LPG - UTILITY GAS DISTRBUTION NETWORK SYSTEM

GENEREAL GUIDELINES

FOR

RESIDENTIAL & COMMERICAL CUSTOMERS

Revision History:

Rev.#	Revision Comments	By	Date

Approvals:

Document Review	Designation	Signature	Date

TABLE OF CONTENTS

1. INTRODUCTION:

Dubai South (Dubai World Central) is an emerging 145 sq. km master-planned city that is anchored around the Al Maktoum International Airport. It is comprised of significantly large-scale projects which are the Residential District, Commercial District, Golf District, Logistics District and Aviation District.

South Energy (SE) is an integrated energy service provider that is a Wholly Owned Dubai South Subsidiary. SE was incorporated in June 2017 with the key mission of providing full Spectrum of Energy Related Services to Dubai South and its customers. SE is solely responsible for district cooling and central domestic gas within Dubai South and provides additional services in all other energy sectors such as Solar within and far beyond Dubai South boundaries.

2. PURPOSE

This document is intended to be used as overview and guidelines for Investors, Building Owners, Client Representatives, Consultants and Contractors to design, construct and operate and maintain the LPG network gas distribution system and Gas utilization system where in to define the scope of work for DUBAI SOUTH customer and SOUTH ENERGY.

The purpose of guidelines are mainly

2.1 To lay down the technical requirements for design and installation of underground main network gas distribution systems as per best industry practices.

2.2 To ensure material and equipment involved in the gas distribution system and utilization system installations and all are comply with international standards.

2.3 To describe the works, related to the supply, installation, testing, pre commissioning and commissioning activities.

2.4 To lay down the requirements for safe handling of LP Gas.

All DUBAI SOUTH Customers, their Consultants and Contractors will be required to demonstrate their compliance incorporating during designing, constructing and handover of gas distribution system and gas utilization system, meeting the SOUTH ENERGY standards and requirements.

Ref: UAE Civil Defence Chapter 11 #2017

2.2.4. Cylinder type LPG installations in all new and modified buildings is not allowed. It is the strong intention of Civil Defence to install centralized LPG systems in all new and modified buildings and developments.

2.2.5. Permission to install LPG cylinders is strictly subjected to approval of Civil Defence based on site and building inspection.

Note : The customers away from the LPG distribution network (or) network is not yet constructed in the Dubai South districts, the plot developers have to follow the local civil defense requirements for the LPG Central Gas Systems for their domestic and commercial usage. As a policy, such installations initial (design) and final (construction & handover) approvals from the local civil defense shall be submitted to the South Energy for review and information. This information will be useful for South Energy to take the strategic decisions.

3. SCOPE :

SOUTH ENERGY is providing the guidelines for Dubai South development and its plot developers for whom undertaking the design and construction of LPG distribution system and utilization systems which will be connected to SOUTH ENERGY's gas piping network system within its supply areas which includes:

3.1 Gas distribution systems

- Gas Storage and Supply Facility (by Gas Service Provider)
- Distribution Mains (MOP up to 2 bar)
- Gas Service Line Extension (by Plot Developers)

3.2 Utilization systems

- Primary Pressure Reducing and Metering Station (by Plot Developers)
- Internal Gas Piping Works - Utilization System (by Plot Developers)

The work and responsibility of the installation designer and plot developers (building contractor/plot developer) begins at the point of delivery service isolation valve and continues up to gas consuming equipment including all installation pipework with necessary gas leak detection systems.

In the city of Dubai there is no developed centralized Natural Gas distribution system yet, therefore the option is to provide local gas distribution system feed by local Storage Facility with LPG. The LPG will be supplied into the distribution system via Pressure Reducing Station located at the site of the LPG tank farm. The Pressure Reducing Station will feed gas into the polyethylene distribution networks operating at the Intermediate Pressure level of 2 bar and all consumers will be supplied from the 2bar network.

Note: The physical demarcation between the Gas Service Provider and Plot Developers design and build responsibilities are shown in Appendix (ref:Appendix A,B&C) and further details in these guidelines which consist of Building Internal Gas Piping system and Pressure Regulating and Metering Station.

3.3 Utilization System Approval's:

This guidelines shall be applicable to Plot Developers/Contractors/Customers who shall apply to SOUTH ENERGY for Utilization system approvals for following criteria's

3.3.1 To apply and get the NOC for the internal gas piping works – Utilization System for the following

3.3.1.1 Design NOC

The design of internal gas piping works for inside building, starting from the tapping of main isolation valve to the point of delivery at the consuming equipment's along with the PRMS station. But a separate approvals shall be taken for the PRMS design & Construction NOC's (Ref: SE- LPG-NOC-F-001, Rev.0, oct19).

Type of internal piping installations

- Residential Buildings
- Commercial Buildings (Hotel/Restaurants/Schools etc.)

3.3.1.2 Construction NOC

The Contractor/Installer/ Customer shall apply for No objection Certificate (NOC) before starting any work at the site for the Installation of LPG internal building piping.

3.3.1.3 Handover NOC

Contractor/Installer/ Customer shall request for the site inspection to SOUTH ENERGY with relevant documents, drawings, test certificates, commissioning reports and Operation & Maintenance manuals as mentioned in the NOC request form.

3.3.1.4Fit-out NOC

Contractor/Installer/Customer shall request for the NOC to change for any modifications requirements in the existing construction related to the LPG piping utilization system.

3.3.2 To apply and get the NOC for the Pressure Reducing and Metering Station (PRMS) in the following stages

3.3.2.1Design NOC

Contractor/Installer/customer should refer for PRMS design and installation guidelines and apply for the NOC ref: (Ref: SE- LPG-NOC-F-001, Rev.0, oct19).

3.3.2.2 Construction NOC

Contractor/Installer/Customer shall arrange a visit with South Energy for the Site Acceptance for PRMS installation within the plot limit and to get the NOC for construction and installation

3.3.2.3 Handover NOC

Contractor/Installer/ Customer shall request for the site inspection to SOUTH ENERGY with relevant documents, drawings, test certificates, commissioning reports and Operation & Maintenance manuals as mentioned in the NOC request form.

Note: SOUTH ENERGY will commission the gas facilities with LPG only after customer/contractor obtaining No Objection Certificate (NOC) from Authority (Dubai Civil Defense) on internal piping installation.

3.3.2.4 FIT-OUT NOC

Contractor/Installer/Customer shall request for the NOC to change for any modifications requirements in the existing construction related to the PRMS room construction.

4. OBJECTIVE

The Design Guidelines forms a part of a suite of technical documents and provides a platform for:

- Engineering instructions
- Management procedures
- Work Procedures
- Method statements
- Minimum functional specifications
- Material specifications

The objective of the Design Guidelines is to define the basis for the design of LPG gas distribution and utilization systems.

5. REFERENCES:

The Gas System has to be designed in accordance with the following applicable codes, standards and specifications.

- **UAE Fire and Life Safety Code of Practice – Chapter 11** (Liquefied Petroleum Gas code of Practice)
- **NFPA 54**- National Fuel Gas Code
- **NFPA 58** - Liquefied Petroleum Gas Code - 2017
- **NFPA 59** - Utility LP-Gas Plant Code - 2018
- **IGE/GM/8** - Non-domestic meter installations. Flow rate exceeding 6 m3/h and inlet pressure not exceeding 38 bar
- **IGE/UP/2**- Installation pipe work on industrial and commercial premises
- **IGEM/G/5** - Gas in Multi-Occupancy Buildings
- **IGE/TD/3** – Steel and PE pipelines for gas distribution
- **IGE/TD/4** – Gas Services
- **IGE/TD/13** - Recommendations on Pressure Regulation for Transmission and Distribution Systems (not exceeding 100 bar)
- **IGE/SR/25** - Hazardous Area Classification of Natural Gas Installations
- **BS EN 60079** – 10 Classification of Hazardous Areas

- **NFPA 70** – National Electric Code
- **ASME B31.8** - "Gas Transmission and Distribution Piping Systems" (latest edition)
- **ASME B31.3** - Process Piping
- **ASME Section IX** - Welding Procedures
- **BS 7336**- Code of Practice for Fire Extinguishing Installations and Equipment
- **BS 5423**- Code of Practice for control of Undesirable Static Electricity

6. DEFINITIONS & ABBREVIATIONS

6.1. **Shall** - It is a mandatory requirement from Civil Defence.

6.2. **Should** - It is a suggested requirement recommended by Civil Defence but not mandatory.

6.3. **Code** - A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.

6.4. **ANSI** – American National Standards Institute.

6.5. **API** – American Petroleum Institute

6.6. **API – ASME Container (Or Tank)** - A container constructed in accordance with the pressure vessel code jointly developed by the American Petroleum Institute and American Society of Mechanical Engineers.

6.7. **ASME** – American Society of Mechanical Engineers.

6.8. **ASME Code** – The American Society of Mechanical Engineers Boiler and Pressure Vessel Code.

6.9. **Client** – The master developer Dubai South Company or its appointed representative.

6.10. **Contractor** – The organization or its appointed representative, responsible for execution of the works

6.11. **Competency** - The possession of a minimum level of knowledge, experience and proficiency required to collect appropriate information, make informed decisions, and physically take the needed actions to deliver the high-quality service of gas piping system installation.

6.12. **Customer** – The owner/ sub-developer in-charge of the building.

6.13. **Engineer –** SOUTH ENEGY's supervision engineer or its appointed representative.

6.14. **SOUTH ENERGY** – The utility company which provides District Cooling, Gas supply, Energy Management and Waste Management services

6.15. **Developer** – The owner of the district.

6.16. **Sub-developer** – The owner of the building.

6.17. **Vendor** – Any invited companies being fully eligible to submit the tender. The successful vendor will be the contractor or supplier.

6.18. **Supervising Consultant** – Customer appointed representative.

6.19. **Concrete Pad –** A foundation consisting of solid concrete or masonry blocks, a placed concrete slab, or a poured concrete foundation.

6.20. **Design Pressure** - The maximum pressure at which the equipment or system is designed to operate.

6.21. **Emergency Control Valve (ECV) -** A valve that is part of the Gas Distribution System. An ECV is utilized in an emergency to shut off the supply of gas and shall also be deemed to be the customer meter control valve immediately prior to the inlet of the Customer Primary Meter Installation.

6.22. **Emergency Isolation Valve (EIV)** - A valve that is part of a Gas Utilization System. An EIV is to be used to isolate a section of pipework such as a lateral or an entire area of a building.

6.23. **Flexible Connector** - A short [not exceeding 36 in. (0.91 m) overall length component of a piping system fabricated of flexible material (such as hose) and equipped with suitable connections on both ends, approved and certified for fuel gas.

6.24. **Flexible Hose Connector** – A component fabricated from LP-Gas hose that is made from a material that is compatible with LP-Gas.

6.25. **Flexible Metallic Connector** - A component fabricated from metallic material that provides liquid and vapor LPGas confinement and is provided with connections on both ends.

6.26. **Gallon** - U.S. Standard. 1 U.S .gal = 0.833gas (LP-Gas) Gallon, U.S.Standard. 1 U.S. gal = 0.833 Imperial gal = 231 in.3 = 3.785 L.

6.27. **Gas** - For the purposes of this code, liquefied petroleum (LP- Gas) in either the liquid or vapor state.

6.28. **Gas Piping** - An installation of pipe, valves or fittings installed on premises or in a building and utilized to convey fuel gas.

6.29. **Listed** - Approved and registered by Civil Defence material department

6.30. **LPG (Liquefied Petroleum Gas)** -Liquefied petroleum gas is classified as flammable, liquefied, and fuel. Any material having a vapor pressure not exceeding that allowed for commercial propane that is composed predominantly of the following hydrocarbons, either by themselves or as mixtures: propane, propylene, butane (normal butane or isobutene), and butylene's. LPG is stored in liquid form at high pressures. Because the LPG is twice heavier than air, if leaked from container, flows back to lower levels and accumulates around container. Most commonly used cooking fuel in UAE is LPG.

6.31. **LPG System** - An assembly consisting of one or more containers with a means for conveying LP Gas from a container to dispensing or consuming devices that incorporates components that control the quantity, flow, pressure, and physical state (liquid or vapor) of the LP Gas.

6.32. **Temporary Installation** - An installation of LPG cylinders, piping, and equipment at a particular location for a brief period of time, usually one day to 40 days during events and Ramadan. This installation is normally expected to change in status, condition, or location. Temporary LPG installations require Civil Defence approval.

6.33. **Maximum Allowable Working Pressure (MAWP) –** The maximum pressure at which a pressure vessel is to operate as described by the ASME ***Boiler and Pressure Vessel Code*.**

6.34. **Mounded Container** – An ASEM container designed for underground service installed above the minimum depth required for underground service and covered with earth, sand, or other material, or an ASME container designed for aboveground service installed above grade and covered with An ASME earth, sand, or other material.

6.35. **Pressure Relief Valve** - A type of pressure relief device designed to both open and close to maintain internal fluid pressure to a specified value.

6.36. **Positive Shutoff Valve** - A shutoff valve that, in the closed position, does not allow the flow of product in either direction.

6.37. **Emergency Shutoff Valve** - Emergency shutoff valve is a positive shutoff valve that is equipped for remote closure and automatic shutoff using thermal (fire) activation or any other sensor.

6.38. **Excess-Flow Valve (or Excess-Flow Check Valve**) - A valve designed to close when the liquid or vapor passing through it exceeds a prescribed flow rate.

6.39. **Vaporizer** - A device, other than a container, that receives LP Gas in liquid form and adds sufficient heat to convert the liquid to a gaseous state.

6.40. **Point of Transfer/Filling Point** - The location where connections and disconnections are made or where LP Gas is vented to the atmosphere in the course of transfer operations.

6.41. **Overfilling Prevention Device (OPD)** - A safety device that is designed to provide an automatic means to prevent the filling of a container in excess of the maximum permitted filling limit.

6.42. **Overpressure Shutoff Device** – A device that shuts off the flow of LP-Gas vapor when the outlet pressure of the regulator reaches a predetermined maximum allowable pressure.

6.43. **UPSO** – Under pressure shut-off device.

6.44. **ASME Container** - A container constructed in accordance with the ASME Code.

6.45. **Regulator :**

6.45.1. **First-Stage Regulator**- A pressure regulator for LP Gas vapor service designed to reduce pressure from the container to 10.0 psig (69 kPag). For example, for residential usage pressure is reduced to 1 psi (75 mbar) and reduced to 5 psi (350 mbar) for large commercial usage

6.45.2. **Second-Stage Regulator**- A pressure regulator for LP Gas vapor service designed to reduce first-stage regulator outlet pressure to 14 inch WC (4.0 kPag) or less.

6.46. **Pressure Reducing and Metering Station (PRMS)** - Each regulation stream must include an active regulator, a monitor regulator and a slam shut valve. Under normal operating conditions, the active regulator will control the outlet pressure at a fixed value. The monitor regulator will be set at a pressure slightly higher than the active regulator and under normal operating conditions will be wide open.

6.47. **Line Pressure Regulator**- A pressure regulator in accordance with the standard for line pressure regulators, ANSI Z 21.80/CSA 6.22, with no integral overpressure protection device for LP Gas vapor service designed for installation inside a building to reduce a nominal 2-psi inlet pressure to 14 inch WC (4.0 kPa) or less.

6.48. **Two-Stage Regulator System** - An LP Gas vapor delivery system that combines a first-stage regulator and a second-stage regulator(s), or utilizes a separate integral two-stage regulator.

6.49. **Fuel (LPG) Demand** - The maximum amount of gas input required per unit of time, usually expressed in cubic feet per hour, or in energy units like Btu/h (1 Btu/h = 0.2931 W).

6.50. **Sources of Ignition** - Devices or equipment that, because of their modes of use or operation, are capable of providing sufficient thermal energy to ignite flammable LP-Gas vapor–air mixtures when introduced into such a mixture or when such a mixture comes into contact with them, and that will permit propagation of flame away from them.

6.51. **Separation distance** - The minimum horizontal and vertical distance through air measured between the LPG container/tank surfaces to the required safe distance.

6.52. **LPG Riser** - A vertical pipe supplying fuel gas.

6.53. **Shaft -** An enclosed 2-hour fire rated space extending through one or more stories of a building, connecting vertical openings in successive floors, or floors and the roof.

6.54. **SIV - Service Isolation Valve** - an underground service isolation valve (SIV) is provided in the each individual plot valve chamber.

6.55. **Vent** - A pipe or other conduit composed of factory-made components, containing a passageway for conveying combustion products and air to the atmosphere, listed and labeled for use with a specific type or class of appliance.

6.56. **Vent Piping** - Piping run from a pressure-regulating device to the outdoors, designed to provide a reference to atmospheric pressure. If the device incorporates an integral pressure relief mechanism, a breather vent can also serve as a relief vent.

6.57. **UL** - Underwriters Laboratories Inc.

6.58. **Utility Gas Plant –** A plant that stores and vaporizes LPGas for distribution that supplies either LP Gas or LP-Gas gas–air mixtures to a gas distribution system of 10 or more customers.

6.59. **Water Capacity – The** amount of water at 60°F (16°C) required to fill a container.

6.60. **Maximum Allowed LPG Quantity** - Maximum allowed LPG quantity referred to in this Chapter is the total quantity installed in the building, either in a single tank or in multiple tank arrangements.

6.61. **PSI.** Pounds per square inch.

6.62. **PSAI.** Pounds per square inch absolute.

6.63. **PSIG.** Pounds per square inch gauge.

6.64. **Gas Storage and Supply Facility (by Gas Service Provider) -** The civil, mechanical, and electrical infrastructure necessary to provide gas storage tanks, vaporizers, related equipment,

connecting piping, control and safety devices, filling facilities, instrumentation and control equipment, gas pressure and flow control facilities and related infrastructure and including the main gas outlet supply valve to a gas distribution network.

6.65. **Gas Distribution Network and Service Line (by Gas Service Provider)** - Gas piping of various sizes below ground transporting gas vapor from the outlet of a gas storage and supply facility, operational and safety shut off valves and including service line up to the plot limit with service valve and end cap for extension of the connection facilities.

6.66. **Service Line Extension (by Plot Developers)** - A pipeline connection from existing service line valve to a specific building, Townhouses, Commercial building and malls where gas is to be used by consumers including the safety shut off valve up to the point of entry to the building or the inlet of the Primary Pressure Reducing and Metering station.

6.67. **Primary Pressure Reducing and Metering Station (by Plot Developers)** - All equipment and piping including regulators (active and monitor), relief valves, strainers, isolation valves, meters, pressure gauges and necessary equipment to reduce the pressure.

6.68. **Internal Gas Piping Works - Utilization System (by Plot Developers)** - All gas piping, risers, droppers including main solenoid valve assembly, operational and safety devices, isolation valves, regulators, meters, strainers, pressure gauges, gas detector with gas leak detection panel, cabling for gas leak detection system and all necessary equipment's to distribute gas throughout residential building or commercial building or complex from the outlet of the Primary pressure reducing and metering station, up to the gas appliance.

7. RESPONSIBILITIES

7.1 SOUTH ENERGY RESPONSIBILITIES

SOUTH ENERGY shall be responsible for communicating the design requirements of LPG distribution system and utilization gas system for the internal piping works to its plot developers/ consultants/ contractors/ customers stated herewith ensuring UAE Fire and Life Safety Code of Practice – Chapter 11, NFPA 54, NFPA 58, relevant IGEM codes and SOUTH ENERGY guidelines compliance, such requirements may correlate with LPG network construction and operation, confirming the allocated demand load for the customers with regards to its development, and therefore SOUTH ENERGY is the authority to control and regulate the LPG system guidelines conforming to all relevant standards requirements to meet design criteria for both LPG underground network piping and Building secondary piping from the service line extension.

7.2 DUBAI SOUTH CUSTOMERS RESPONSIBILITIES

7.2.1. The Plot developer / owner through his consultant and Contractor shall be responsible for the items listed below:

7.2.2. To design, procure, supply, install, test and commission all necessary PRMS room & Inside building gas piping works such as Pressure Regulators, Slam Shutoff valves, Solenoid valves, Pressure gauges, Ball Valves, Pressure relief valves, CS piping / fittings, strainers, valves, RPD meters, flowmeters, flanges, PE Transition fittings necessary instrumentation to provide fully functional PRMS to meet design criteria for both LPG underground network piping and & Building inside secondary piping starting from service line extension (material submittals and specifications to be submitted to SOUTH ENERGY for approvals)

7.2.3. To supply, install, test and commission the underground HDPE piping (from existing gas service line PE –isolation ball valve to (tie-inn) till the point of delivery (positive shut off valve) inside the kitchen including gas detection system with control panel interfaced with FACP (Fire Alarm Control Panel). The plot valve chamber (manhole) will be within plot limit where in connected to main underground gas service piping network. (Plot Valve Chamber details with levels to be coordinated with DUBAI SOUTH-Planning & Zoning as per infrastructure consultant details)

7.2.4. To design, supply, install, test, commission of both primary side (from existing gas service line PE- Isolation ball valve) and inside building secondary piping and PRMS room equipment's specification shall be submitted to SOUTH ENERGY for approvals)

7.2.5. Actual completion dates for PRMS room inside works should be provided in advance to SOUTH ENERGY dept. for readiness to connect / supply LPG from the underground piping network.

7.2.6. All the shop drawings of the building starting from the pre-installed underground PE pipe to the point of delivery shall be submitted to the SOUTH ENERGY for approvals)The drawings should contains the information of

1. Cover letter
2. Affection plan /Site key plan
3. Infrastructure drawings
4. All floor plans
5. LPG piping layout on roof top
6. Electro – Mechanical schematic flow diagrams
7. Setting out plan
8. Typical detailed drawings

To provide proper regular maintenance to the PRMS and inside building secondary piping system, its associated fittings, accessories & gas detection system maintenance shall be done quarterly once and the same reports shall be submitted to SOUTH ENERGY for review. However, the Primary side underground PE piping and Gas farm maintenance and its management will be done by SOUTH ENERGY.

8. DESIGN PRINCIPLES

8.1 THE KEY DESIGN PRINCIPLES THAT SHALL BE ADHERED TO ARE:

8.1.1. In all matters, the overriding goal designing and installing the utilization network is in consideration with safety of the public, customers, property and protection. Adoption of the best international practices utilizing appropriate modern technology.

8.1.2. The project shall be designed for minimum life cycle cost consistent with the efficient operating practices meeting all health, safety and environmental protection requirements. In addition, the design principles will be including assurance of a safe, reliable, effective, efficient and secure supply of gas.

8.1.3. Ensure that gas piping system installed in Dubai South is identical for ease of operation and maintenance and avoiding any complicated installation. In addition the design principles will include assurance of a safe, reliable, effective, and efficient and secure of gas supply system in all building premises in Dubai South

8.2 LPG NETWORK DESIGN PARAMETERS AND SYSTEM CONFIGURATION

8.2.1. LPG Composition 30% Propane and 70% Butane

8.2.2. Higher Heat Content or calorific valve = 1,07,508 Btu/m3 (47,338 Btu/kg)

8.2.3. Specific Gravity = 1.86

8.2.4. Maximum Operating for existing networks – the regulated LPG vapor pressure delivered from storage shall be 2 bar

8.2.5. Minimum available pressure 1.2 bar at the service line

8.2.6. Maximum allowed delivered pressure to commercial customers has MOP 350 mbar

8.2.7. Maximum allowed delivered pressure to residential consumers has MOP 75 mbar

8.2.8. Maximum utilized pressure at residential appliances is 37 mbar

8.2.9. Maximum allowed pressure drop for utilization pipes is 10% and velocity is less than 20 m/s.

8.2.10. All gas detection systems to be designed in compliance with Dubai Civil Defense requirements.

8.3 GAS DESIGN PRINCIPLES FOR SUPPLY AND DISTRIBUTION

The primary function of a gas service is to transport LP Gas from a distribution main to service isolation valve (SIV). Each gas service shall be sized to deliver the quantity of LP Gas that meets the connected customer requirements. A gas service is the takeoff from distribution line to each individual plot.

The design principles shall include:

8.3.1. Assurance of a safe, reliable, effective, efficient and secure supply of gas

8.3.2. The load that applied for design calculations shall be considered with the diversity factor of consumption based on the application.

8.3.3. These principles will be achieved by:

8.3.4. The availability of LPG is considered suitable for constant and adequate to supply the peak demand.

8.3.5. Controlling the flow of gas in the event of damaged facilities or components will be incorporated in the design.

8.3.6. Velocities will be in accordance with IGEM recommendations and not exceed 20m/s respectively under the conditions of lowest operational pressure and maximum flow rate.

8.3.7. Pipe grade and wall thickness will be selected by considering design conditions hoop stress, safety and design factors and corrosion allowance as per Dubai Civil Defense Requirements.

8.3.8. The hourly flow rate for pressure regulating station is assumed to provide a sufficient supply and constant downstream delivery pressure. It will be considered to operate normally to fulfill current and future demand.

8.3.9. Only standard, well-proven equipment will be used and customized or “first of a kind” selections will be avoided. Major equipment items of equipment common to each PRMS will be standardized to optimize operational and maintenance effort and to reduce spare parts.

8.3.10. All material, assemblies, and installations will assure correct functionality and operability under local ambient conditions and will be subject to Client approval.

8.3.11. The design will allow construction to be completed using existing and/or reasonably available methods, tools and equipment.

8.3.12. The design of the facilities shall provide for ease of all operation and maintenance activities

8.3.13. For some customers, multi-occupancy buildings and commercial or industrial installations, an underground service isolation valve (SIV) shall be installed for manually isolating the supply of LP gas from the connected customers.

8.4 GAS LOADS ASSUMPTIONS

Peak hour loads are determined by diversifying total connected loads. The connected gas loads calculated using presented information about type of the consumer and based on following load assumptions for Natural Gas generally using for UAE which can be recalculated to LPG load according to calorific value.

These loads are then used for the design of the Gas supply facility and the Gas Distribution Network and Gas utilization system.

Gas Assumptions (Residential and Commercial Building)			
Property Type	Peak Hour m3/hour (NG)	Peak Hour m3/hour (LPG)	Diversity Factor
Apartment	1.0	0.4	0.2
Villa	1.7	0.6	0.3
Restaurant	16	6.0	See Note 1
Mall Restaurant	16	6.0	See Note 1
Large Hotel	400	140	-
Other Hotel	65	25	-

Note 1: Restaurants diversity factor:

a) 1-5 Restaurants diversity factor 1.0
b) 6-10 Restaurants diversity factor 0.8
c) 11-15 Restaurants diversity factor 0.75
d) Above 15 Restaurants diversity factor 0.7

8.5 PRIMARY PRESSURE REDUCING AND METERING STATION (PRMS) AND SOLENOID VALVE ASSEMBLY

8.5.1. Each regulation stream must include an active regulator, a monitor regulator and a slam shut valve.

8.5.2. Under normal operating conditions, the active regulator will control the outlet pressure at a fixed value.

8.5.3. The monitor regulator will be set at a pressure slightly higher than the active regulator and under normal operating conditions will be wide open.

8.5.4. If the active regulator should fail open, the outlet pressure would rise to the set point of the monitor which would then begin to control at the slightly higher pressure. In the extreme event that both active and monitor regulators should fail open, the pressure would rise to the set point of the slam shut valve which would then close, isolating that stream.

8.5.5. A check valve can be installed downstream of the regulators in case twin stream PRS but upstream of the sensing points of the active and monitor regulators in each line.

8.5.6. The sensing point of the slam shut valve will be located between the active regulator and the check valve. This will allow the standby stream to remain operational in the event the active slam shut closed due to high outlet pressure.

8.5.7. An incorporated relief valve will prevent "nuisance" closure of the slam shut valve in the event there is a pressure build-up from the flow through the pilots during periods when the station is not operating, this is especially important when considering a small downstream system.

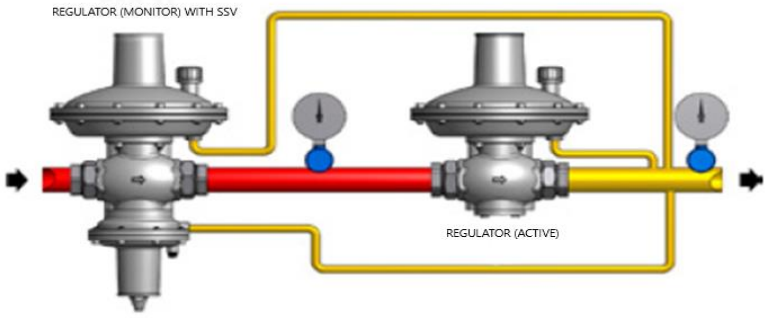
8.5.8. A solenoid valve shall be installed at downstream of the primary PRMS and for bypass either a physical disconnection with plugged valves to be provided, or single valve lockable type normally locked position shall be provided.

8.5.9. The pressure reducing station should be constructed, installed and commissioned as per IGE/TD/13 and IGE/GM/8 standards

A PRMS should be installed in such a way that:

- Adequate space is available for the installation of associated equipment
- Adequate space for construction and maintenance is available
- Space for additional anticipated equipment is available

- Space for emergency egress is available
- Adequate ventilation should be available



Active Pressure Regulator and Monitor with Slam Shut off Valve

9. INSTALLATION OF GAS PIPING INSIDE BUILDING REQUIREMENTS

9.1 INTERNAL GAS PIPING INSTALLATION WORKS - UTILIZATION SYSTEM (BY PLOT DEVELOPERS)

9.1.1. All piping, fittings and equipment used shall be suitable for purpose and in compliance with the UAE civil defense standards and specifications

9.1.2. Where the customer PRMS installation is located at the boundary wall, the downstream piping should be extended to the villa below ground using PE pipe or above ground piping should be carbon steel Schedule 40 Grade B. The below ground pipe work not run in villa or conceal in cement. Below ground pipe work shall be in accordance with IGE/TD/4 gas services.

9.1.3. Designer shall ensure the gas pipes service to the plot is accurate.

9.1.4. Customer Installation piping work extends from the outlet valve of the Pressure Reducing & Metering Station (Customer Primary Meter) to the consumer appliances. (PRMS Scope? Customer/Contractor/South Energy?)

9.1.5. At the initial stages of building design and planning the designer/Installer needs to ensure that the Customer Internal Piping connected to the PRMS outlet valve are adequately designed in order to provide a safe supply of gas to the point of use.

9.1.6. Residential unit and apartment pipe work in the kitchen shall be installed with shutoff valve, solenoid valve, low pressure regulator with UPSO, auto-shutoff valve, gas meter, Emergency switch, and domestic gas leak detection system as minimum.

9.1.7. Gas regulator in the building shall be able to be operated with 75mbar incoming pressure from the main Pressure Reducing and Metering Station.

9.1.8. Risers/droppers shall be installed external to the building or in shafts/ducts ventilated.

9.1.9. Risers/droppers installed in the shaft/duct shall be steel, of fully welded construction.

9.1.10. Droppers will be in steel / copper and installed in ventilated shafts/ducts and copper pipes cannot be used for droppers with length above 20m.

9.1.11. An isolation valve will be installed at the top of each dropper

9.1.12. Shaft dedicated for gas distribution system for building shall be 2 hr. fire rated

9.1.13. Pipe in pipe containment arrangement with approved pipes sleeves and LPG detection system shall be used for routing LPG pipe lines through enclosed, nonventilated or basement areas with at least one end open to air.

9.1.14. Pipe in pipe system shall be used to prevent gas leakage entering a building in the exceptional cases where it is necessary for riser or dropper pipe work to enter the building other than in a ventilated duct or shaft.

9.1.15. For residential units an automatic shut off valve / manual ball valve shall be installed downstream of the consumer meter unit.

9.1.16. Pressure loss calculations and friction factor shall be in accordance with IGE/UP/2 standard.

9.1.17. Diversity should be taken into account when determining pipe sizes.

9.2 RESIDENTIAL VILLAS

9.2.1. Where the customer PRMS installation is located at the boundary wall, the downstream piping should be extended to the villa below ground using PE pipe or above ground piping should be carbon steel Schedule 40 Grade B. The below ground pipe work shall not run in villa or conceal in cement. Below ground pipe work shall be in accordance with IGE/TD/4 gas services.

9.2.2. Operating pressure in the downstream of PRMS Pipe work operating pressure shall depend on load and distance between customer primary meter installation and point of entry to a building but shall not exceed 75mbar.

9.2.3. Maximum operating pressure within the building should be 75mbar.

9.2.4. Primary regulator shall be installed outdoor building which is fitted with relief mechanisms shall ensure that the gas is vented directly to the outside atmosphere.

9.2.5. Secondary regulator 37mbar shall be installed inside kitchen and incorporate with UPSO

9.2.6. Pressure loss calculation and friction factors shall be in accordance with IGE/UP/2 and Equivalent lengths of valves and fittings will be added to the pipe length.

9.2.7. The building internal piping shall be designed to deliver at least the minimum operating pressure of all connected appliances.

9.2.8. LPG related safety equipment (i.e. solenoid valve, gas detector, and low-pressure shutoff) shall be installed to monitor leakage and isolate the gas supply.

9.3 RESIDENTIAL AND RESIDENTIAL / COMMERCIAL MULTI-STORY BUILDINGS.

9.3.1. Pressure from the gas distribution system at the outlet of the primary PRMS should not exceed 75mbar for residential building.

9.3.2. Pressure from the gas distribution system at the outlet of the primary PRMS should not exceed 350mbar for residential/commercial building.

9.3.3. Diversity factor should be taken into account when determining pipe sizes.

9.3.4. Pressure loss calculation and friction factors shall be in accordance with IGE/UP/2 and Equivalent lengths of valves and fittings will be added to the pipe length.

9.3.5. Expansion joints and flexible connections shall be considered to avoid unacceptable stresses being inflicted on any lateral pipe work.

9.3.6. Pipe work shall be supported adequately along its entire length.

9.3.7. Threaded steel pipe work shall be used 2" and below for schedule 40

9.3.8. Pipe work above ceiling, basement or in voids shall have pipe in pipe arrangement and gas detection equipment linked to a safety shut off devices capable of monitoring and shutting off the pipe work supplying that area.

9.3.9. Risers should be installed external to the building or inside shaft with 2hr. fire rated.

9.3.10. All risers and droppers shall be provided with isolation valve at the top of each dropper.

9.4 Small Commercial Installation

9.4.1. Meter installation should connect into the customer internal pipework as close as possible to the entry point to the building

9.4.2. Isolation valve are required immediately downstream of the point of entry into any building.

9.4.3. Delivery pressure shall be not excess of 350mbar.

9.4.4. Secondary pressure regulator shall be installed in customer PRMS with UPSO

9.4.5. All above ground pipe works should be carbon steel schedule 40 Grade B.

9.4.6. The maximum allowable pressure drop is 10% of the delivery pressure.

9.4.7. Diversity should not apply to the design of commercial piping systems.

9.4.8. Pressure loss calculation and friction factors shall be in accordance with IGE/UP/2.

9.4.9. Equivalent lengths of valves and fittings will be added to the pipe length.

9.4.10. LPG related safety equipment (i.e. solenoid valve, gas detector, and low-pressure shutoff) shall be installed to monitor leakage and isolate the gas supply.

9.5 Medium / Large Commercial

9.5.1. Medium and large commercial premises shall be treated on an individual basis.

9.5.2. Meter installation (Primary) should be located at or near the existing service line and any downstream piping shall be extended below ground in PE and/or above ground in steel pipe to the point of entry into building.

9.5.3. All above ground pipe works should be carbon steel schedule 40 Grade B

9.5.4. Delivery pressure shall be not excess of 350mbar.

9.5.5. Regulator installations within installation pipe work shall incorporate OPSO and UPSO capabilities.

9.5.6. Pressure loss calculation and friction factors shall be in accordance with IGE/UP/2.

9.5.7. Equivalent lengths of valves and fittings will be added to the pipe length.

9.5.8. Suitable isolation valves shall be installed in appropriate locations in the pipe work downstream of the customer (Primary) meter installation and shall be clearly tagged as such.

9.5.9. Where the gas installation has multiple branches an isolation valve shall be installed on each branch.

9.5.10. All Risers / droppers shall be running inside 2hr fire rated dedicated shaft (Minimum 30cmx30cm) and shaft shall be naturally ventilated to open to air.

9.6 Kitchen Safety Devices

9.6.1. The solenoid valve should be located upstream of the regulator and as close as possible to the ECV

9.6.2. The solenoid valve is activated by either output from the gas detector or the wall mounted "on-off" switch.

9.6.3. The gas detector shall be positioned at suitable low-level location and not more than 300mm from finished floor level in accordance with Civil Defense requirements

9.6.4. Pipe work to each appliance shall terminate with an appropriately anchored fitting.

9.6.5. An automatic shut off valve / manual ball valve shall be installed downstream of the meter for residential kitchen.

10. MATERIAL TECHNICAL SPECIFICATIONS & REQUIREMENTS

10.1 Piping Materials

10.1.1. General

Pipe fittings and component shall be designed and installed in accordance with relevant standards. Material shall have the physical properties suitable to the proposed duty considering all surrounding forces, operating temperature and pressure

10.2. Carbon Steel Seamless Pipes

10.2.1. The pipes should be seamless carbon steel manufactured to ASME B36.10M, API 5L, ASTM A106 or A53 and the grade shall be Grade B. specifications. The pipes should be schedule 40.

10.2.2. Risers, rooftop laterals, and droppers may be tested individually. However, the total pipework may be subjected to an overall test before commissioning.

10.2.3. Test pressure will be 1.5 x MOP.

10.2.4. Testing will be in accordance with IGE/UP/1 or 1A

10.2.5. Pipe should be installed in locations where there is little risk of accidental damage or protected against accidental damage by a sleeve or casing.

10.2.6. Pipe will be painted with an approved yellow paint.

10.2.7. Pipe will generally be installed at high level and supported by suitable hangers, pipe clamps or brackets. Horizontal and vertical support spacing is as follows below table:

10.2.8. Table - Minimum Support Interval – Steel Pipe

Nominal Diameter	Welded Steel (horizontal)	Screwed Steel (horizontal)	Welded Steel (vertical)	Screwed Steel (vertical)
15mm	2.5m	2.0m	3.1m	2.5m
20mm	2.5m	2.5m	3.1m	3.1m
25mm	3.0m	2.5m	3.7m	3.1m
32mm	3.0m	2.7m	3.7m	3.3m
40mm	3.5m	3.0m	4.3m	3.7m
50mm	4.0m	3.0m	5.0m	3.7m
65mm	4.5m	n/a	5.6m	n/a
80mm	5.5m	n/a	6.8m	n/a
100mm	6.0m	n/a	7.5m	n/a
150mm	7.0m	n/a	8.7m	n/a
200mm	8.5m	n/a	10.6m	n/a

10.3. Steel pipe Fittings

10.3.1. Flanges:

Forged steel welding neck/raised face flanges will be in accordance with ASTM A105. Flange welding ends shall match the pipe wall thickness.

10.3.2. Welded Fittings

Welding fittings will be in accordance with ANSI B16.9, material ASTM A 234 WPB.

10.3.3. Threaded fittings

Threaded fittings will be in accordance with API standards. Threads will be NPT, material ASTM A 105.4

10.4. Gaskets, Bolts and Nuts

10.4.1. BS 3381: 1989 : Specification for spiral wound gaskets for steel flanges to BS 1560

10.4.2. ASME B16.20: Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound, and Jacketed.

10.4.3. ASME B16.21: Nonmetallic Flat Gaskets for Pipe Flanges

10.4.4. ASTM A193 : Standard Specification for Alloy-Steel and Stainless-Steel Bolting for High Temperature or High-Pressure Service and Other Special Purpose Applications

10.4.5. ASTM A194 : Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

10.4.6. ASTM A153 : Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

10.5. Copper Piping and Fittings

10.5.1. Copper piping 15mmmay be used for kitchen pipe work with MOP below 75 mbar only

10.5.2. Copper pipe will be secured to permanent walls and supported at regular intervals using stand-off clips.

10.5.3. Copper pipes cannot be used for risers and droppers with length above 20m and copper pipes is not applicable in areas with potential risk of third-party damage (at roofs and walls).

10.5.4. Below provide support spacing details

Minimum Support intervals - Copper Pipe

Nominal Diameter	Horizontal	Vertical
15mm	1.5m	2.0m

10.5.5. Copper pipework to each appliance shall terminate with an appropriately anchored fitting.

10.5.6. Copper pipes shall be in compliance to BS EN 1057

10.5.7. Copper fittings shall be in compliance to BS 2051-1, BS EN 1254

10.5.8. Testing, purging and commissioning will be in accordance with IGE/UP/1A or 1B as appropriate.

10.6. Ball Valves

10.6.1. The valves for distribution piping shall be of carbon steel, above 2" flanged type and 2" and below is threaded type CS / Brass ball valve and minimum operating pressure is 5bar.

10.6.2. The valve should be manufactured to API 6D and should be fire safe. The valves should be suitable for use with fuel gases

10.7. Strainers / Filters

10.7.1. A removal strainer/filter shall be fitted to the inlet of regulator. The size of the strainers/filter mesh shall be 50 micron. Design code of filter is ASME Sec. VIII Div.1 or equivalent. The strainers shall be used-Type.

10.7.2. 100% Factory Pressure Tested

10.7.3. Filters/strainers protect downstream process system components by mechanically removing unwanted solids from liquid, gas, or steam lines by means of a perforated or wire mesh straining element.

10.7.4. For Primary PRMS 2" and below shall be strainers and above 2" shall be used filters

10.8. Pressure Regulators

10.8.1. The 1st stage pressure regulators for Primary PRMS include two pressure regulators (active and monitor with SSV) 2 bar to 75 mbar (or 350 mbar).

10.8.2. The 2nd stage pressure regulators 75 mbar (or 350 mbar) to 37 mbar will be equipped under-pressure safety device (UPSO)

10.8.3. Design code: BS EN 334 or Equivalent, Diaphragm Material: Nitrile synthetic rubber with cloth reinforcement or Equivalent Body: Die cast Aluminum / Ductile Iron / Carbon Steel or Equivalent the pressure regulators should be suitable for use with LP Gases.

10.9. Pressure Relief Valves

10.9.1. Pressure Relief valve shall be installed downstream of the active regulator in the primary PRMS room

10.9.2. Pressure Relief valve vent stack shall be terminated above 3m from the ground level.

10.9.3. Pressure relief valves shall be equipped with direct spring-loaded pressure relief valves conforming to applicable requirements of UL 132 Standard or equivalent

10.9.4. The relief valves with automatic exhaust spring control, absorb and release outside pressure in the flow.

10.10. Gas Meters

10.10.1. Approvals, All meters shall comply to IGE/GM/8 requirements and shall be produced according to follow codes:

10.10.2. BS EN 12480, BS 4161-6 or Equivalent for RPD (Rotary Positive Displacement) Meters

10.10.3. BS EN 12261, AGA 7 or Equivalent for Turbine Meters

10.10.4. BS EN 1359 or Equivalent for Diaphragm Meters

10.10.5. EN 14236 Ultrasonic domestic gas meters.

10.11. Accuracy

Standard accuracy limits for CT-models are in accordance with the EC directives and many foreign regulations:

± 1% or better for Turbine and RPD meters within range

± 2% or better for Diaphragm Meters within range

10.12. Range ability

10.12.1. Not Less than 1:20 for Turbine Metes

10.12.2. Not Less than 1:50 for RPD and Diaphragm

10.13. Selection of Gas Meter type

Gas Meter G2.5, G4, G6, G10 and G16 shall be diaphragm type and G25 and above shall be Rotary Gas Meter (RPD) / Turbine Gas Meter

10.14. Solenoid valve

10.14.1. Solenoid valve is an electromechanical device used for controlling gas flow by turning on or off the valve and normally connected to gas leak detector, and emergency switch. Solenoid valve as part of safety system.

10.14.2. Emergency shut-off solenoid valve shall be located in the downstream of the primary PRMS and for the apartment kitchens / retails kitchens shall be upstream of the regulator and shall be directly controlled by gas detector.

10.14.3. By pass valve for solenoid valves are generally not allowed. However, in case design includes by-pass for the solenoid valve, either a physical disconnection with plugged valves to be provided, or single valve lockable type in normally locked position shall be provided.

10.14.4. Solenoid valve shall be suitable to be used for fuel gas.

10.15. Pressure Gauges

10.15.1. Pressure gauges shall be fitted with isolation valve.

10.15.2. Pressure gauges design shall be ASME B40.100 & EN 837-1 or Equivalent.

10.15.3. Material: 316L stainless steel

10.15.4. Dial Size minimum: 63mm

10.16. PE – Pipes (Below Ground)

10.16.1. The pipe should be PE 100, SDR 11 as per IGE/TD/3

10.16.2. PE pipe shall be for buried used only.

10.16.3. PE pipe must not be used within building, for entry or exit sit shall be sleeved with special requirement.

10.17. PE– Fittings

10.17.1. The fittings, both electro-fusion and butt-fusion, should be manufactured to ISO 8085 specifications.

10.17.2. The fusion should be carried out as per approved methods in line with IGE/TD/3 requirements and records should be filed for future reference.

10.18. PE – Ball Valves

10.18.1. The PE Valves will be buried and operated from the surface using the appropriate access facilities, i.e. a valve chamber. The valves will be connected to the distribution system either by butt fusion or electro fusion.

10.18.2. The valves will be ball valves with plain ends of SDR 11 PE 100, suitable for butt fusion or electro fusion.

10.19. Auto shutoff valve

10.19.1. Upstream of every domestic type kitchen appliance an auto shutoff valve or isolation valve shall apply.

10.19.2. Automatic shut-off valves for gas appliances shall be BS EN 161 or equivalent.

10.20. Gas Hose

10.20.1. Gas Hose connection to the kitchen equipment shall be comply with BS 3212 or BS EN 1762 or equivalent

10.20.2. Gas hose connection to kitchen equipment and automatic shut-off valve / isolation valve must be use female or male NPT threaded coupler.

10.20.3. The hose mechanical coupler shall be of factory manufactures fittings.

10.20.4. Hose shall have marking and steel braided is preferable.

10.21. Gas Leak Detector

10.21.1. The primary objective of the gas leak detector is to provide a means for safety detecting any malfunction of a pressurized gas system in order to prevent accumulation of combustible gases so that damage or explosion due to such an accumulation of gases is prevented.

10.21.2. The gas leak detector must be calibrated to the type of gas to be detected.

10.21.3. Installation shall be as per manufacturer recommendation.

10.21.4. The apartment kitchen / villa shall be domestic type detector and shut off switch shall be located outside the kitchen area (near to entry)

10.21.5. The pipe in pipe, PRMS, Gas shafts gas detector shall be fire safe type (weather proof)

10.21.6. Gas leak detector shall be provided, not more than 30cm from finished floor level and 1.5m from the cooking and other LPG consuming appliances.

10.21.7. Gas detection equipment shall be installed in pipe in pipe systems, PRMS, gas shafts, kitchens and any other areas where is a potential for gas release inside the building.

10.21.8. The gas detectors should be installed for pipe in pipe at regular intervals (20m) and connected to safety shutoff devices that are strategically placed to isolate the section of pipework that the gas detector is monitoring.

10.21.9. For commercial and multi residential gas appliances each gas detector to be connected either directly to GCP (conventional type) or inline (addressable type), separate connection to be provided for ESS and solenoid valve.

10.22. Containment

10.22.1. Pipe in pipe (containment) piping arrangement shall be provided where LPG piping is passing through basements, above false ceiling or public spaces.

10.22.2. Pipe in pipe arrangement shall be with CPVC / Steel piping complete with gas detectors monitored by gas leak detection panel.

10.22.3. Sleeve shall be naturally ventilated to open air at least from one side

11. PAINTING AND COLOR CODES

11.1. The Steel piping shall be protected from corrosion and to be provided with piping color for ease of identification of the pipelines and their content. Pipeline color coding shall follow to international acceptable standard.

11.2. The Copper pipes shall be marked with yellow color band around the pipes every 2 meter.

11.3. The Material surface to be painted shall be cleaned from any welding slag, dust, grease or debris.

11.4. Various methods of surface preparation can be adopted e.g. degreasing, high pressure fresh water hosing, hand tool cleaning, power tool cleaning etc.

11.5. Color of LPG Steel piping shall be yellow and paint shall be in 2-layer coating.

11.6. Material surface to be painted shall be dry.

11.7. Paint shall be fully cured before another layer to be applied.

11.8. Paint application shall follow manufacturer specification or procedure.

12. PIPE MARKING

12.1. Main Network

12.1.1. Additional warning signs or markers shall be installed to indicate the presence of a pipeline at road, highway, railroad, stream, canal crossings and other locations where there is a possibility of damage or interference. Ref Drawing :

12.1.2. A marker shall be marked in bold and legible local language and Arabic / English with at least the following: Name of Gas Distribution Network Operating Company
Contact Telephone Number to report emergency.
Location Area Code
Warning - "High Pressure Gas Line, Dial before Digging" etc.

12.1.3. Markers may not be installed for service pipeline within consumer premises, however, the Operating Company shall maintain such service pipeline routing drawings for easy reference.

The operating company shall provide minimum safety information to the consumer/customer before starting the gas supply.

12.1.4. It shall be mandatory for the group housing societies/cluster of houses etc. which are providing the inbuilt facilities for the gas connectivity to each and every dwelling unit in such buildings to have the line diagrams of the connection piping fixed at the main entrance of such premises

12.2. Gas Utilization System Pipe Marking

12.2.1. Pipe shall be provided with arrow marking direction of the gas.

12.2.2. Arrow marking shall be black with word “LP GAS”

12.2.3. The vapor LPG pipelines (CS) in “Yellow” with the marking of the word “LP GAS” at intervals of not more than 3M.

12.2.4. Copper pipe can be marked with yellow color band around the pipes every 2m.

12.2.5. The marking of pipework is essential for correct meter reading, safe operation, maintenance and accurate billing of gas consumed.

13. VALVE INSTALLATION

13.1. General

Full bore polyethylene ball valves / Ductile Iron Gate valves or Steel Ball valve shall be installed in the distribution mains system for the purpose of sectorisation and isolation where design requirements dictate and a service ball valve before each plot boundary. The installation of these valves shall comply with the following requirements:

13.2. Valve Locations

Valves incorporated into the HDPE distribution mains system shall be installed in compliance with IGE/TD/3 and as per approved shop drawings.

13.3. Pre-Installation

Prior to installation, all valves shall be checked for defects or damage.

All valves shall be thoroughly cleaned internally immediately prior to installation and all ends shall be kept closed with protective coverings when the valve is not being worked upon.

Following installation, and prior to commissioning, all valves shall be operated from open to closed and closed to open positions, respectively.

All parts or accessories shall be installed according to manufacturers' technical recommendations of this requirement.

13.4. Valve Installation Details

Valves shall be positioned so as to ensure unrestricted access and maintenance at all times. All valves should be installed as per the manufacturer's recommendations.

Purge points shall be installed either side of all main valves and these pressure points shall be 32 mm diameter reducing to 20 mm.

For valves of 200 mm diameter and above the valve shall include a gear assembly and for such valves a precast concrete blocks (PCC) or reinforcement cement concrete (RCC) chamber shall be provided so as to allow access to and operation of the valve/gear assembly. Valve size 200mm and above shall use Ductile Iron Gate valve with block and bleed capability.

For all service valves a surface box shall be provided 300 mm clear opening ductile iron cover while main valves shall have double triangular 600mm clear opening and also ductile iron cover. The surface boxes shall be installed flush with the ground surface and the valve spindle and pressure points shall terminate 100 mm below the underside of the cover. All ductile iron cover shall have client logo, "gas" marking and material standard stamp on it, refer to the Typical Manhole Cover Details drawing number SE-LPG--DWG in Appendix .

Security devices with valve identification markings shall be fitted to the spindle of valves to prevent un- authorized operation. Aluminum or Stainless Steel marker plates shall be installed on either buildings or securely fixed posts adjacent to the location of all valves. The plates shall be coated with an epoxy type coating (colour white) and the required lettering shall be silk screened (colour black). The layout of the marker plate lettering and fixing arrangements shall be agreed with the South Energy.

14. LABELING AND IDENTIFYING

14.1. Warning Tape

Acid and alkali-resistant PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, colored yellow at 400 mm above the top of the pipe a warning tape shall be laid along the length of the pipe.

14.2. Marker Posts

Route marker posts complete with identification plates shall be installed each side of Special Crossings and at such other locations or where practicable, at changes in direction or as directed by SOUTH ENERGY or its representative, for details refer to Typical Sign Board drawing no. SE-DS-IGS-DWG- and Typical Sign Board Details drawing no. SE-DS-IGS-DWG-in Appendix 5.

14.3. Stone marker

Stone marker for underground HDPE Pipe shall be installed for every 25 meter on any unmade areas, marker plate shall be installed on hardscape areas, marker pins for road crossing and where practicable, at any change of direction or as directed by SOUTH ENERGY or its representative, for details refer to Typical Marking Pin drawing no. SE-DS-IGS-DWG- and Typical Stone Marker drawing no. SE-DS-IGS-DWG- and in Appendix 6.

15. GAS PIPE ROUTING PROHIBITED AREAS

15.1. LPG pipe installation or distribution shall not be permitted in the following areas.

15.2. In the ground under concrete flooring within building

15.3. Under building foundations / structure

15.4. Within lift shafts and cavity walls.

15.5. In compartments or ducts dedicated for electrical switchgears, transformers or generators, garbage rooms, garbage chutes, refrigeration chambers, cold rooms, air handling rooms and ventilation or air-conditioning ducts.

15.6. Adjacent to pipes and vessels containing flammable, oxidizing, corrosive and other hazardous liquids and materials.

15.7. In fire-fighting lobby, fire command centers, smoke stop lobbies, fire pump rooms, fire-fighting water tank rooms, sprinkler control valve rooms, firefighting riser ducts, areas of refuge, protected corridors, protected staircases, bedrooms and other occupied areas.

16. GAS LEAK DETECTION AND SAFETY SHUT OFF EQUIPMENT

16.1. Gas detection equipment shall be installed in pipe in pipe systems and any other area where there is a potential for gas release inside building

16.2. The coverage ranges from both sides of the gas detector to be considered as per manufacturer specification or 20m for pipe in pipe applications.

16.3. Combustible gas leak detector linked to a solenoid valve and separate low pressure shut off shall be installed in area where appliances are connected to monitor leakage and isolate the gas supply to that particular area

16.4. Location of gas detector for LPG should be at low level 300mm from floor or bottom (for shafts) level.

16.5. For commercial and multi residential gas appliances each gas detector to be connected to Gas Control Panel (GCP) and separate connection to be provided for Emergency Shutoff System (ESS) and solenoid valve.

16.6. The electrical connections for residential kitchens where no gas control panel (GCP) is applicable shall follow the equipment manufacturer schematic or following logic power supply to be provided to domestic gas detector, connection cable 2C+E, 1.5mm from ESS to safety device (solenoid valve).

16.7. All cables for gas detection system shall be fire protection type.

16.8. The gas detection system should be approved by Dubai Defence.

17. TESTING AND COMMISSIONING

17.1. Scope :

This scope specifies the minimum criteria to be adopted for pressure testing and commissioning of polyethylene and steel gas distribution mains and services operating at pressures up to 4 bar. Testing and commissioning shall be in line with the requirement specify in IGE/TD/3, IGE/SR/22, IGE /TD/1.

17.2. The criteria for testing are

a. There will be a soak or stabilization period of at least 48 hours for the mains, before testing takes place,
b. The test duration shall be 24 hours or according to the volume calculations.
c. Pipe is SDR 11, PE 100 (HDPE) or carbon steel pipes Schedule 40 as minimum.
d. The reference test temperature is taken as 20°C. (The temperature is likely to be higher than 20°C in which case the creep allowance provided will be higher. Refer to IGE/TD/3 table A4.4).

The method of calculating the permissible pressure loss for a 24 hour test shall comply with section A4.2 of IGE/TD/3.

17.3. Test pressure for Pneumatic Testing

17.3.1. The test pressure shall be 1.5 times the operating pressure of the system which is 4bar.

17.3.2. Prior to testing and commissioning, the pipes must be cleaned from any debris by carrying out pigging. Pigging procedure must be provided by Contractors doing the pipe installation for supervision consultant approval.

17.3.3. Intermediate pressure and low pressure testing criteria have been included in this specification to cover situations where the normal operating pressure of isolated sections of main must be reduced due to safety constraints.

17.3.4. The objective of the pneumatic test of polyethylene mains system and steel pipes is to prove the integrity of the system before commissioning.

17.3.5. The pneumatic test sets out to ensure that any leakage is within permissible limits (Permissible Pressure Loss).

17.3.6. The test shall take into account the fact that HDPE pipe creeps during the test, contributing towards any measured pressure loss.

17.3.7. Any installation shall be subject to pneumatic strength test and tightness tests. Testing shall be carried out prior to application of paint or other protective coatings and before the installation is put into service.

17.3.8. Before carrying out any test, the Contractor shall ensure that the installation fully complies with the relevant statutory obligations and regulations.

17.3.9. Upon completion of such Testing, the Contractor shall complete and sign a testing certificate to the effect that agreed Testing procedures have been duly carried out.

17.3.10. The installation shall generally comply with the requirements of the Local Authority requirement and codes of practices.

17.3.11. Meters, regulators and associate equipment shall not be subjected to on site pneumatic or test it shall be tested by manufacturer in factory.

17.3.12. After the completion of internal gas piping installation, it shall be subjected to pneumatic Pressure test.

17.3.13. In accordance with the standard requirement, installer /contractor is requested to conduct pressure test the piping installation not less than 1.5 times maximum operating pressure for not less than one hour depending on the volume of gas pipe to be tested.

17.3.14. Prior to commissioning of the building internal gas piping, Contractor is required to provide Test Certification, Pre-commissioning, and commissioning procedure, local authority approval and other details required for commissioning.

17.4. Procedure for Testing

17.4.1. All Polyethylene mains and steel piping with a maximum operating pressure (MOP) of 4bar, shall be pressure tested in accordance with above mentioned codes but not less 1.5 MOP

17.4.2. Any part of the supply network which is constructed, diverted, altered or renewed and cannot be included in a sectional or overall pressure test i.e. a tie-in, shall be tested at the system Maximum Operating Pressure (MOP) using leak detection fluid. Such occurrences shall be minimized and shall be approved by the Supervising Consultant and final approval be by SOUTH ENERGY or its representative.

17.4.3. Following a successful test, commissioning shall commence immediately or pressure to remain at certain level as directed by SOUTH ENERGY or it representative.

17.5. Safety Precautions for Main Pipe Lines:

17.5.1. The precautions detailed below, shall be taken during the preparation and application of pneumatic tests.

17.5.2. All caps, plugs, bends, tees and other fittings on mains incorporating flexible joints shall be restrained against any movement during the test.

17.5.3. The trench shall be backfilled up to 200mm at least to secure the pipes in position before pneumatic pressure is applied.

17.5.4. All temporary pipe, fittings and equipment fitted to the section of main under test shall be appropriately pressure rated.

17.5.5. The stand pipe used for the purpose of pressurizing the main shall be fitted with a pressure relief valve to ensure over-pressurization of the main does not take place.

17.5.6. Consideration shall be given to means of minimizing noise during pressurization and de-pressurization.

17.5.7. Where the main is exposed and accessible to the public, notices warning that pressure testing is in progress shall be prominently displayed and the area securely cordoned off.

17.5.8. Before final pressurization commences a visual check shall be made to ensure that the test section is secure for pressurization.

17.5.9. No person shall enter any excavation whilst the test pressure is being raised, the main is under test or the main is being depressurized.

17.5.10. Throughout the duration of the test, the system shall be examined at regular intervals to ensure that all anchorage points are secure and that no hazards exist.

17.5.11. Before the start of the test period the temperature of the air in the pipe shall be allowed to stabilize before the test period is commenced. This shall be indicated by a stable pressure reading.

17.5.12. When the test has been completed to the satisfaction of the Supervising Consultant and submitted to South Energy or Engineer for final acceptance, the air pressure shall be released through suitable vents in a controlled manner until the whole of the main is at atmospheric pressure.

17.5.13. The Supervising Consultant and or South Energy or Engineer shall confirm by checking the gauges installed at all extremities that the pressure within the whole of the main has been reduced to atmospheric pressure. The Consultant shall record this information on the test certificate before authorizing further work to proceed.

Note: All the Gauges and equipments and regulators used in testing shall be calibrated and a valid third party certificated shall be carried during the testing.

17.6. Test Equipment

The minimum equipment shall be as given below:

1) Suitable pressure instruments.
2) Temperature thermometer.
3) Pressure Gauges.
4) Ball Valves.
5) Barometer.
6) Pressure & temperature recorder.

17.7. Test Failure

Where the instrument reading after correction for barometric pressure and temperature readings shows a pressure loss greater than the calculated allowable pressure loss, investigations shall be carried out to find the leakage. All connections plugs and external fittings shall be re-examined for possible leakage by leak detection fluid.

If the leakage still happen after rectified all the visible connection and fittings, contractor to use other suitable method to find the leakages. Any leakage on a HDPE fusion joint should not be repaired and the joint should be cut away and remade.

17.8. Pressure Test Certificate

Gas Contractor has to provide a Pressure test certificate as in Appendix 1. The test certificates shall be certified or approved by Supervising Consultant and or SOUTH ENERGY.

17.9. Commissioning

The purpose of commissioning is to gasifying pipeline with fuel gas (NG or LPG). Therefore it is necessary to remove or purge the air, inert gas or nitrogen gas in the existing or new pipeline using the fuel gas. Two basic methods can be employed for the purging operation

a. Ram Purging- purge gas is fed continuously at one end of the pipe work and the gas mixture being vented off/flared at the other end under a steady and continuous condition until the total content of the pipe work is replaced by the purge gas

b. Cycle Purging (pressure and vent) – the content inside the closed pipe work system is diluted by introducing inert gas with minimum at 10% (Nitrogen) of the total pipe volume and then introduce the fuel gas into the pipeline. Once the pipeline is full with the inert gas and fuel gas, the mixture shall be vented off until gas percentage is 48 - 50% (SNG Gas) from the vented content (it shall be more than 95% for Natural Gas). This process is repeated until the required dilution off fuel gas/air is achieved or the replacement of the purge gas is completed.

c. The Gas contractor through their Supervising Consultant shall submit a detailed procedure with accompanying sketch(s) for all commissioning operations, 48 hours prior to the planned commissioning date. The procedures shall be subjected to the SOUTH ENERGY approval.

The planning and execution of the commissioning of mains must avoid large networks and excessive lengths of feeder mains being commissioned at any one time.

The following criteria shall apply when planning and preparing a commissioning procedure:

Looped sections of main shall be minimized and where the purge section contains a loop, it shall be physically isolated by closure of a valve

- Branch sections shall be purged simultaneously or sequentially.
- Flow stopping on live mains shall be by a double block and bleed system.
- Purge velocities shall not exceed 20 m/s
- All vent pipes shall be manned during purging operations and equipped with flame arrestors.
- Communications shall be set up to ensure safe co-ordination of activities.
- Pressures at all points shall be monitored throughout the commissioning operation and the minimum system requirements maintained.
- Tie in to existing gas pipes shall consider:

a. Gasified system

b. Empty not in use system

c. Contractor to take consideration for tie-in works and submit the detailed procedure prior the activity.

18. CIVIL WORKS FOR PIPE LAYING

18.1. Design

Civil works for below ground service piping will be in accordance with:

a. IGE/TD/3
b. Project specifications
c. The International codes, project requirements and requirements of the local approving authorities.

18.2. Existing Services, Utilities, etc.

Before commencement of any section of below ground works the Contractor shall identify the position of services, utilities, etc. on the proposed route. Utility location plans issued to the Contractor shall be studied carefully before digging operations are commenced. If necessary upon as directed by SOUTH ENERGY, no objection certificates shall be acquired by the contractor from other utility services.

18.3. Trial Hole, Route survey, Excavation and Trenching

Trial hole by hand dig method shall be performed to verify the existing utilities and the below ground conditions.

Route survey should be conducted prior to the commencement of the construction.

Trench depths shall be sufficient to provide 1000 mm of cover to mains piping and service piping. Cover shall be measured to the top of the pipe. Trench widths shall be a minimum of 400 mm or pipe diameter plus 150 mm on each side of the pipe, whichever is the greater. However, where rapid trenching techniques are used the trench need only be of sufficient width to allow fine filling material to surround the pipe completely. The mains shall be protected against mechanical damage by means of concrete slabs or steel plates at a height of 150 mm above the gas pipes, be embedded in sand or soil and be compacted with backfill material firmly and evenly before making good of the road surface.

Excavation shall be by means of hand and/ or machine as expedient and it shall be the Contractor's responsibility to locate and protect all services, utilities, etc. encountered during excavation.

The width of the trench shall be maintained until commencement of backfilling and the Contractor shall be responsible for providing any necessary shoring and supports for such purpose, if required, and for ensuring the safety of workmen and other persons who may enter the excavated trench.

Excavations shall be kept free from water at all times and before commencement of excavation the Contractor shall determine the water table level and, if considered necessary, install a well point dewatering system.

Trench bottoms shall be uniformly graded to provide a firm base for the pipe along its length. The bed and sides of the trench shall be free from loose stones and other sharp objects which may damage the pipe during or after installation. Pipe bedding should be free from stones minimum distance of stones away from pipe should be 150mm

18.4. Crossing

Sleeves and carrier pipes below roadway and railway shall be installed in accordance with the Authorities' requirements and shall have a minimum cover of 1,200 mm measured from the top of the pipe to the ground level.

Installation of road crossings by open cut methods shall be so scheduled to minimize interruption to site traffic and the Contractor shall co-ordinate such activities with the Supervising Consultant, Marafeq and other third party contractors.

Pipe crossing the road not meeting the minimum depth requirement shall be installed in sleeve with concrete encasement.

18.5. Proximity to other Services, Utilities, etc.

Minimum distances/spacing of 600 mm, 500mm and 250 mm shall be maintained between the mains and electric power cables, sewage water and other utilities/services/obstructions respectively and the Contractor shall be responsible for all additional excavation to ensure such distances/spacing are maintained. At locations where such separation distances are not physically achievable the Contractor shall provide and install precast concrete slabs between the mains and the cable(s) and the services/utilities in question, or sleeves with concrete encasement subject to the approval of the consultant. No other utilities are allowed to be laid in the Gas Corridor.

18.6. Backfilling and Reinstatement

Pipes shall be installed in a bedding, with consolidated stone free material (dune or wash sand), either selected from excavated materials or imported. The bedding shall be of 150 mm thickness.

The pipe surround shall apply 150mm on top of pipe by using stone free material. The sample of material shall submit in detail for Engineer's approval.

The trench shall be further backfilled and hand tampered, with stone free material (dune/wash) to a level 400 mm above the top of the pipe.

18.7. At this level a warning tape shall be laid along the length of the pipe. The tape shall be supplied in accordance with Warning Tape with tracer wire or as specified by the Marafeq. The trench shall be further backfilled to the finished level with the excavated material and compacted with a mechanical hand compactor. Backfill material should be well compacted to avoid trench settlement.

18.8. Surface Enclosure for Valves

The surface box should be constructed with either solid blocks or precast concrete. Blinding concrete should be provided prior to installation of the pre-cast concrete/solid block. Bitumen coating should be provided on the surface of the plaster where it comes in contact with the soil.

18.9. Route Marking

Marker posts shall be installed at each side of Special Crossings and at other locations, specified by the Marafeq, where it is felt that the main could be susceptible to interference damage.

18.10. Reinforced Valve Chamber

The valve chamber shall be reinforcement cement concrete (RCC) type if falling under asphalt. Others than the road area precast concrete blocks (PCC) can be used. The standard chamber details shall be given by contractor to Marafeq for approval.

19. CONSTRUCTION RECORDS

The construction records shall include the following:

- Type and specifications of materials and fittings used with certifications.
- Test certification package.
- As-built drawings including details of surface construction, depth of cover, pipe protection, etc.
- Ground conditions (soil).
- Construction methods, including trenchless techniques.
- Welding procedure specification.
- Welder qualifications.
- NDT records.
- Quality control procedures and documentation.
- Inspection records.
- Pneumatic Pressure test records
- Soil compaction test results.
- Commissioning certificates.
- Handover documents.

19.1. DOCUMENTS TO SUBMIT PRIOR TO WORK

In order to assess the Contractor's proposal through Supervising Consultant , South Energy, the Engineer's has the right to request the complete list of material, apparatus and various fittings that

the Contractor envisages using for the execution of the work with the detailed manufacturers details associated with the selected materials and equipment.

During the work preparation period of 30 days, the Contractor, through its Supervising Consultant shall submit to the South Energy or Engineer's:

- A detailed program for the work per construction phase. The work shall be in a multi-utility environment. The construction program should take into consideration the other utilities and adapt to this situation.
- Full set of shop drawings including layout plans and combined profiles.
- One set of complete detailed construction drawings for the work; these drawings shall provide all information necessary for their comprehension and verification.
- The design calculation notes, which may be supplied in different files for restitution to the Contractor after examination.
- If necessary, within a period of 15 (fifteen) days after return of the draft construction drawings accompanied by all observations by the Engineer, the drawing up of a new rectified drawing to take the observations into account.
- Detailed list of suppliers and specification of materials and equipment showing particularly the compliance with the Engineer specification.
- Method of statement including:
  - Description of the project.
  - Objectives-Execution of Work.
  - Scope and Major Activities needs to be completed before work start.
  - Reference Documents.
  - Personnel Responsibilities Matrix.
  - Material.
  - Material Storage, Transportation and Handling.
  - Instrument and Measurement Devices.
  - Methodology for Installation of Polyethylene Gas Pipe Network.

- Objective, Pre Installation Check and Installation Works of the Network.
- Health Safety and Environmental Plan.
- Commissioning procedure included testing, cleaning, swabbing and or drying
- Risk Assessment for the gas development work

This list is not exhaustive; the Engineer may ask the Contractor at any time for any specific construction or technical drawing.

20. QUALITY CONTROL

The Contractor should be able to document and demonstrate that all the activities relating to quality throughout the process from confirmation of order to design/development, purchasing, manufacturing and delivery to the customer have been carried out in a properly monitored and well organized fashion.

As a minimum, the Contractor should provide a quality manual in which the quality system is described. The areas of responsibility and authority with regard to quality should be clearly defined such that the performance of the system and the authority of the quality system manager can be assessed.

The quality system should be based on the requirements laid down in the international standard for quality systems, ISO 9001.

21. RISK ASSESSMENT

21.1. The requirements of Risk Assessment are based on reducing risks "As Low as Reasonably Practicable. Where there are established or standards design, this requirement can be met by the application of standards and best practice. Where there are not, as with all multi-occupancy buildings, a risk assessment approach is required in addition to demonstrate the necessary risk reduction.

21.2. A generic consideration of the hazards and risks from different supply options leads to a number of general principles:

- Gas supplies should be as far as possible sited out of doors.
- Gas supplies should be sited in well-ventilated area
- Gas supplies should be excluded from poorly ventilated or strongly confined spaces such as basements and cellars.
- Apparatus should be sited to avoid accidental damage or interference with the supply wherever possible.
- Consideration shall be given to the location of the supply with respect to the ability of the structure to withstand the consequence of an ignition in the event of a gas escape.

22. VENDORS LIST

SL.NO.	PRODUCT	NO.	SUPPLIER / MANUFACTURER	ORIGIN
1	PIPES CARBON STEEL	1	INTER PIPE	UKRAINE
		2	MITTAL STEEL	CZECHREPUBLIC
		3	SUMITOMO	JAPAN
2	CARBON STEEL PIPE BUTT-WELD	1	BENKAN / BKL	THAILAND
		2	TTU	THAILAND
		3	RHINOFITT	UK
3	CARBON STEEL PIPE THREADED FITTING	1	BOTH-WELL	TAIWAN
		2	LAME	ITALY
		3	MEGA	ITALY
4	FLANGE	1	ULMA	SPAIN
		2	NEUMIRA	SPAIN
		3	METALFAR	ITALY
5		1	SPIRA POWER	UAE

	GASKET	2 3	SMITH KLINGER	USA UAE
6	BALL VALVE	1 2 3	A+R CLESSE APOLLO	GERMANY FRANCE USA
7	PRESSURE REGULATOR WITH SLAM SHUT VALVES(PRMS)	1 2 3	GNALI BOCIA PIETRO FIORENTINI / BRIFFAULT BOLDRIN	ITALY ITALY ITALY
8	LOW PRESSURE REGULATOR (APARTMENT)	1 2 3	CLESSE / NOVACOMET REGO MESURA	FRANCE USA ITALY
9	LOW PRESSURE REGULATOR(RESTAURANT)	1 2 3	CLESSE / NOVACOMET REGO PIETRO FIORENTINI/ BRIFFAULT	FRANCE USA ITALY
10	STRAINER / FILTER	1 2 3	BOLDRIN TAG 3D VALVE APOLLO	ITALY USA USA
11	SAFETY RELIEF VALVE	1 2 3	MADAS REGO BOLDRIN	ITALY USA ITALY
12	DIAPHRAGM METER	1 2 3	SITEX ELSTER ITRON / ACTARIS	CHINA GERMANY GERMANY
13	ROTARY METER (RPD)	1 2 3	ITRON / ACTARIS COMMON SA ELSTER	GERMANY POLAND BELGIUM
14		1	ITRON / ACTARIS	GERMANY

	TURBINE METER	2 3	COMMON SA ELSTER	POLAND BELGIUM
15	SOLENOID VALVE	1 2 3	MADAS A+R ASCO	ITALY GERMANY USA
16	PRESSUREGAUGE	1 2 3	BOLDRIN WIKA CALCON	ITALY GERMANY INDIA
17	COPPER PIPES / FITTING	1 2 3	MULLERINDUSTRIES YORKSHIRE COPPER TUBE ALLPEX	UK UK UK
18	AUTO SHUTT OFF VALVE	1 2 3	CLESSE CHUCHU DECAYEUX OMB	FRANCE FRANCE ITALY
19	FLEXIBE HOSE	1 2 3	CLESSE/NOVACOMET HYDROFLEX POLYHOSE	FRANCE ITALY INDIA
20	PE PIPES	1 2 3	HEPWORTH COSMOPLAST UNION PIPES INDUSTRY	UAE UAE UAE
21	PE FITTINGS	1 2 3	GEORGE FISCHER (GF) AVK FUSION	SWITZERLAND UK UK
22	PE BALL VALVES	1 2 3	GEORGE FISCHER (GF) AVK FUSION	SWITZERLAND UK UK
23	CONTAINMENT PIPE	1 2 3	AL JAZEERA UTP TIGER	OMAN UAE UAE

		4	GEORGE FISCHER (GF)	USA
24	GAS LEAK DETECTION PANEL	1 2 3	OLDHAM TECHNO CONTROL EDS	FRANCE ITALY UK
25	GAS DETECTOR	1 2 3 4	OLDHAM SITEX TECHNO CONTROL EDS	FRANCE CHINA ITALY UK
26	PIPE SUPPORT	1 2 3	DIAMOND FLAMCO WEICCO	ITALY NETHERLANDS INDIA
27	PAINT	1 2	NATIONAL PAINT HEMPEL	UAE UAE

Note: Preference to all applicable materials should be accepted or listed by Civil Defence.

Appendix: 1

TYPICAL PRESSURE TEST CERTIFICATES FORM IN: IGE/TD/3 Edition 4:

	Reference Number	**Pneumatic Test Certificate Number**
	.....	.....

GENERAL DETAILS
Project title:.....
Project reference: .....Drawing No.: .....
Start location: .....End location: .....
Pipework details (SDR-Pipe diameter- Length):.....
Design pressure:.....bar Test pressure: .....bar
MOP:.....bar
Test specification: .....
Associated hydrostatic pressure test certificate No.: .....

INITIAL PRESSURISATION
Witnessed by: .....Designation:.....
Date: .....Time: .....

TEST COMMENCED
Witnessed by: .....Designation: .....
Date: .....Time:.....

Conditioning time: .....hours Test period: .....hours
Creep allowance: .....mbar

PNEUMATIC REPORT	TEST 'ON'	INTERMEDIATE READINGS		TEST 'OFF'
Date/time				
Absolute pressure				
Ground/skin temperature				
Pressure correction				
Corrected pressure				

Gauge type: ..... Serial number: .....
Calibration date:..... Calibration expiry date:.....
Permissible loss: .....mbar Actual variance: .....mbar

Test Pass/Fail
(Delete as appropriate)
PASS
FAIL

Test accepted by: .....
Designation: .....Date: .....

TEST DE-PRESSURISATION
Witnessed by: .....Designation: .....
Date: .....Time: .....

23. APPENDICES: SCHEMATIC DRAWINGS OF PRMS ROOM AND ITS CONNECTION BASED ON MAXIMUM REQUIRED CAPACITY

23.1. Appendix A – Schematic drawing for 32 dia Service line Maximum Capacity 100scmh

23.2. Appendix B – Schematic drawing for 63dia Service line Maximum Capacity 250scmh

23.3. Appendix C –Schematic drawing for 90dia Service line Maximum Capacity 400scmh

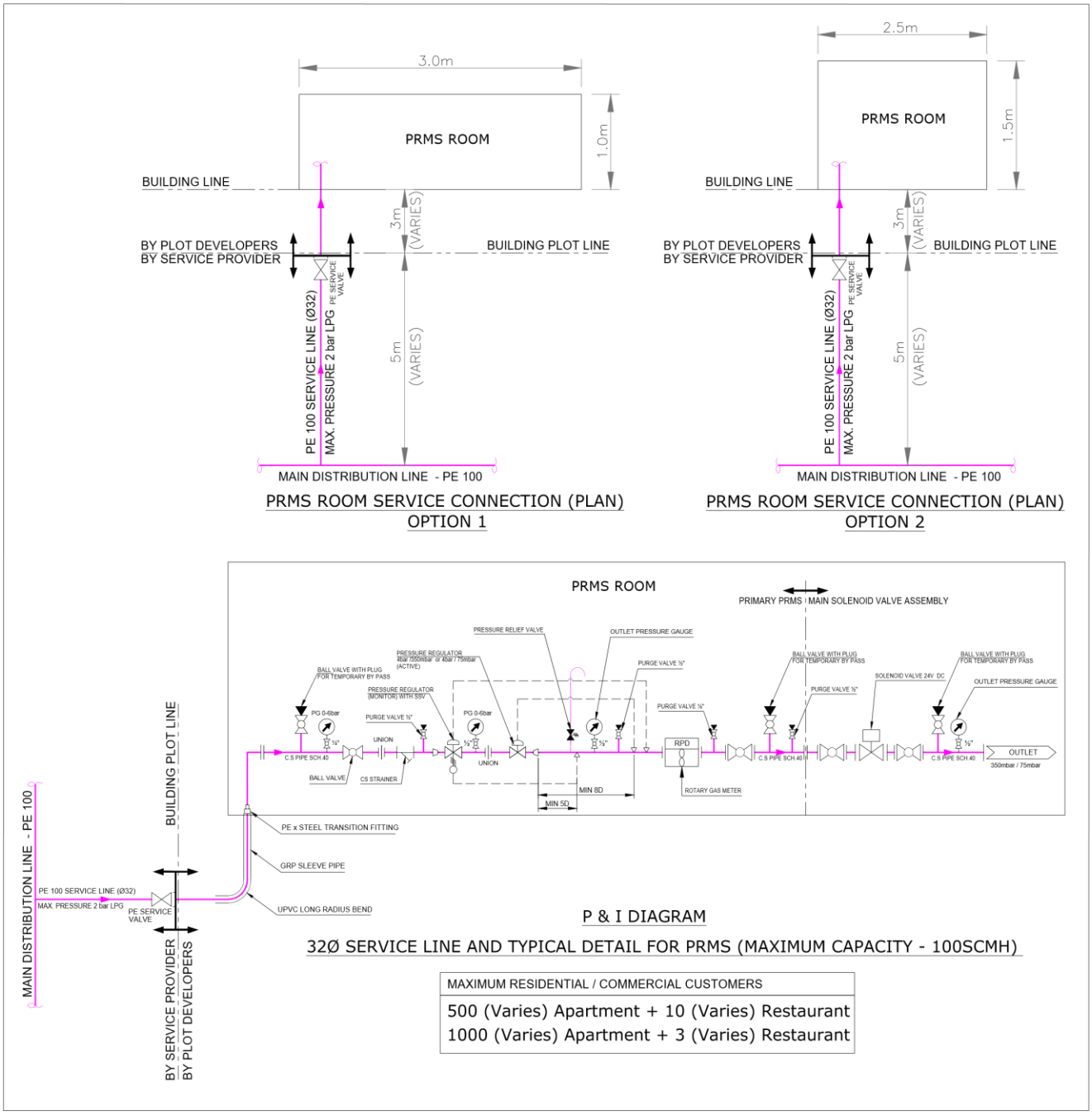
23.4. Appendix D -Schematic Diagram Detail for Residential Building

23.5. Appendix E- Schematic Diagram Detail for Residential / Commercial Building

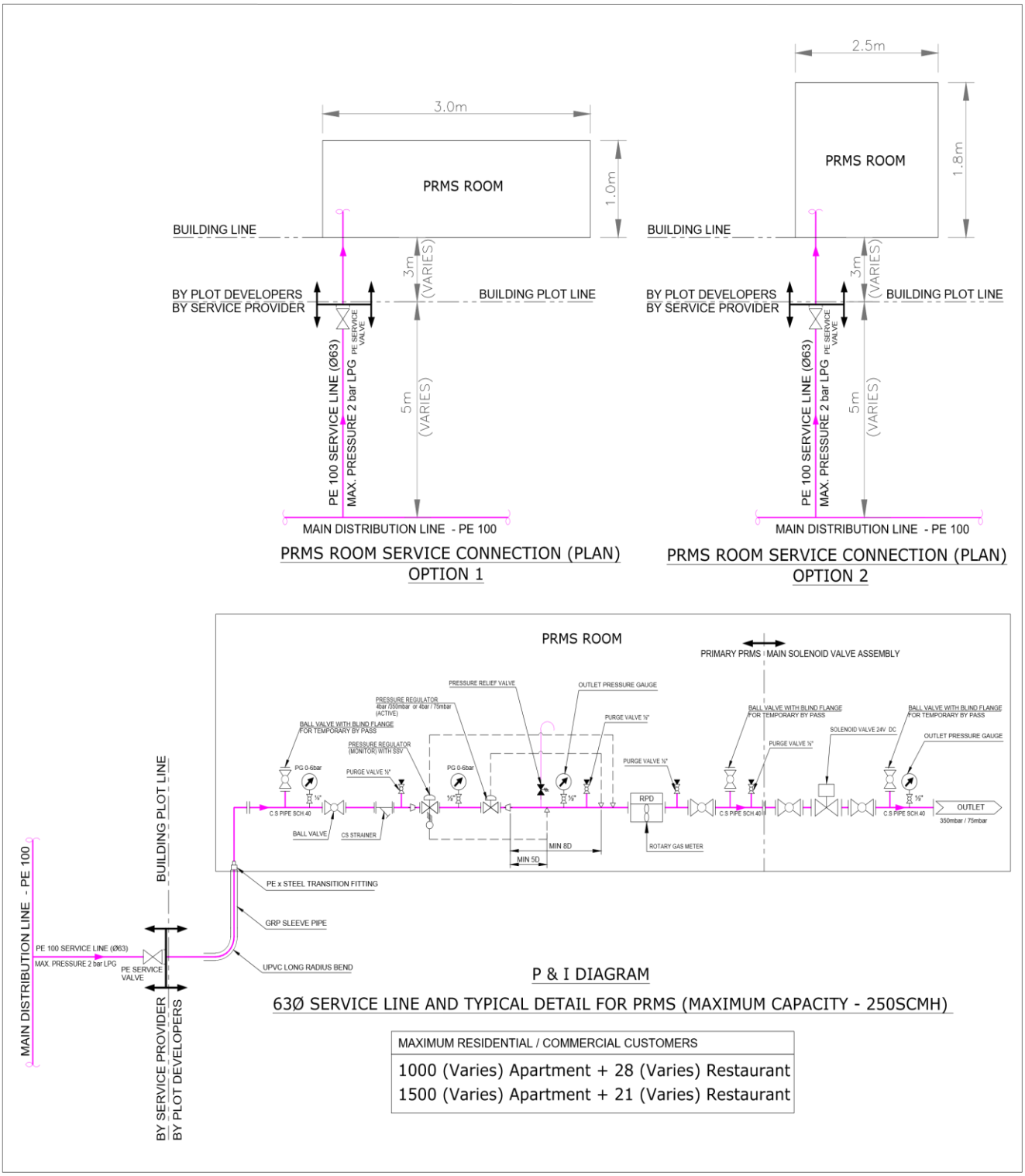
23.6. Appendix F- Typical Kitchen Detail for Residential Connection

23.7. Appendix G- Typical Customer PRMS Detail for Retails/Restaurants

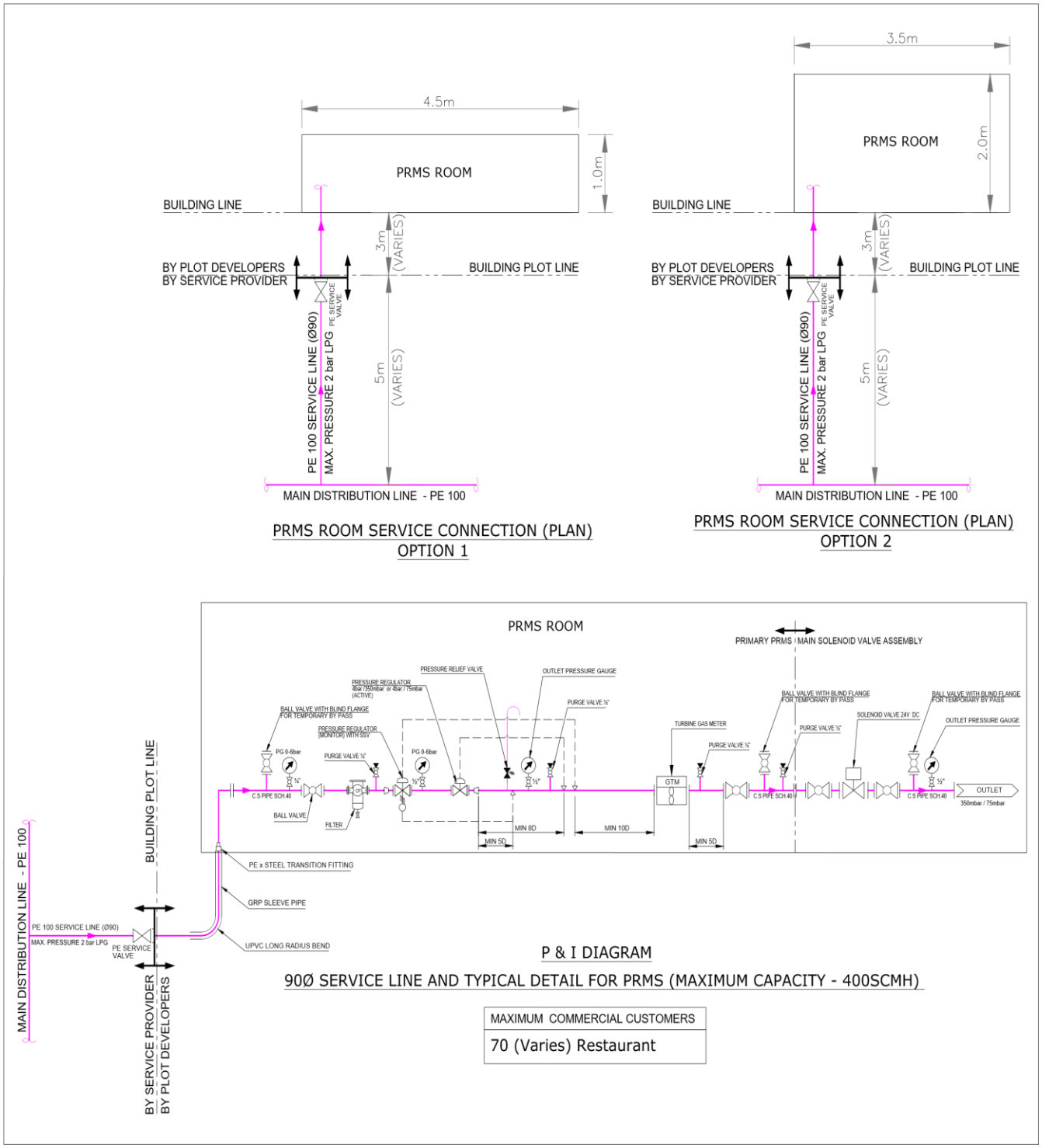
Appendix A – 23.1 Schematic drawing for 32 dia Service line Maximum Capacity 100scmh



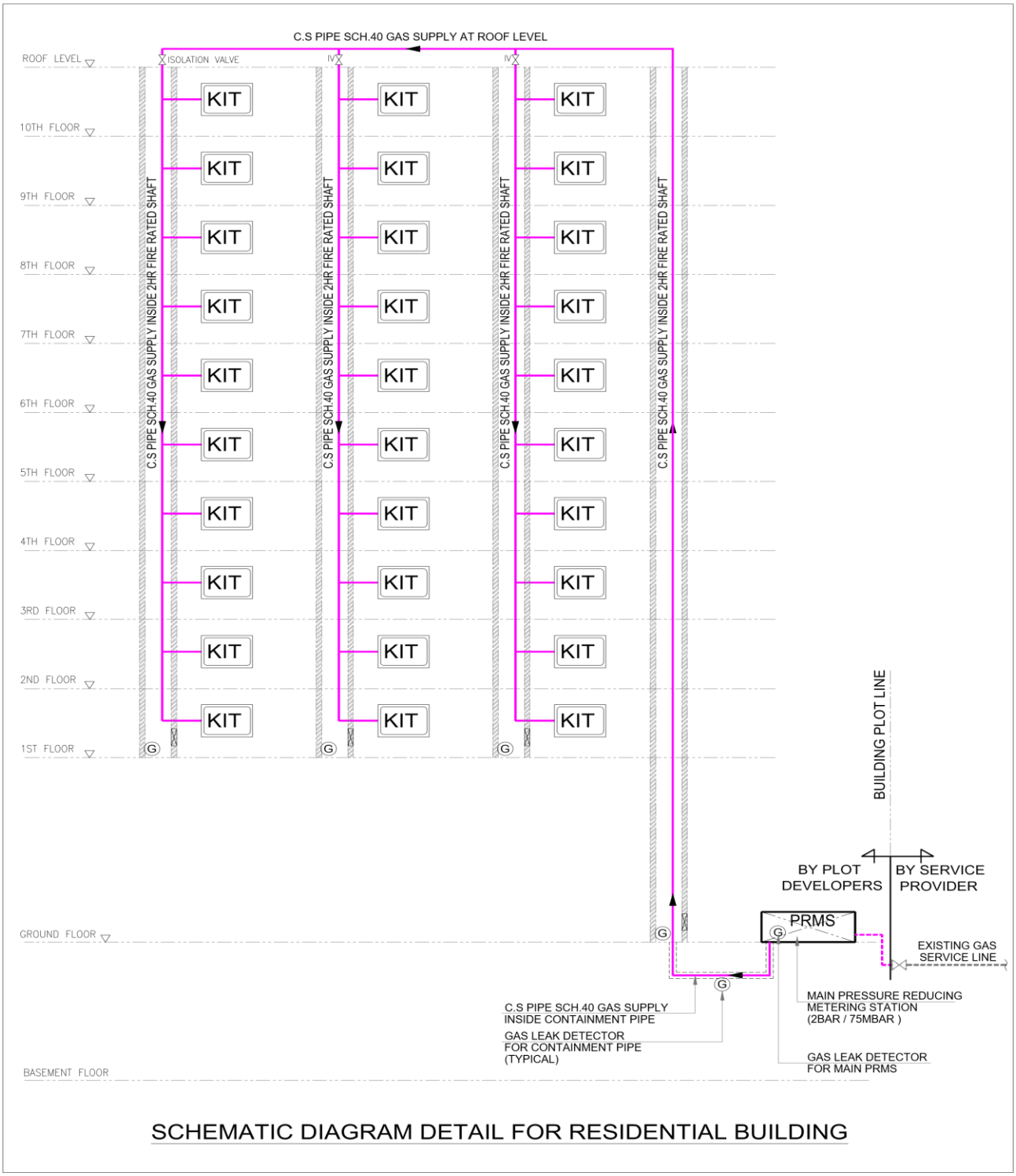
Appendix B –23.2 Schematic drawing for 63dia Service line Maximum Capacity 250scmh



Appendix C – 23.3. Schematic drawing for 90dia Service line Maximum Capacity 400scmh

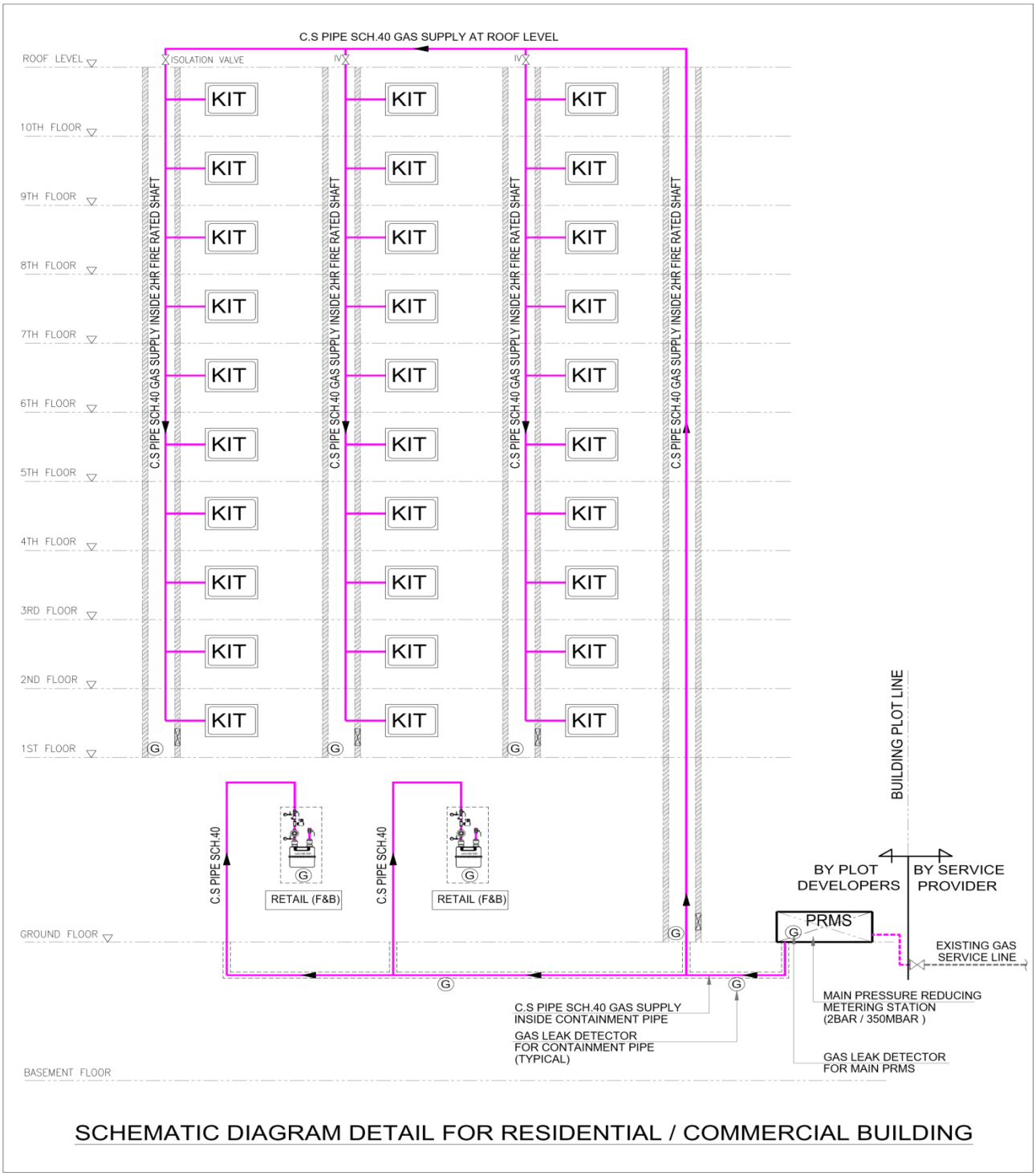


Appendix D -23.4. Schematic Diagram Detail for Residential Building

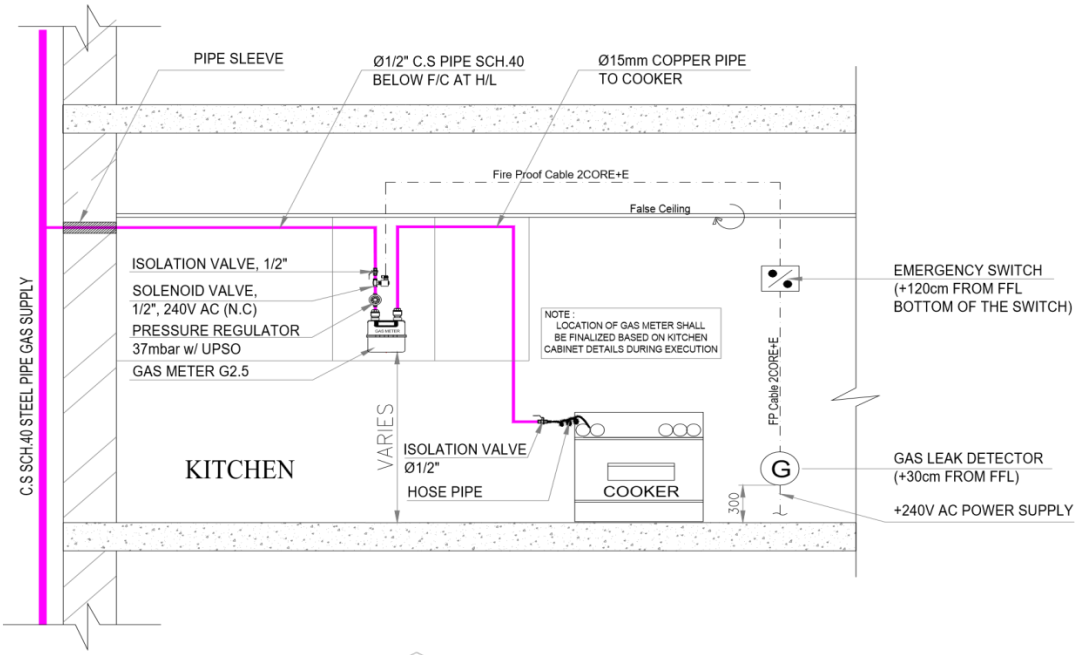


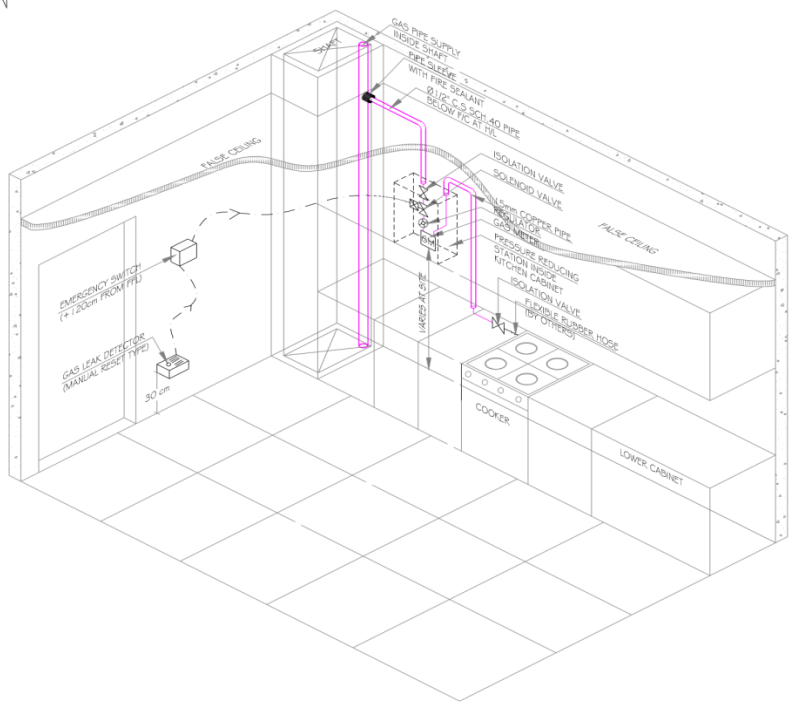
SCHEMATIC DIAGRAM DETAIL FOR RESIDENTIAL BUILDING

Appendix E- 23.5. Schematic Diagram Detail for Residential / Commercial Building



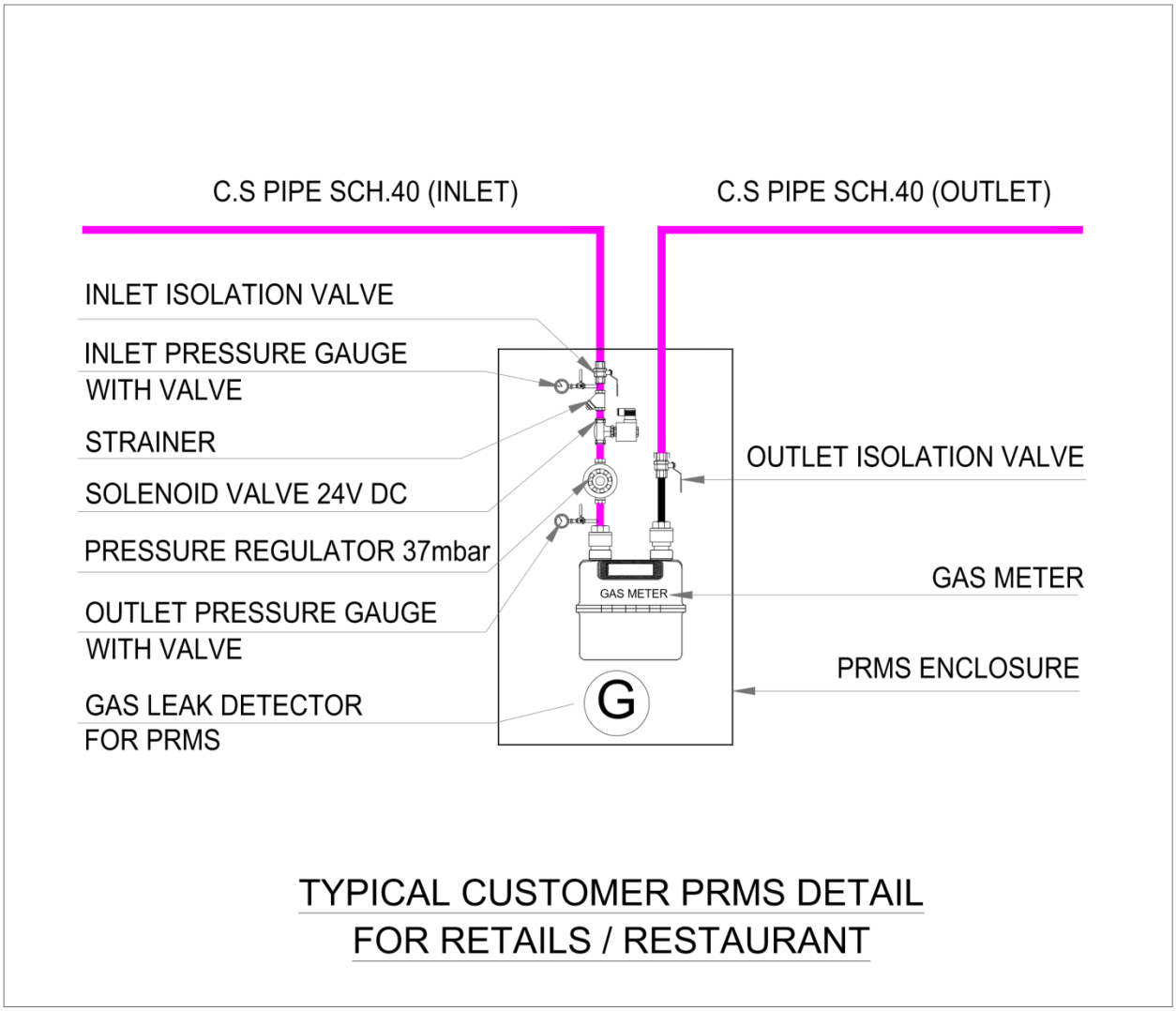
Appendix F- 23.6 Typical Kitchen Detail for Residential Connection





TYPICAL KITCHEN DETAIL FOR RESIDENTIAL CONNECTION

Appendix G- 23.7 Typical Customer PRMS Detail for Retails/Restaurant



Operation and Maintenance:

Emergencies:

In the event that gas piping either in a building or underground in the streets is damaged by construction or other activities, whether or not gas is leaking, please call the Call Center immediately. All customers are reminded that any activity intended near a gas pipeline that may create a problem for the safety of the system must be approved by the gas company prior to commencement of the activity. This includes digging in the vicinity of your apartment or villa where gas lines may be buried.

Patrol and Operation of the Gas System

Technicians regularly patrol the gas piping network and any associated facilities to ensure they are operating correctly and safely. Technicians routinely test for leaks or any indication that the safety and reliability of the system might be compromised.

Company personnel conduct periodic inspections of facilities and components and will run tests from time to time to verify that all components are functioning as specified. You may observe our personnel engaged in these activities. All personnel carry approved company identification and will produce this upon request to confirm their authenticity.

Your gas equipment safety

It is important that the gas piping in your home or business is not subjected to abuse or damage. Nothing should be pushed up against gas piping or equipment and nothing should be hung or attached to gas piping or equipment. Gas equipment and shut-off valves should be unobstructed at all times. No other materials or foodstuffs should be stored in compartments with gas equipment inside.

Your gas detector is an essential safety device. The gas detector should not be obstructed by any materials and should have a clear flow of air around it at all times.

It is important to ensure that combustible materials are not stored close to any gas appliance. When operating any gas appliance the area around it should provide clear and functional access and should not create any additional hazards for the user.

What to do if you smell gas

- If you are in your home or business and you smell gas please do the following:
- Immediately shut off the gas supply at the nearest gas shut-off valve
- Immediately eliminate all sources of ignition – extinguish any open flames
- Open doors and windows to ventilate the gas
- Call at South Energy 800 – immediately
- Leave the area if the gas leak does not immediately cease
- Do not operate electrical equipment – do not switch anything on or off

If you are outside your home or business and you smell gas upon arrival please do the following:

- Do not enter the area
- If an outside shut-off valve is available, close it
- Call South Energy at 800 – immediately and wait in a safe area
- Alert other occupants and building security
- Do not operate electrical equipment – do not switch anything on or off