressure control valves, Safety Shut Off (Slam Shut) valves.

b) Set points for Pressure Regulators and slam shut valves.

c) Instrument ranges to meet the Process operating and design conditions.

d) Noise calculations for Regulator. Vendor to provide detailed Noise calculation and standard used and any assumption considered.

e) All the instruments/ equipments to be procured as per the approved vendor list of HOGPL

f) Instruments and connection ratings considering the process pressure.

2. Typical instrument data sheets for Pilot operated control valves (PCVs), Slam shut valves, pressure gauges, temperature gauges and accessories indicating materials for body, internals etc. is provided in this specification. However, this does not absolve the Vendor of the responsibility for proper selection with respect to the fluid and its operating and design conditions. Proper sizing and selection of the pipe, isolation valves, self-actuated pressure control valves for the regulators, slam shut valves and accessories are vendor's responsibility.

3. All the major items like valves (Plug & Ball), Pressure control valves, Slam shut valves, Pressure and Temperature instruments etc. shall be supplied from the vendor list attached elsewhere and the offered model of equipments shall have proven track record of successful operation for at least 6 months till bid submission date.

4. Quantities of instruments indicated for each skid on the P&IDs and Datasheets are tentative and minimum. Vendor shall recommend additional quantities in their offer, if required for successful and safe operation of the unit.

5. EQUIPMENT/ INSTRUMENT DESIGN CRITERIA

5.1 No instrument air shall be provided by HOGPL. Special care to be paid for dealing the problem arising from possible condensation due to pressure reduction. A well proven system to be used for this application. Filter regulators, Actuators, shall be suitable for Natural gas(sour) application.

5.2 The Equipments and instrumentation selected for the skids shall be rugged in design and must be well proven in the hydrocarbon industry. Prototype design or equipment of experimental nature or design undergoing testing etc. shall not be selected and supplied. Following criteria must be applied before selecting a particular instrument item: "The instruments as being offered/supplied should have been operating satisfactorily in hydrocarbon industry like Refinery, Petrochemical and Gas Processing Plant under similar process conditions for at least 4000 hrs. from the bid due date."

5.3 All the connections in the skid having design rating of 300# and above shall be of welded type only.

5.4 Hole tight / leak tight should not be used on threaded / flange joints. Stud nuts only are to be provided on flange joints.

5.5 Valves body, bonnet, cover and / or end flanges components made of cast iron and / ductile iron (as per ASTM A 395) shall not be used.

5.6 Flanges made of cast iron, ductile iron and non-ferrous materials (brass or bronze) shall not be used. All stud bolts and nuts shall be hot dipped galvanized as per ASTM A 153 or equivalent.

5.7 All the instruments shall be suitable for outdoor mounting and weatherproof to protect instruments from direct rain & sunlight.

5.8 Statutory Approvals

a) Bidder shall be responsible for obtaining all statutory approvals, as applicable for all instruments, equipments, calibration gas cylinders and control systems.

b) In addition, equipments/instruments/systems located in the hazardous area shall be certified by the local statutory authorities for their use in the area of their installation. In general following certification shall be given:

- For all intrinsically safe/explosion proof/flameproof equipments/ instruments/systems or equipments with any other type of protection allowable as per this package which are manufactured abroad and certified by any statutory authority like BASEEFA, FM, UL, PTB, LCIE etc. should also have the approval of Chief Controller of Explosives (CCOE), Nagpur.
- For all flame proof equipments manufactured locally (indigenously), the testing shall be carried out by any of the approved test house like CMRI/ERTL etc. The equipment shall in addition bear the valid approval from Chief Controller of Explosives, Nagpur and a valid BIS license.
- For all intrinsically safe equipment manufactured locally (indigenously), the testing shall be carried out by any of the approved test house like CMRI/ERTL etc. The

equipment shall in addition bear the valid approval from Chief Controller of Explosives, Nagpur.

- CCOE certificate for the foreign items shall be submitted during detailed engineering, however Appropriate approval certificates from the country of origin shall be provided with the bid

5.9 All instruments in the skid shall be certified for IEC Zone 1 Gas Group IIA/IIB, T3.

5.10 Junction boxes/ local control panels shall be flame proof/ explosion-proof

5.11 Single / multiple pair cables between instrument and Local Control Panel shall be through perforated trays. Cable glands shall be provided at instrument end and panel end. Supply of interconnected Cables is in bidder's scope.

6. TESTING AND INSPECTION

6.1 Vendor to carry out 3.1 certification for the complete supplied items.

6.2 Requirements of non destructive testing like radiography, magnetic particle test, hardness test, hydro-test, Charpy test for slam shut valves shall be carried out strictly as per following specification.

a) 100% radiography shall be carried out on all casting. Radiography procedure and area of casting to be radiographed shall be as per ANSI B16.34 and acceptance criteria shall be as per ANSI B16.34 Annexure B. Two shots shall be taken for each area to be radiographed, as a minimum.

b) Radiography/X-ray shall be carried out for all welded joints and vendor shall furnish test certificate for the same. Dye-penetration test certificate shall be provided for joints wherever radiography/ X-ray is not possible.

c) Charpy impact test on each heat of base material shall be conducted as per A370 for all pressure containing parts such as body, end flanges and welding ends as well as bolting material for pressure containing parts. Unless specified otherwise, the Charpy impact test shall be conducted at 0°C. The Charpy impact test specimen shall be taken in the direction of principal grain flow and notched perpendicular to the original surface of plate or forging. The minimum average absorbed energy per set of three specimens shall be 27J with an individual minimum per specimen of 22 J.

6.3 Inspection of Slam Shut Valves, Pressure Regulators includes:

a. Testing to demonstrate set point accuracy and actuation time for Slam shut valves

c. Seat tightness test for PCVs and Slam shut valves (shall be conducted at manufacturer's shop and certificates shall be submitted)

ONLINE BATTERY OPERATED ELECTRONIC VOLUME CORRECTOR

1. Type: Microprocessor based battery operated Volume corrector with integral smart Pressure transmitter and temperature sensor suitable for mounting in the field location. EVC will be separate / inbuilt with RPD.

2. Make : By Vendor

3. Model No. : By Vendor

4. Quantity : 1 for each RPD meter as per respective P&ID.

5. Function : To measure actual gas volume, pressure and temperature and calculates compressibility factors of the gas and based on which calculates standard volume of gas. The unit shall be complete in all respect to achieve this functionality.

6. Inputs :

   i. HF Pulse signal from RPD for flow.

   ii. Temperature signal from RTD (4 wire) thermal element in the range of -40 deg C to 50 Deg. C with measurement error +/- 0.3 Deg C . Encapsulated inside 6mm SS316 thermowell and necessay cabling.

   iii. Pressure signal from builtin Pressure Sensor in the range of 1 to 6 barg with measurement error +/- 0.3% typical. Pressure sensors to be individually calibrated and characteristics stored within the volume corrector.

   The tubing and tube fitting accessories to be supplied by vendor.

7. Outputs: RS 232 serial port for PC/LAPTOP connectivity OR GSM connectivity.(1 Port.)

8. Output Measurement : a) Un-Corrected flow rate in actual cubic meter per hour (ACMH). b) Corrected Flow rate in standard cubic meter per hour (SCMH). c) Gas Temperature in Deg. C d) Gas Pressure in barg e) Alarm outputs for unit malfunctioning h) Actual Volume i) Correction Factor j) Compressibility, etc.

9. Isolation : All inputs, outputs and power supply shall be individually isolated

10. Display : 2 line LCD with selectable decimal, Displaying all units, messages, alarms (Battery Low, Low Pressure, Pressure out of range, Temp. out of range, flow over range, fault in measurement) etc shall be in english.

11. Units of display : a) Days Total (SCM) b) Corrected Totalised volume : Sm3 c) Yesterday's Corrected Volume (SCM) d) Non resettable total (SCM) e) Actual Volume: M3 f) Correction Factor

12. Power supply : Battery along with mounting Hardware. Lithium Battery (5 years normal life) Battery pack should be instrincially safe and replaceble in Field itself, without memory loss.

13. Configuration Setup : To be done in factory for all volume corrector fully taking into account the process conditions, sensor & flowmeter's characteristics and calibrations for direct on site operations.

14. Calculations standard : a) Latest AGA7 for Volume Measurement b) Latest AGA8 — detail method for compressibility

15. Features : a) Built in diagnostics to detect proper functioning. b) Data security through password/key-lock facility and volume conversion and configuration to be sealed. c) Parameters and programmed constants shall be stored in EEPROM / flash memory. d) Facility for entry and accessing live and stored data through Laptop. e) Shall have to store at least 120 days data (on hourly basis) of 4 parameters with data and time stamping (such as flowing pressure, temperature and corrected flow uncorrected flow. f) Shall have to store at least last 35 days cumulative corrected flow on daily basis. g) The stored data above shall be retrievable by using Laptops. Suitable dedicated port shall be available on the volume corrector for portable PC connection. Software required shall be supplied. Shall be compitable to use with SCADA. h) MODBUS Facility for any third party software with Modbus registers address changing facility.

16. Hazardous area : Certified intrinsically safe for area classification Class 1 , Div 1, Group D.

17. Site conditions : Temperature 0 – 45°C, Hot, humid, tropical, saline environment.

18. Enclosure : IP65 & Intrinsically Safe, Rated for Class 1, Div 1, Group D

19. Mounting : Separate / inbuilt with RPD Meter 20. Accuracy of the system : + / - 0.5 (Bibber shall categorically indicate the system accuracy i.e. overall accuracy considering RPD meter, PT, RTD etc.)

Notes:

1. Two set of software for retrieving the stored data, programming the volume corrector using portable PCs (Laptop), software based on Windows 2000/ XP shall be supplied with each Skid.

2. 2 sets of Volume corrector documentation including product literature, software/hardware manual, operating manual, maintenance instructions, Certificates etc. shall be supplied with each DRS.

3. In case of RPD input, the Volume corrector shall be separate / inbuilt with RPD Flow Meter. The RPD should have a mechanical counter as mentioned in the specifications of the RPD Meter and additionally there should a LCD Display in the Volume Corrector as per the specifications. This should be as per the IGE/TD/13 guidelines. Meter should be visible from outside.

4. EVC shall be suitable 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.

5. Following fetaures shall be available in volume corrector: - i) Memory allocations shall be as given below: - a) Flash memory with non-volatile copy of program code. b) Programmable peripheral chip with EEPROM contains boot ladder code. c) SRAM with copy of program code and data/exact logs. d) Flash memory preservation shall be achieved by 5-year data unpowered retention. e) SRAM memory preservation shall be backed by Lithium Cell / Supercapcitors.

6. Vendor/Supplier shall configure and update records in Volume Corrector as per technical requirement and data sheet before Final Inspection call. The process parameter and the required measuring units are already specified in Data sheets/ tender documents and it shall be made available in Volume Corrector. All the specified function and features shall be demonstrated during the Final inspection.

SECTION IV INSTRUMENTATION DATASHEETS

DIFFERENTIAL PRESSURE GAUGES

1.	Type	: Direct	2.	Accuracy	: ± 1.5% of FSD or Better
3.	Mounting	: Local/ Surface	4.	Zero Adjustment	: Micrometer Pointer (External)
5.	Dial Size	: 150mm	6.	Connection	: ½" NPTF
7.	Colour	: White with Black Numerals	8.	Connection Location	: Side/ Bottom
9.	Case Material	: SS 316	10.	Movement	: SS 304
11.	Bezel Ring	: Screwed	12.	Diaphragm Seal	NA
13.	Window Material	: Shatterproof Glass	14.	Over range protection	: Maximum static pressure
15.	Enclosure	: Weatherproof to IP68	16.	Blow out protection	: Required
17.	Pressure Element	: Diaphragm	18.	Options	5-way manifold
19.	Element Material	: SS 316	20.	Make & Model	*
21.	Socket Material	: SS 316			

Tag No.	Range (bar)	Operating Pressure (bar)	Maximum Pressure (bar)	Instrument Range	Maximum Temperature (^{o} C)	Fluid	Service	Qty./Skid
DPG	0-2	200-250	300	*	65	CNG	Across Filter	1

Notes:

1. * - Vendor to Specify
2. Tapings for the DPG connections shall be provided on the inlet and the outlet nozzle of the gas filters.
3. Make : As per Approved Vendor List.

PRESSURE GAUGES

1	Make & Model	*	12	Socket material	SS 316
2	Manufacturing Standard	IS 3624/ EN 837	13	Accuracy	1% FSD
3	Type	Direct	14	Pointer	Aluminium
4	Mounting	Local	15	Zero adjustment	Micrometer pointer (External)
5	Dial size	150 mm	16	Gauge Connections	½" NPT (M)
	Colour	White with black numerals.	17	Movement	SS 304
6	Case material	Cast aluminium	18	Blow out protection	Required
7	Bezel ring	Screwed/ Bayonet	19	Measuring Unit	Bar
8	Window material	Shatter proof glass	20	Diaphragm seal	NA
9	Enclosure	IP 65 or better	21	Over range protection	130% of range
10	Pressure element	Bourdon tube	22	Options a)	Liquid filled casing
11	Element material	SS 316		b)	2 Way Manifold

Tag No.	Range	Pressure		Design Temp.	Fluid	Location	Qty/Skid
		Operating	Design				
PG -1	*	250	300	65	CNG	Inlet header of Skid	1
PG-2A	*	20	25	65	Natural Gas	Discharge of PCV 1st stage	1
PG-2B	*	20	25	65	Natural Gas	Discharge of PCV 1st stage of redundant line	1
PG-3	*	20	25	65	Natural Gas	Outlet Header of Skid	1

NOTES:

1) '*' Information to be supplied by the Vendor / Contractor.
2) The pressure gauges range shall be selected so that the operating pressure shall be within 35% to 65% of the instrument range.
3) Make of the PG shall be from approved vendor list.

TEMPERATURE GAUGES

GENERAL			FILLED SYSTEM		
1	Type	FILLED SYSTEM	16	SAMA Class	V B
2	Well	REQUIRED		Compensation	CASE
3	Mounting	LOCAL	17	Bulb type	ADJUSTABLE UNION
4	Dial size	150 mm		Bulb material	316SS
5	Colour	WHITE (Non-rusting plastic with black figs.)	18	Bulb union threaded to	½" NPT(M)
6	Case material	DIE CAST ALUMINIUM (EPOXY PAINTED)	19	Extension type	RIGID
7	Window material	SHATTER PROOF GLASS	20	Bulb dia	8 mm (Min)
8	Conn. Location	BOTTOM	21	Capillary material	
9	Accuracy	1% FSD		Armour Flexible	
10	Enclosure	WEATHER PROOF TO IS 2147		Armour material	
	Enclosure class	IP 67 / NEMA 4		Capillary length	
11	Zero adj. Screw	MICROMETER POINTER (Internal)	22	Over range protection	130% OF RANGE
THERMOWELL					
12	Material	SS 316	23	Thermowell as per drg	Drg enclosed
13	Construction	DRILLED BAR STOCK	24	Options a)	LIQUID FILLED
14	Process connection	1 ½" FLANGED	25	Make & Model	*
15	Gauge connection	½" NPT (F)			

Tag No.	Range	Temperature (^{O}C)		Well Dimensions		Flange		Location	Qty/ Skid
		Operating	Design	U	T	Material	Rating/Face/ Finish		
TG – 1	*	0 -50	65	*	*	ASTM A 105	2500# RF 125 AARH	Inlet header of Skid	1
TG – 2A	*	0 -50	65	*	*	ASTM A 105	300# RF 125 AARH	Discharge of PCV 1st stage	1
TG – 2B	*	0 -50	65	*	*	ASTM A 105	300# RF 125 AARH	Discharge of PCV 1st stage of redundant line	
TG – 3	*	0 -50	65	*	*	ASTM A 105	150# RF 125 AARH	Outlet Header of Skid	

Note: '*' Information to be supplied by the Vendor / Contractor.

1. Vender shall furnish Make & Model No. with product catalogues along with the offer.
2. Make of the TG shall be from approved vendor list.
3. For installation of Temperature Gauge & Thermowell, vendor shall follow the standard installation

4. Vendor shall submit the Matching flanges also.

PRESSURE CONTROL VALVES

General	01	Tag No.		PCV- ** (Quantity as per P& ID)	
	02	Inlet Line No.			
	03	Outlet Line No.			
	04	Line Size	Schedule	2500# (1st stage)	S80 for 0" to 1.5" line size S40 for 2" to 6" line size
	05	Inlet Line I.D.	Outlet Line ID	*	*
	06	Service		PR. REDUCTION (Double stage Regulation)	
Valve	07	Regulation		DOWNSTREAM	DOWNSTREAM
	08	Type of Regulator : STD	Direct & loading type Pilot Op.	Director Operated	Loading Type PILOT operated Type
	09	Body Size	Port Size	*	*
	10	End Conn : Flgd. Size & Rating		*	2500# for 1st Stage 300# for 2nd Stage
	11	Facing & Finish		RF 125 AARH	
	12	Body Material		ASTM A216 GR. WCB (For 2nd stage PRV)	SS316 (for 1st Stage PRV)
	13	Trim Material		SS 316	
	14	Bonnet Type	*		
	15	Impulse Connecn. Int.	Ext.		EXTERNAL
	16	Connection Size & Type if External		*	**
	17	Material of Diaphgram		*	Nitrile
	18	Other Wetted Parts		*	SS 316
	19	Soft Seating	Material		
	20	ANSI Leakage Class		CLASS VI	
	21	Failure Position		FC/FO	
Options	22	Solenoid Valve			
	23	I/P Converter			
	24	Filter With Gauge			
	25	Limit Switch/ Proximity Switch		Not Required	
Service Conditions	26	Fluid	State	NATURAL GAS VAPOUR	
	27	Flow Liquid_Min	Normal / Max		
	28	Flow Vapour_Min	Normal / Max	*	*
	29	Flow Water_Min	Normal / Max		
	30	Inlet Pr._Min	Normal / Desn.		*
	31	Outlet Pr._Min	Normal / Max		*
	32	Delta Pr. Shut Off		*	
	33	Temp. °C Oper.	Max	65	0-50

	34	Oper. S.G.	Mol. Wt.	Refer TS	Refer TS
	35	CP/ CV	Compressibility Factor	Refer TS	Refer TS
	36	Flash %	Visc. (cP)		Refer TS
	37	Maximum Flow Capacity			*
	38	PCV Set Point		3 (NOTE -2)	
	39				
Valve Data	40	Cv. Min.	Cv. Max.	*	*
	41	Cv. Nor.	Selected Cv.	*	*
	42	Predicted Sound Level DBA		*	
	43	Inlet Velocity M/S		*	
Model Nos.	44	Valve	Actuator	*	*
	45	Positioner	Limit Switch	*	--
	46	100% Radiography	Required		

Notes:

1. * - TO BE FURNISHED BY THE VENDOR.
2. SPRING SHALL BE SUITABLE TO ADJUST SET PR. FROM 15 TO 25 KG / CM2(g) FOR 1ST STAGE PCV AND 2 TO 10 KG / CM2(g) FOR SECOND STAGE PCV. SET POINT OF THE PCVs SHALL BE PROVIDED BY VENDOR.
3. VENDOR SHALL FURNISH A SCHEMATIC INCLUDING ALL THE IMPULSE LINE CONNECTIONS. LOCATION AND SIZES. TO THE MAIN VALVE AND TO THE PILOT INLET/OUTLET VALVE.
4. ACCURACY OF REGULATION (2nd stage)SHALL BE BETTER THAN ± 1% OF THE SET PRESSURE.
5. ACCURACY OF REGULATION (1st stage)SHALL BE BETTER THAN ± 10% OF THE SET PRESSURE
6. VENDOR SHALL FURNISH THE SIZING CALCULATIONS AND SPRING RANGES ALONG WITH THE QUOTE.
7. THE SELECTED SIZE & MODEL SHALL BE SUCH THAT THE PRESSURE CONTROL VALVE MUST OPERATE AND CONTROL AT BOTH MIN. AND MAX. FLOW RATE AS INDICATED WITH THE GIVEN PRESSURE CONDITIONS.
8. THE SELECTED MODEL(2nd stage) SHALL BE OF Loading type PILOT OPERATED (GLOBE TYPE) WITH EN 334
   APPROVAL.and PED 2014/68/EU
9. THE SELECTED MODEL (1st stage) SHALL BE OF Direct operated type (GLOBE TYPE) WITH PED 2014/68/EU

SLAM SHUT VALVE

1.	Tag No.	
2.	Line Size & Sch.	* , S80 for 0" to 1.5" line size & S40 for 2" to 6"
3.	Services	NATURAL GAS
4.	Type of Valve	* (Intergral with Pressure Control Valve-for 2nd stage PRV)
5.	Body Size	*
6.	End connection	FLANGED * , 2500# RF 125 AARH
7.	Body Material	ASTM A 216 Gr. WCB for 2nd stage SSV and SS316 for 1st stage SSV
8.	Trim Material	SS 316
9.	Impulse Connection	*
10.	Spring Range	*
11.	Accuracy	1% OF SET PRESSURE OVER WHOLE RANGE (2nd stage); 10% OF SET PRESSURE OVER WHOLE RANGE (1st stage);
12.	Pressure Drop	<0.5
13.	Type of Actuator	PILOT
14.		YES REQUIRE , ONE EACH FOR OPEN /
	Limit Switches	CLOSE POSITION (2nd stage)
15.	Manual Reset	Yes , Required
16.	Failure Position	CLOSE , TIGHT SHUT OFF
17.	Position Indicator	YES , REQUIRED
18.	Closing Time	LESS THAN 2 SEC
19.	Fluid & State	DRY NATURAL GAS
20.	Temperature ^{O}C Working/ Design	50 / 65
21.	Inlet Pressure : MIN / NORMAL /	
	MAXIMUM	*
22.	FLOW : MIN / NORMAL / MAXIMUM	*
23.	Design Pressure	49
24.	Operating S.G	Refer TS
25.	Molecular Weight	Refer TS
26.	Cp/CV	Refer TS
27.	Compressibility Factor	Refer TS
28.		HI SET POINT :- 5.5 kg/cm2(g), LOW SET POINT
	Shut Off Pressure	:-2.9 kg/cm2(g) (Note 5)
29.	RADIOGRAPHY (100%)	REQUIRED
Notes:		
1.	'*'Vendor to Specify	

2. VENDOR SHALL FURNISH A SCHEMATIC INDICATING ALL THE IMPULSE LINE CONNECTIONS, LOCATIONS, MIN. DISTANCES AND SIZES TO THE MAIN VALVE AND TO THE SLAM SHUT VALVES.
3. VENDOR SHALL FURNISH SIZING CALCULATIONS ALONGWITH OFFER.
4. SDV SHALL BE AS PER EN /EQVT STD.
5. SET POINTS SHALL BE FIELD ADJUSTIBLE. VENDOR SHALL INDICATE THE ADJUSTIBLE RANGE OF OFFERED VALVE.

CREEP RELEIF VALVE

General	01	Tag No.	CRV-1st& CRV-2nd
	02	Line No./ Size	W
	03	Vessel Protected	-
	04	Quantity & Size	W
	05	Safety/ Relief	CREEP RELIEF
	06	Vendor	W
Valve	07	Type	Standard
	08	Full Nozzle Full Lift Mod. Nozzle	Full Nozzle Full Lift
	09	Bonnet Type	Closed
	10	Conv./ Bellows/ PIlot Operated	Conventional
	11	Inlet Conn. : Size & Rating	W
	12	Inlet Conn. : Facing & Finish	RF, W
	13	Outlet Conn. : Size & Rating	W
	14	Outlet Conn. : Facing & Finish	RF, W
	15	Cap Over Adj. Bolt :	Required
	16	Screwed or Bolted	Bolted
	17	Lifting Gear - Type	-
	18	Test Gag	Required
Material	19	Body and Bonnet	ASTM A216 Gr. WCB
	20	Nozzle and Disc	SS 316
	21	Spring	SS 316
	22	Bellows	
	23	Resilient Seat Seal	W
Options	24		
	25		
Basis	26	Code	API 520 & 526
	27	Basis of Selection	CREEP RELIEF
	28		
	29	Fluid and State	Natural Gas Vapour
	30	Corrosive Constituent/ Corr. Allow.	CO2 (0.27%)(max.)/ 2 mm

Service Conditions	31	Required Flow Capacity MMSCMD	W
	32	Mol Wt./ S.G. at Rel Temp.	Refer TS
	33	Oper. Pressure, kg/cm^{2}g	W
	34	Oper. Temp.°C Rel. Temp.°C	5 - 45
	35	Valve Discharges to	Atm.
	36	Back Press. Const. Or Variable	Atm.
	37	Set Pressure, kg/cm^{2}g	10
	38	Cold Bench Test Pressure	W
	39	% Over Pressure % Blow Down	10
	40	Cp/Cv / Compressibility Factor	Refer TS

	41	Viscosity at Rel. Temp. (cP)	Refer TS
	42	Vess. : Wall Temp.,°C Surf. Area-m^2	-
Orifice	43	Calculated Area-$inch^2$	W
	44	Sel. Area-$inch^2$ Orifice Design	W
	45	No. of Valves Reqd. for capacity	W
	46	Total Area-$inch^2$	W
	47	Actual Flow Capacity, SCFM	W
	48	Relief Load	-
	49	Model No.	W
	50	Radiography	Reqd. (100%)
	51	IBR Certification	Not Required

Notes:

1. 'W' VENDOR TO SPECIFY/ CONFIRM
2. VENDOR SHALL FURNISH SIZING CALCULATIONS TO SUPPORT OF THIS VALVE SELECTION.
3. VALVES SHALL BE 100% RADIOGRAPHED
4. VENDOR TO CONSIDER COEFFICIENT OF DISCHARGE DERATED BY A FACTOR OF 0.9 AS PER ASME-VIII
5. FOR SAFETY VALVE SIZING, FURNISH CERTIFIED CAPACITIES AS PER API-520.
6. CRVs SHALL BE SUPPLIED WITH INLET & OUTLET COMPANION FLANGES.
7. VENDOR TO CONSIDER HYDRO-TEST PRESSURE 1.5 TIMES OF DESIGN PRESSURE
8. DESIGNATION, NO. & RATING OF PSVs & CRVs SHALL BE DECIDED DURING DETAILED ENGINEERING.

RPD METER

1. Make : Vendor To Provide
2. Meter Type : Rotary Positive Displacement Meter
3. Standard : OIML Recommendation (OIML R137: Ch1) / EN 12480
4. Service : Natural Gas
5. Model / Size : Vendor To Provide
6. Rating : 150#
7. Meter Head : IP65,
8. Digit 8.0 End Connection : Ref. P&ID & Flange confirming to ANSI 125/ASME B16.5 (Refer respective P & Id for details)
9. Flange to Flange Dimension : Vendor to Provide
10. Flow Range : Vendor To Provide
11. Typical Start Flow : Vendor To Provide
12. Pulsar : Pulses from RPD meter for Flow / Volume to EVC / Field Mounted Flowcomputer
13. Differential Pressure at Qmax : Vendor to Provide
14. Flow (at actual condition) : Ref. P&ID
15. Flow (at standard condition) : Vendor To Provide (Note-1)
16. Accuracy : +/- 2% from Qmin to 0.2Qmax and +/- 1% from 0.2Qmax to Qmax
17. Rangeability / Turndown Ratio : 1:100 (min.)
18. Maximum Index Reading (Local Counter) : 99999999
19. Material Construction:
    19.1 Body & Cover : Cast Aluminum Alloy (Tamper proof & corrosion resistant)
    19.2 Impellers : Extruded Aluminum Alloy
    19.3 Impeller Shaft : High Grade Alloy Steel
    19.4 Bearing : High Carbon Steel
    19.5 Gears (Timing & Reduction) : Steel Alloy
    19.6 Magnetic Coupling : Hard Ferrite Ceramic Magnet
    19.7 Rings / Gaskets : Synthetic Elastomer
    19.8 Plastic Components : Not to be used in Meter
    19.9 Meter Internals shall be tested for low noise, frictionless, endurance for minimum 20 years life & external tamper proof.

    SERVICE CONDTION:
20. Fluid : Natural Gas
21. Design Pressure : Ref. P&ID
22. Working Temperature : 0 to 50 Deg. C
23. Area Classification: Intrinsically Safe, Class 1, Div.1, Group D
24. Qty : Ref. P&ID
25. Maximum Operating Pressure : Ref. P&ID
26. Normal Operating Pressure : Ref. P&ID
27. Reverse flow Restrict : Essential (If not in-built non return valve to be Supplied)
28. Approved To : Measurement Canada, NMI, PTB as per OIML Specifications or equivalent Note :

I. Flow capacity in SCMH is calculated considering Maximum Operating Pressure.

II. Bidder to provide 5 point Calibration Certificate and Accuracy at atmospheric pressure with air covering the following flow rates:
i. Q maximum ii. Q minimum iii. Qt = 0.2 Qmax

III. Make of the Meter shall be from Approved Vendor List of HPCL/ client

ONLINE BATTERY OPERATED ELECTRONIC VOLUME CORRECTOR

1. Type: Microprocessor based battery operated Volume corrector with integral smart Pressure transmitter and temperature sensor suitable for mounting in the field location. EVC will be separate / inbuilt with RPD.

2. Make : By Vendor

3. Model No. : By Vendor

4. Quantity : 1 for each RPD meter as per respective P&ID.

5. Function : To measure actual gas volume, pressure and temperature and calculates compressibility factors of the gas and based on which calculates standard volume of gas. The unit shall be complete in all respect to achieve this functionality.

6. Inputs :

    i. HF Pulse signal from RPD for flow.

    ii. Temperature signal from RTD (4 wire) thermal element in the range of -40 deg C to 50 Deg. C with measurement error +/- 0.3 Deg C . Encapsulated inside 6mm SS316 thermowell and necessay cabling.

    iii. Pressure signal from builtin Pressure Sensor in the range of 1 to 6 barg with measurement error +/- 0.3% typical. Pressure sensors to be individually calibrated and characteristics stored within the volume corrector.

    The tubing and tube fitting accessories to be supplied by vendor.

7. Outputs: RS 232 serial port for PC/LAPTOP connectivity OR GSM connectivity.(1 Port.)

8. Output Measurement : a) Un-Corrected flow rate in actual cubic meter per hour (ACMH). b) Corrected Flow rate in standard cubic meter per hour (SCMH). c) Gas Temperature in Deg. C d) Gas Pressure in barg e) Alarm outputs for unit malfunctioning h) Actual Volume i) Correction Factor j) Compressibility, etc.

9. Isolation : All inputs, outputs and power supply shall be individually isolated

10. Display : 2 line LCD with selectable decimal, Displaying all units, messages, alarms (Battery Low, Low Pressure, Pressure out of range, Temp. out of range, flow over range, fault in measurement) etc shall be in english.

11. Units of display : a) Days Total (SCM) b) Corrected Totalised volume : Sm3 c) Yesterday's Corrected Volume (SCM) d) Non resettable total (SCM) e) Actual Volume: M3 f) Correction Factor

12. Power supply : Battery along with mounting Hardware. Lithium Battery (5 years normal life) Battery pack should be instrincially safe and replaceble in Field itself, without memory loss.

13. Configuration Setup : To be done in factory for all volume corrector fully taking into account the process conditions, sensor & flowmeter's characteristics and calibrations for direct on site operations.

14. Calculations standard : a) Latest AGA7 for Volume Measurement b) Latest AGA8 – detail method for compressibility

15. Features : a) Built in diagnostics to detect proper functioning. b) Data security through password/key-lock facility and volume conversion and configuration to be sealed. c) Parameters and programmed constants shall be stored in EEPROM / flash memory. d) Facility for entry and accessing live and stored data through Laptop. e) Shall have to store at least 120 days data (on hourly basis) of 4 parameters with data and time stamping (such as flowing pressure, temperature and corrected flow uncorrected flow. f) Shall have to store at least last 35 days cumulative corrected flow on daily basis. g) The stored data above shall be retrievable by using Laptops. Suitable dedicated port shall be available on the volume corrector for portable PC connection. Software required shall be supplied. Shall be compitable to use with SCADA. h) MODBUS Facility for any third party software with Modbus registers address changing facility.

16. Hazardous area : Certified intrinsically safe for area classification Class 1 , Div 1, Group D.

17. Site conditions : Temperature 0 – 45°C, Hot, humid, tropical, saline environment.

18. Enclosure : IP65 & Intrinsically Safe, Rated for Class 1, Div 1, Group D

19. Mounting : Separate / inbuilt with RPD Meter 20. Accuracy of the system : + / - 0.5 (Bibber shall categorically indicate the system accuracy i.e. overall accuracy considering RPD meter, PT, RTD etc.)

Notes:

1. Two set of software for retrieving the stored data, programming the volume corrector using portable PCs (Laptop), software based on Windows 2000/ XP shall be supplied with each Skid.

2. 2 sets of Volume corrector documentation including product literature, software/hardware manual, operating manual, maintenance instructions, Certificates etc. shall be supplied with each DRS.

3. In case of RPD input, the Volume corrector shall be separate / inbuilt with RPD Flow Meter. The RPD should have a mechanical counter as mentioned in the specifications of the RPD Meter and additionally there should a LCD Display in the Volume Corrector as per the specifications. This should be as per the IGE/TD/13 guidelines. Meter should be visible from outside.

4. EVC shall be suitable for Custody Transfer of Natural Gas by NMI or PTB or Measurment Canada or Directorate of Legal Metrology (India) under provision of OIML or related guidelines

5. Following fetaures shall be available in volume corrector: - i) Memory allocations shall be as given below: - a) Flash memory with non-volatile copy of program code. b) Programmable peripheral chip with EEPROM contains boot ladder code. c) SRAM with copy of program code and data/exact logs. d) Flash memory preservation shall be achieved by 5-year data unpowered retention. e) SRAM memory

preservation shall be backed by Lithium Cell / Supercapcitors.

6. Vendor/Supplier shall configure and update records in Volume Corrector as per technical requirement and data sheet before Final Inspection call. The process parameter and the required measuring units are already specified in Data sheets/ tender documents and it shall be made available in Volume Corrector. All the specified function and features shall be demonstrated during the Final inspection.

RESISTANCE TEMPERATURE DETECTOR

GENERAL			13	Cable entry	½" NPT (F)
1	Assembly	Standard	14	No. of entries	Single
			15	Enclosure type	Dual Chamber Weather proof to IP55 and Explosion proof to
2	Type	RTD Class A		Tag Plate	Yes SS
				Terminal block	Ceramic, spring loaded screws for lead wire termination
ELEMENT			THERMOWELL		
3	No. of elements	Simplex	16	Material	SS 316
4	Calibration	As per DIN 43760 /BS 1904/ IEC60751 / IS 2848 *	17	Construction	Drilled bar stock
5	Element material	Platinum (Pt 100)	18	Process connection	1 ½" Flanged / Rating ANSI 300#
6	Resistance at 0 C	100 ohms	19	Inst. connection	½" NPT (F)
7	Leads	Standard	20	Response Time with Thermowell	*
8	Sheath Material	SS 316			
	Sheath O.D.	*		Thermowell as per drg	STD
	Insulation	Mineral Insulated			
			21	Quantity	*
9	Nipple & Union Material	SS 316	22	Input	0 to 200 ºC
10	No. Of wires	4 Wire	23	Output	*
HEAD			24	Power Supply	24V DC
11	Head Cover type	Screwed cap & SS chain	25	Mounting	On pipeline
12	Material	Cast Aluminium	26	Enclosure class	NEMA 4 & NEMA 7
			27	Make & Model No.	*

Tag No.	Range	Temperature		Well Dimensions		Flange		Fluid	Qty
		Nor	Design	U	T	Material	Rating/Face/ Finish		
TE -*	*	*	*	*	*	ASTM A 105	300# RF 125 AARH	NATURAL GAS	

NOTES:

1) '*' Information to be supplied by the Vendor / Contractor.

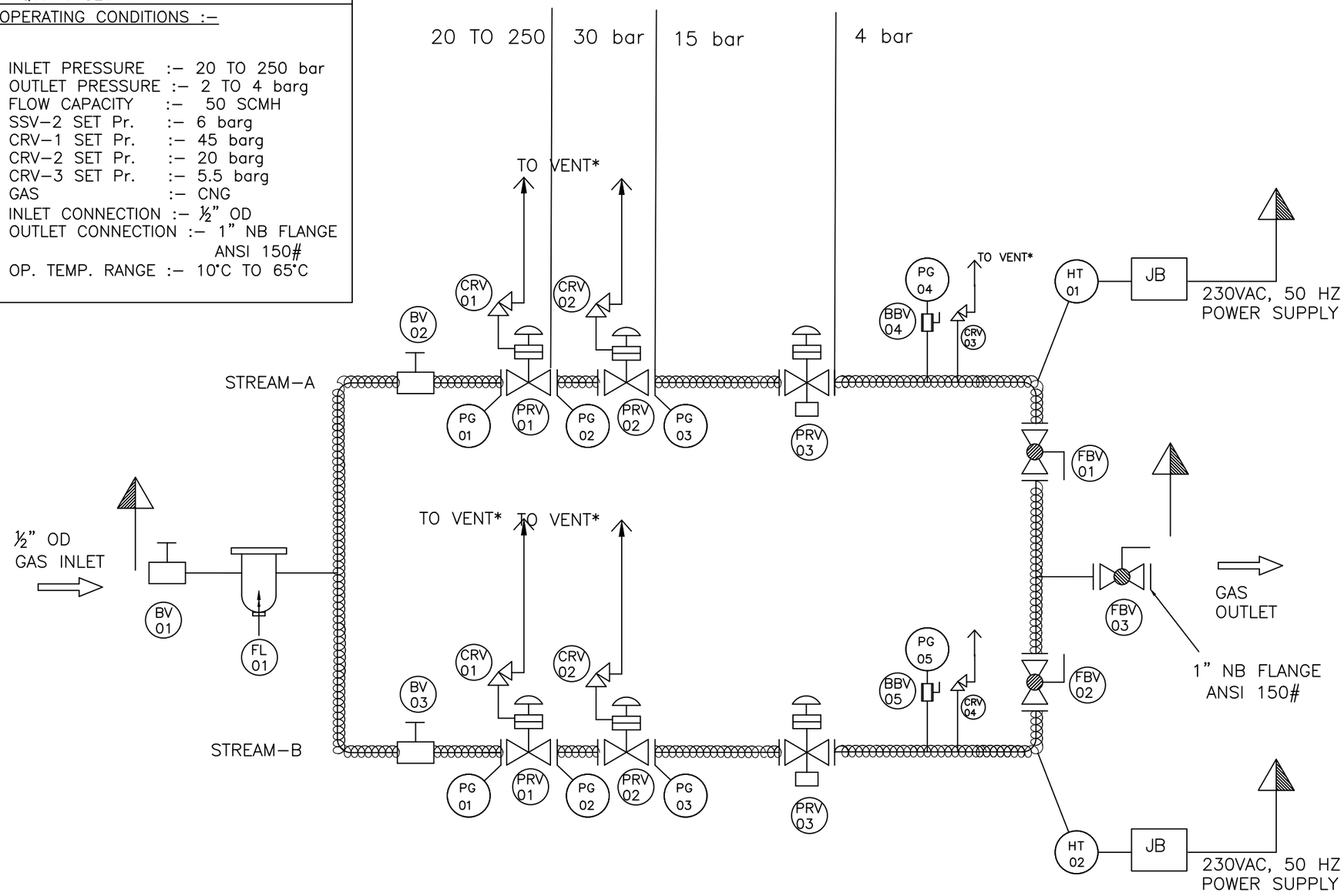
2) Make of the RTD shall be from approved vendor list.

LEGENDS	
PRV	PRESSURE REDUCING VALVE
PG	PRESSURE GAUGE
BBV	BLOCK & BLEED VALVE
CRV	CREEP RELIEF VALVE
SSV	SLAM SHUT OFF VALVE
BV	BALL VALVE
FBV	FLANGED BALL VALVE
FL	FILTER
HT	HEAT TRACING CABLE/ HEATER/ HOT WATER BATH

QTY–1 SET

OPERATING CONDITIONS :–

INLET PRESSURE :– 20 TO 250 bar
OUTLET PRESSURE :– 2 TO 4 barg
FLOW CAPACITY :– 50 SCMH
SSV–2 SET Pr. :– 6 barg
CRV–1 SET Pr. :– 45 barg
CRV–2 SET Pr. :– 20 barg
CRV–3 SET Pr. :– 5.5 barg
GAS :– CNG
INLET CONNECTION :– ½" OD
OUTLET CONNECTION :– 1" NB FLANGE ANSI 150#
OP. TEMP. RANGE :– 10°C TO 65°C



DCS WILL BE SUPPLIED DULY MOUNTED ON PRE–FABRICATED SKID

NOTE;–

1) VENT* :The vent lines shall be terminated at a height of 3 meter from the ground level.

DRN	ARS	06.12.25	TITLE		
HPOIL GAS			TYPICAL P&ID OF 50 SCMH TWIN STREAM CNG DECOMPRESSION SKID	DRG No. DCS–50	REV 0
			HPOIL GAS PRIVATE LIMITED	SHEET No.	SCALE