Guidelines for Biogas (Biomethane) injection in Natural Gas Pipelines/City Gas Distribution Network & its Facilities

पी एन जी आर बी
PNGRB

11-02-2026

Guidelines for Biogas (Biomethane) injection in Natural Gas Pipelines/City Gas Distribution Network & its Facilities.

These guidelines are intended for ensuring the safety and integrity of installations and facilities related to injection of Biogas (Biomethane) into Natural Gas pipeline (NGPL), City Gas Distribution (CGD) network or facilities including and not limited to its material selection, planning and designing, installation, inspection, testing and commissioning as well as operation and maintenance of the facilities, associated with injection of bio-gas into Natural gas networks up to its injection point of CGD network or NGPL.

DESIGN, INSTALLATION AND OPERATION

Design, construction, operation & maintenance of bio-gas(Biomethane) injection skid, pipeline and associated facilities till injection into CGD network and NGPL shall follow the provisions of Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks) Regulations, 2008 and Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Natural Gas Pipelines) Regulations, 2009 and their latest amendments respectively, as applicable. In addition, the provisions of NGPL IMS Regulations and CGD IMS Regulations, respectively shall also to be followed. Further, the provisions of Retail Outlets T4S Regulations shall also be followed for dispensing thru mobile cascade.

Following operational requirements are to be ensured:

1. Minimum Quality, Technical & Safety Requirements

A. The quality parameters of Biogas (Biomethane) to be injected into CGD or NGPL shall be in line with requirement specified in:

I. PNGRB (Access Code for Common Carrier or Contract Carrier Natural Gas Pipelines) Regulations, 2008 for trunk NGPL and its latest amendments.
II. PNGRB (Access Code for City or Local Natural Gas Distribution Networks) Regulations, 2020 for CGD network and latest amendments.
III. IS 16087: 2025: Biogas (Biomethane) – Specification (latest amendments).

For Injection of Biogas (Biomethane) directly into Natural gas Pipeline (NGPL) or into Gas Gathering Stations (GGS) or into NGPL thru GGS : above sub para I & III shall be applicable for quality parameters.

For Injection of Biogas (Biomethane) directly into CGD Networks or into Gas Gathering Stations (GGS) or into CGD Networks thru GGS : above sub para I & III shall be applicable for quality parameters

Specifications, whichever are more stringent in above referred codes/regulations shall be considered.

B. Biogas (Biomethane) injected into NGPL or CGD networks shall comply with network operating requirements, ensuring a maximum hydrocarbon dew point and water dew point of 0°C at pipeline operating pressure, and a maximum gas temperature of 55°C.

C. An online biogas (biomethane) quality monitoring system with analysers shall be installed by CBG Producer to ensure gas composition and other parameters remain within specified limits.

D. CBG producers shall install Moisture and H_2S analysers at the plant to ensure that moisture and sulphur content remain within specified limits.

E. An automatic interlocks and shut-off system shall be provided to ensure biogas supply is within the specified quality parameters. The system shall automatically isolate the gas flow if the composition deviates the permissible limits.

F. Requirements related to Gas Chromatograph / Gas Analysers at CBG Plants

I. The online gas analyzer/ chromatograph shall be configured to sample gas at a minimum frequency of once every 5 minutes.

II. All Parameters to be analysed and monitored as per latest applicable PNGRB regulations and IS 16087 Standard.

III. Net Calorific Value, Gross Calorific Value, Relative Density, and Wobbe Index are calculated using standard formulae based on gas composition, in accordance with the latest version of ISO 6976, and the reading values are recorded.

IV. Gas analyzers /gas chromatographs shall capture and store historical trends (Min 60 days) of various operating parameters, with provisions for both locally and remotely access .

V. Gas Analyser / Gas chromatograph being used for quality measurements should comply with the testing method for each composition as specified in IS 16087:2025 and GC method analysis should comply to ISO 6974.

VI. Required communication hardware shall be supplied along with GC/ GA and web access link shall be shared with CGD/NGPL network operator for online monitoring of desired parameters and download of logs. Support for Modbus protocol and spare communication port (RS485/Ethernet) is necessary for remote communication.

VII. Uninterrupted power supply along with adequate power back-up to GC/ GA & control panel shall be provided to ensure continuous operations.

VIII. Periodic calibration of Gas Analysers/GC as per prevalent practices and prior information to be provided to CGD/NGPL network operator. Weekly calibration should be carried out for Gas Analyser/GC. However, the calibration must be on auto mode for injection into NGPL network. Joint Calibration/Validation frequency for Gas Analyser/ GC may be based on mutual consent between CBG producer & CGD entity. Records to be shared with CGD/NGPL network operator. The required Gas for calibration of the Gas Analysers/GC should be procured from ISO 17025 accredited laboratory.

In addition to the quality assurance of CBG producer, CGD or NGPL entity to also ensure confirmation against CBG quality being injected into their systems. For this the CGD/NGPL entities to obtain samples of Bio-gas (Biomethane) and carry out composition analysis through NABL accredited labs at defined frequency (minimum on Quarterly basis) and should also conduct the same, in case of reporting of complaints related to poor quality/heating issue from end users (PNG/CNG/NGPL customers). In event that result of composition analysis of CBG in non-odorized state results in identification of additional corrosive or abrasive component like siloxanes, Total Sulphur etc content is more in analysis. The CGD entity or NGPL Operator can ask CBG producer to install suitable GA or GC to monitor these identified additional components like Siloxanes , Total Sulphur etc at CBG producer's site. For collecting samples from batch of produced CBG for conducting tests, IS 15125 will be referred. Corrective actions to be initiated by Bio-gas (Biomethane) producers immediately in case of non-conformance of quality parameters.

2. **Pressure Regulating Skid**

a. Pressure regulating Skid (PRS) should be provided for injecting CBG in the pipeline network. The injecting pressure shall be as per the agreement between the producer and NGPL/CGD entity, however this will be within the maximum allowable operating pressure of the pipeline.

b. Pressure Regulating Skid should typically consist of:

i. Gas filter.
ii. Pressure Reduction skid comprising active-monitor configuration, including slam shut valve and CRV for over and under pressure protection. Stagewise Pressure Reduction may be considered based on input/output pressure requirement.
iii. Inlet and outlet isolation valves and
iv. NRV

c. For injection of CBG through cascade into PE/Steel network, decompression Skid should be provided. Decompression skid should have water heater for preheating of gas (if required) to compensate for temperature reduction during de-compression in addition to the typical requirements of Pressure regulating skid as mentioned above.

d. Installation location of Decompression skid at CGS/CNG station should be such that it maintains inter-distance from compound wall, Control room/office, CNG cascade, CNG compressor etc. as per requirements given in PNGRB T4S CGD Regulations, PESO guidelines & Gas Cylinder Rules, as applicable.

e. Vent point should be provided for controlled venting. Vent height should extend to a minimum of 3 meter above the nearby working platform.

3. **Compressor at CBG Plant**

A. CBG for injection into NGPL/CGD Pipeline Network:

I Compressor to be installed by CBG producer at CBG producing site to ensure supply of CBG at desired pressure for injecting of CBG in CGD network i.e., approx. 3-5 bar (or as per CGD entity requirement) into MDPE network and in case of steel network, required injecting pressure shall be as that of operating pressure of CGD/NGPL, however this will be within the maximum allowable operating pressure of the pipeline network.

B. CBG for dispensing for CNG and DCU injection Stations.

I. Compressor should be provided at CBG producing site to ensure supply of CBG in mobile cascade at desired pressure i.e. 200-250 bar for dispensing at CNG Station and for injecting CBG in CGD network through DCU station.

All Quality, Technical and Safety requirements are required to be maintained at CBG Plants for dispatches through mobile Cascades for CNG and DCU injection stations.

4. Metering Skid.

A. CBG for injection into NGPL/CGD Pipeline Network:

I. CBG Metering Skid shall be provided which monitors real time Gas consumption, flow rate and other process related parameters through as per applicable AGA standard based on flowrate. Metering skid configuration should be twin streams based.

II. Real-time flow rate data sharing for odorization with adequate isolation/ protection to flow computer hardware shall be used to facilitate odorant dozing proportionate to maintain flow.

III. Data sharing shall be ensured with NGPL/CGD entity for online monitoring. Sizing of meter shall be in consultation with NGPL/CGD entity. Filter, flow restrictor shall be installed for safe operation of meter. Modem and its power supply / other accessories are to be installed in the Ex-proof/flameproof junction box within explosive zones. However, these can also be installed outside the explosive zone (typically 6 to 10 m from meter skid).

IV. The hazardous area shall be classified into Zone 0, Zone 1 or Zone 2 as per IS: 5572 or equivalent standards. The electrical fittings installed in the hazardous areas shall be as per IS/IEC 60079 or equivalent standards, conform to the hazardous area classification and gas group.

V. Joint Calibration and calibration frequency of the meters at ISO 17025 accredited labs shall be as per applicable standard or OEM recommendation or as per mutual agreement. Calibration and Measurement Capability [CMC] value of lab/ calibration agency should be ± 0.5 % or as per applicable standard.

VI. Gas flow metering shall be installed before injection of odorization (If provided) for proper metering.

B. CBG Metering facility for dispatches at CNG / DCU injection stations:

I. Mass Flow Meter shall be installed at Delivery Point (CBG unloading point) which monitors real time Gas consumption, flow rate and other process related parameters.

II. Meter shall also be installed at the producing point/MCV/LCV loading point which monitors real time CBG flow rate for input to Odorant dozing system to facilitate odorant dozing proportionate to flow.

III. Calibration of the Mass flow meters at ISO 17025 accredited lab as per OIML R117 is to be considered with joint witness. In case of requirement of Volumetric flow/Energy data, a GC Input will be considered for measurement.

IV. Real-time flow rate data sharing for odorization with adequate isolation/ protection to flow computer hardware shall be used to facilitate odorant dozing proportionate to maintain flow

V. Joint Calibration and calibration frequency of the meters (as per the agreed terms b/w the stakeholders) at ISO 17025 accredited labs shall be as per applicable standard, Calibration and Measurement Capability [CMC] value of lab/ calibration agency should be ± 0.5 % or as per applicable standard.

VI. Gas flow metering shall be installed before injection of odorization (If provided) for proper metering.

5. Gas Detectors at CBG Plant

I. Fixed type Methane Gas detectors shall be installed to cover all possible leak sources by CBG producer to ensure no gas cloud formation happened. Alert for the same to be generated locally (audio and visual) as well as remotely through real time SMS & alert in the control room. Half yearly calibration of these detectors shall be taken up by CBG producer and their records including master calibrator certificate shall be shared with NGPL/CGD entity on a regular basis.

II. The gas detectors shall be of flame proof conforming to IS/IEC 60079 or equivalent standards, conform to the hazardous area classification and gas group.

III. The system shall generate alarm if gas leak alarm > 20% LEL and shall automatically isolate the gas flow if activation of gas leak alarm > 40% LEL.

IV. At least one portable gas detector shall be made available at CBG plant to ensure gas leak checks on regular basis

6. Odorization System at CBG Plant

I. Odorization of the biogas is one of the critical requirements for detection of leakages if any from gas networks, installations and equipment for the safety of gas handling personnel, customers or users and public. Adequate odor level is critical for the leakage detection.

II. CBG producer shall provide Odorant System (including Odorant tank, Odorant Dozing system with provisions of dozing proportionate to flow-based dozing).

III. The odorant being used to odorize natural gas such as Ethyl Mercaptan, Tetra Hydro Thiophene, may be used for odorization of biogas. However, odorant being used should preferably be of the same type as being used by the CGD entity.

IV. The Odorization smell or concentration checking shall be regularly checked at the farthest point and record shall be maintained as per PNGRB Regulations for CGD.

V. Two standards may be considered: ISO TR 16922 (which specifies the principles for the odorization technique and the control of odorization of natural gas) and ISO 13734 (specifies general requirements for odorants and the physical and chemical properties of commonly used odorants).

For NGPL - Odorization is not required if injection is being done in steel network of NGPL. However, if MDPE is laid for NGPL, odorizations is required to be done in accordance with above clauses 6 (I-V)

7. Automation related to Isolation.

The following parameters shall trigger automatic system isolation:

I. Delivered pressure deviates from agreed specification (redundancy in pressure monitoring is necessary to ensure delivery pressure doesn't exceed MAOP of the pipeline).

II. Gas quality deviates from aforesaid specified specifications in clause 1.A.

III. Odorization is not being done as per the specification as per para 6 (V).

IV. If there is power supply interruption to Gas Chromatograph/Gas Analyser.

V. Activation of methane detection (>40 % LEL) by Gas detector.

VI. On pressing Emergency Stop push button.

8. Other Important requirements

i. Control Panel for monitoring of Pressure shall be installed and for Controlling over/under pressure, SOV/ROV shall be provided.

ii. HAZOP, QRA studies shall be carried out through reputed Third parties and shall comply to all recommendations observed in the said studies.

iii. CBG Plant to prepare the ERP plan

iv. Before commissioning, actual site installation as well as control check points as specified above should be reviewed in consultation with the NGPL /CGD entity, once site readiness confirmation is received from CBG producer.

v. Compliance to NGPL / CGD entity SOP related to Technical & Safety aspects if CBG injection into NGPL/CGD network as revised from time to time.

vi. The commissioning of CBG shall subject to meeting all the technical specifications shared from time to time by NGPL/CGD entity.

vii. Operations & Maintenance activities & frequencies for the equipment & pipeline network in which Biogas is being injected, shall be same as per applicable PNGRB Standard.

viii. Handheld analyser to monitor other impurities should be kept available by CBG producer for CBG being supplied.

ix. The operators shall be equipped with suitable PPEs such as cotton clothing, Safety Shoes, hard hat.

x. MSDS for Biogas (Biomethane) and Odorant (if installed) should be displayed in both English & Local languages.

xi. Colour coding shall be defined for each type of process piping at the site.

xii. CCTV should be provided at critical locations with at least 60 days of backup.

xiii. Standard operating procedures and emergency handling procedures (in coordination with NGPL /CGD entity) shall be established and prominently displayed for safe operation & maintenance bio-gas installation, blending skid, odorization unit, CNG cascade etc. SOP shall also be reviewed and updated periodically. Emergency Protocol and Communication Matrix for Potential Leak Scenario or any other exigencies should be available to CBG producer and NGPL/ CGD entity.

xiv. Emergency Stop push buttons to be installed at critical locations such as control room, outside process area and on equipment such as compressors.

xv. Portable Fire extinguishers should be adequately kept for fighting fire in case of emergency including both ABC type and CO2 type, for each type of assets such as compressors, Pressure regulating skid, Bio-gas storage units, filling point, etc.

xvi. Local Municipal Agencies to be roped in to provide necessary support in emergency scenarios.

xvii. Staff shall be trained, and refresher training shall be provided periodically to Operation & Maintenance staff for safe handling of bio-gas facilities including pipeline network. Staff shall have valid safety certification or completed examinations from the reputed safety organizations.

xviii. For storage of Bio-Gas at the produce end in cylinder cascades and the Cylinders installed on the vehicles shall conform to the safety requirements of the Gas Cylinder Rules which are administered by PESO.

xix. Plant layout and flow diagram and SOPs should be displayed.

xx. Crash barrier should be provided at LCV/HCV loading point.

xxi. The facility should be secured by boundary wall to prevent unauthorized access.

xxii. Management of Change: Any change in existing gas network for injection of CBG should be communicated to CGD/NGPL entity and should be undertaken through Management of Change (MoC) process.

xxiii. All applicable statutory clearance/approvals such as DM NOC, PESO license and State Pollution Control Board etc. for CBG injection/compression system and its allied facilities shall be obtained.

xxiv. PNGRB Guidelines for Road Transportation of Hazardous Petroleum Products, LPG, Natural Gas etc. shall be applicable for mobile cascade transportation.

xxv. Mobile cascades vehicle shall be equipped with VTS, speed governors etc. and driver should have a valid driving license with Hazardous good transportation endorsement.

xxvi. All free vents ends to be equipped with double brass wire mesh of 11 linear per centimeters

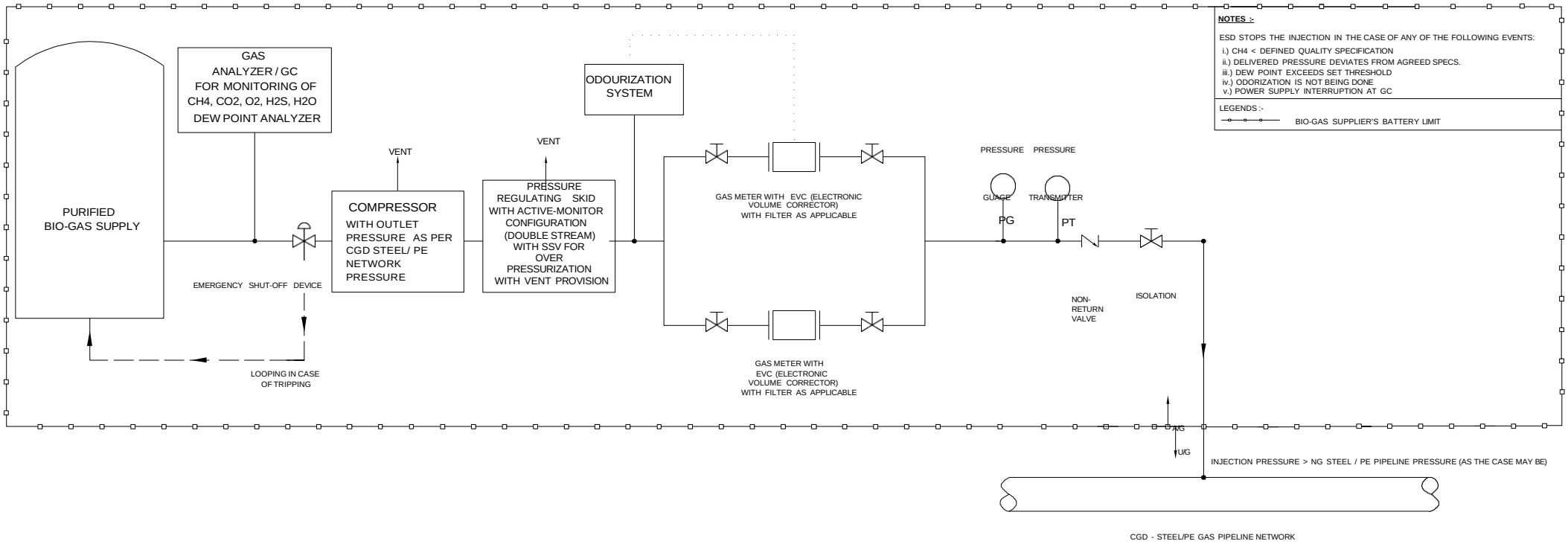
Enclosures:

DRAWING 1. Typical Schematic for Bio-Gas injection into CGD Steel/PE Network
DRAWING 2. Typical Schematic for Bio-Gas injection into NGPL Network
DRAWING 3. Typical Schematic for Bio-Gas For CNG System
DRAWING 4. Typical Schematic for Bio-Gas Injection into CGD/NGPL Pipeline through DCU

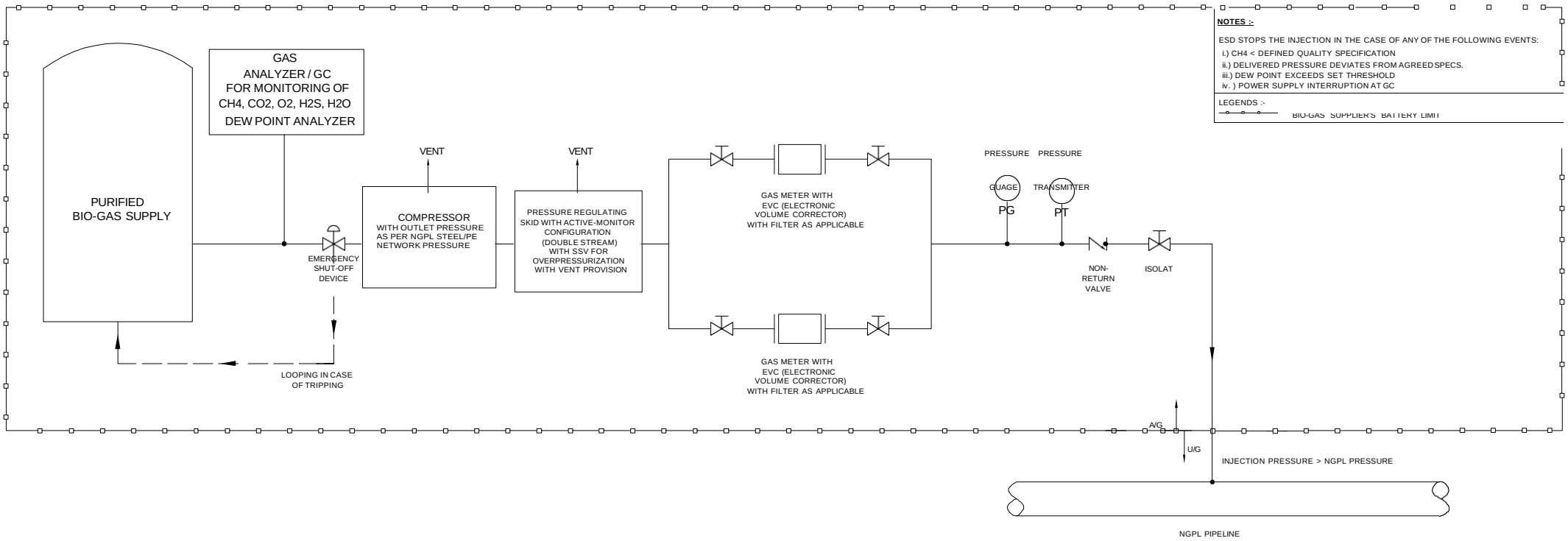
Abbreviations:

AG - Above Ground	LPG -Liquified Petroleum Gas
AGA- American Gas Association	MDPE- Medium-Density Polyethylene pipe
CBG – Compressed Biogas	MOC – Management of Change
CCTV- Closed-Circuit Television	MSDS – Material Safety Data Sheet
CGD: City Gas Distribution	NGPL – Natural Gas Pipeline
CGS - City Gate Station	NOC - No Objection certificate
CMC-Calibration and Measurement Capability	NRV- Non- Return Valve
CNG – Compressed Natural Gas	OEM - Original Equipment Manufacturer.
CRV - Creep Relief Valve	PESO- Petroleum and Explosives Safety Organization
DCU– Decompression Unit	
DM – District Magistrate	PNG- Piped Natural Gas
ERP- Emergency Response Plan	PNGRB – Petroleum and Natural Gas Regulatory Board
GA – Gas Analysers	PRS- Pressure Regulating Skid
GC- Gas Chromatographs	PRV- Pressure Reduction Valve
HAZOP - Hazard and Operability Study	PT – Pressure Transmitter
HCV - Heavy Commercial Vehicle	QRA- Quantitative Risk Assessment.
IEC- International Electrotechnical Commission	ROV- Remote Operated Valve
IS – Indian Standard	SOP - Standard Operating Procedure
ISO - International Organization for Standardization	SOV – Shut Off Value
	UG – Under Ground
LCV - Light Commercial Vehicles	VTS - Vehicle Tracking System
LEL – Lower Explosive Limit	

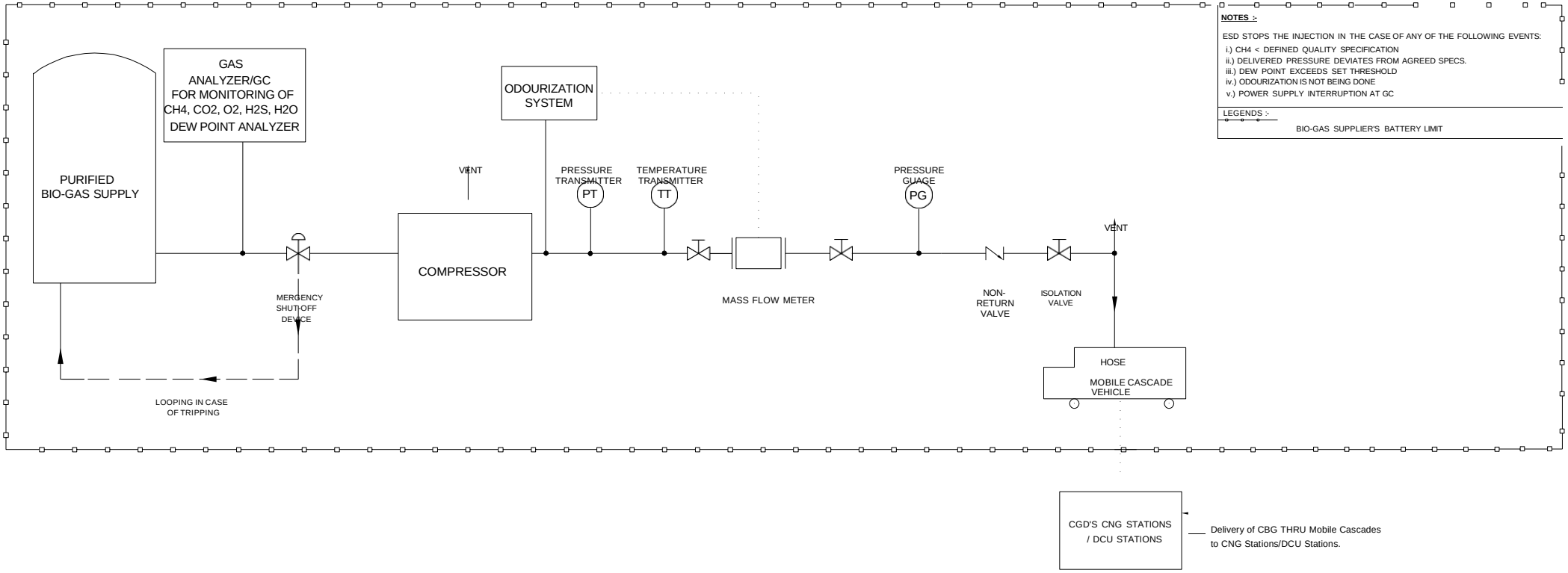
DRAWING 1. Typical Schematic for Bio-Gas injection into CGD Steel/PE Network:



DRAWING 2. Typical Schematic for Bio-Gas injection into NGPL Network:



DRAWING 3. Typical Schematic for Bio-Gas For Mobile Cascade Filling:



DRAWING 4. Typical Schematic for Bio-Gas Injection into CGD/NGPL Pipeline through DCU: