



الجنوب للطاقة
— SOUTH —
ENERGY

LPG – BUILDING INTERNAL GAS PIPING DESIGN AND INSTALLATION
GENEREAL GUIDELINES
FOR
RESIDENTIAL & COMMERICAL CUSTOMERS

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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 aSubsidiary. 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.

The objective of this Building Internal Gas Piping Design and Installation Guidelines is to define and implement a standard and identical design and installation approach for the NG and LPG Gas System that to be interface between South Energy Gas Network Distribution System and Gas Utilization Systems (Building Internal Piping). This design and installation guideline is not to be used to override any other international standard in use currently. The purpose of this document is also to provide a clear direction to have safe and attentive gas piping installation.

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Note: This guideline is subject to change or to be superseded by UAE Civil Defense at any time without notice

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, handover, operate & maintain the inside building LPG Central Gas System where in to define the scope of work for DUBAI SOUTH customer and SOUTH ENERGY.

The purpose of guidelines are mainly

- To lay down the technical requirements for design and installation of LPG central gas systems as per best industry practices.
- To ensure material and equipment involved in LPG installation and all are comply with international standards.
- 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 design, construction and handover of LPG Utilization Gas System, to meet with the SOUTH ENERGY standards and requirements.

3. SCOPE:

This guidelines shall be applicable to customers who shall apply to SOUTH ENERGY for LPG Utilization Gas system for following criteria's:

This guideline shall be utilized by Plot Developers for design and installation of downstream Gas Utilization System.

The work and responsibility of the installation designer and plot developers (building contractor) 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:

1. The physical demarcation between the Gas Service Provider and Plot Developers design and build responsibilities are shown in Appendix A and further details in these guidelines which consist of Building Internal Gas Piping system.
2. The customers away from the LPG distribution network/ network is not yet constructed in the Dubai south districts, they 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.

Others reference for gas distribution network and PRMS design and installation requirements for Plot developers are available in the below mentioned documents.

1. Design Guidelines for Gas Distribution System to be referred to SE-LPG-Guidelines ----
2. Guidelines for Pressure Reducing And Metering Station (Primary Customer Meter) to be referred to SE- LPG-PRMS

4. REFERENCES:

The Gas System shall 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

5. DEFINITIONS & ABBREVIATIONS

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

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

5.3. The term “must” identifies a requirement by law.

5.4. **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.

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

5.6. **API** – American Petroleum Institute

5.7. **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.

- 5.8. ASME – American Society of Mechanical Engineers.
- 5.9. ASME Code – The American Society of Mechanical Engineers Boiler and Pressure Vessel Code.
- 5.10. **Consumer** - Any person, agency or authority to whom gas is delivered either directly or indirectly.
- 5.11. **Consumer (Secondary) Meter Installation** - The gas utilization equipment that measures the volume of gas delivered to a consumer
- 5.12. **Customer** - a property owner or any person, agency or authority operating under his consent to whom Gas Service Provider sells gas.
- 5.13. **Customer (Primary) Meter Installation – Pressure Reducing and Metering Station (PRMS)** - A gas utilization facility that measures the volume of gas delivered to a customer. A customer primary meter installation may also filter the gas and/or reduce the pressure of gas to the customer's delivery pressure.
- 5.14. **Customer Internal Piping** - is a Gas Utilization (Building Internal Piping) small network consisting of Customer Primary Meter Installations, installation pipework and utilization equipment that carry gas from the Gas Distribution System to the utilization equipment for consumption.
- 5.15. **Delivery Pressure** - The pressure at which gas is to be delivered to a customer at the inlet to the utilization pipework.
- 5.16. **Design Pressure** - The maximum pressure at which the equipment or system is designed to operate.
- 5.17. **Delivery Pressure** - The pressure at which gas is to be delivered to a customer at the inlet to the utilization pipework.
- 5.18. **Design Criteria** - Design Criteria are established, but usually unquantifiable, inputs that shall be applied in the design process.
- 5.19. **Design Parameters** - Design Parameters are quantifiable inputs that shall be used in completing a design.
- 5.20. **Distribution Network** - Interconnected group of pipes that are part of the Gas Distribution System.

- 5.21. **Distribution Pipeline** - (MOP) less than or equal but exceeding 4 bar. A gas distribution facilities consisting of PE and/or steel pipes and other components.
- 5.22. **Diversified Load** - The ratio of the maximum potential demand, typically hourly, to the maximum actual demand.
- 5.23. **Dropper Pipework** - that is part of the Gas Utilization System. The flow of gas through a dropper is vertically downward.
- 5.24. **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.
- 5.25. **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.
- 5.26. **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.
- 5.26.1. **Flexible Hose Connector** - A component fabricated from LP-Gas hose that is made from a material that is compatible with LP-Gas
- 5.26.2. **Flexible Metallic Connector** - A component fabricated from metallic material that provides liquid and vapor LPGas confinement and is provided with connections on both ends.
- 5.27. **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.
- 5.28. **Gas** - For the purposes of this code, liquefied petroleum (LP- Gas) in either the liquid or vapor state.
- 5.29. **Gas Piping** - An installation of pipe, valves or fittings installed on premises or in a building and utilized to convey fuel gas.
- 5.30. **Gas Riser** - Pipework that is part of either a Gas Service or the Gas Utilization System. The flow of gas through a riser is vertically upward.
- 5.31. **Gas Distribution System** - A network consisting of pressure regulating stations, distribution pipelines, distribution mains and gas services that distributes gas from the Tank Farm supply system to the Gas Utilization Systems.

- 5.32. **Gas Service Provider (GSP)** - The company appointed by South Energy having the authority to supply gas to customers in Dubai South districts
- 5.33. **Gas System** - The combined gas supply system, Gas Farm, Gas Distribution System and Gas Utilization Systems that process, transport, measure, distribute and deliver gas for consumption
- 5.34. **Listed** - Approved and registered by Civil Defence material department
- 5.35. **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.
- 5.36. **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.
- 5.37. **Stationary Installation (Permanent Installation)** - An installation of LP Gas containers, piping, and equipment for indefinite use at a particular location. An installation not normally expected to change in status, condition, or location. This installation requires Civil Defence approval.
- 5.38. **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.
- 5.39. **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*.
- 5.40. **Maximum Operating Pressure (MOP)** - The maximum pressure to which the system may be subjected under normal conditions.
- 5.41. **Pressure Relief Valve** - A type of pressure relief device designed to both open and close to maintain internal fluid pressure to a specified value.

- 5.42. **Positive Shutoff Valve** - A shutoff valve that, in the closed position, does not allow the flow of product in either direction.
- 5.43. **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.
- 5.44. **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.
- 5.45. **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.
- 5.46. **UPS0** – Under pressure shut-off device.
- 5.47. **Regulator :**
- 5.47.1. **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
- 5.47.2. **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.
- 5.48. **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.
- 5.49. **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.
- 5.50. **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.
- 5.51. **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).

- 5.52. **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.
- 5.53. **Separation distance** - The minimum horizontal and vertical distance through air measured between the LPG container/tank surfaces to the required safe distance.
- 5.54. **LPG Riser** - A vertical pipe supplying fuel gas.
- 5.55. **SIV - Service Isolation Valve** - an underground service isolation valve (SIV) is provided in the each individual plot valve chamber.
- 5.56. **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.
- 5.57. **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.
- 5.58. **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.
- 5.59. **UL** - Underwriters Laboratories Inc.
- 5.60. **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.
- 5.61. **Water Capacity** - The amount of water at 60°F (16°C) required to fill a container.
- 5.62. **PSI**. Pounds per square inch.
- 5.63. **PSAI**. Pounds per square inch absolute.
- 5.64. **PSIG**. Pounds per square inch gauge.
- 5.65. **Plot** - A finite amount of property/land used for commercial or residential purposes. Plots may belong to or be controlled by a specific individual, entity or authority. Plots may be vacant areas but may also be occupied by buildings, facilities or equipment. Buildings are typically located fully within plots but in some circumstances do extend beyond plot boundaries.

- 5.66. Polyethylene (PE)- for the purpose of these guidelines means PE100 SDR 11.
- 5.67. **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.
- 5.68. **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.
- 5.69. **Service Line Extension (by Plot Developers)** - A pipeline connection from existing service line isolation 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.
- 5.70. **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.
- 5.71. **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.

6. RESPONSIBILITIES

6.1 SOUTH ENERGY RESPONSIBILITIES

SOUTH ENERGY shall be responsible for communicating the design requirements of PRMS & building internal gas piping system to its plot developers/consultants/contractors/customer stated herewith ensuring UAE Fire and Life Safety Code of Practice – Chapter 11, NFPA 58 & 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 utilization system guidelines conforming to all relevant standards requirements to meet design criteria for both LPG underground network piping, PRMS room and building secondary piping from the service line extension.

6.2 DUBAI SOUTH CUSTOMERS RESPONSIBILITIES

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

6.2.2. To design, procure, supply, install, test and commission all necessary PRMS room & Inside building fuel 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)

6.2.3. To supply, install, test and commission the underground HDPE piping (from existing gas service line PE –isolation ball valve to (tie-in) 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)

6.2.4. 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)

6.2.5. 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.

6.2.6. 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.

7. DESIGN PRINCIPLES

7.1. THE KEY DESIGN PRINCIPLES THAT SHALL BE ADHERED TO ARE:

- 7.1.1. 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.
- 7.1.2. 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.
- 7.1.3. 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

7.2. LPG NETWORK DESIGN PARAMETERS AND SYSTEM CONFIGURATION

- 7.2.1. LPG Composition 30% Propane and 70% Butane
- 7.2.2. Higher Heat Content or calorific value = 1,07,508 Btu/m³ (47,338 Btu/kg)
- 7.2.3. Specific Gravity = 1.86
- 7.2.4. Maximum Operating pressure for existing networks – the regulated LPG vapor pressure delivered from storage shall be 2 bar
- 7.2.5. Minimum available pressure 1.2 bar at the service line
- 7.2.6. Maximum allowed delivered pressure to commercial customers has MOP 350 mbar
- 7.2.7. Maximum allowed delivered pressure to residential consumers has MOP 75 mbar
- 7.2.8. Maximum utilized pressure at residential appliances is 37 mbar
- 7.2.9. Maximum allowed pressure drop for utilization pipes is 10% and velocity is less than 20 m/s.
- 7.2.10. All gas detection systems to be designed in compliance with Dubai Civil Defense requirements.

7.3. GAS DESIGN PRINCIPLES FOR SUPPLY AND DISTRIBUTION

The design principles shall include:

- 7.3.1. Assurance of a safe, reliable, effective, efficient and secure supply of gas
- 7.3.2. The load that will be applied for design will be diversified.
- 7.3.3. These principles will be achieved by:
- 7.3.4. The availability of LPG is considered suitable for constant and adequate to supply the peak demand.
- 7.3.5. Controlling the flow of gas in the event of damaged facilities or components will be incorporated in the design.
- 7.3.6. 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.

- 7.3.7. 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.
- 7.3.8. 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.
- 7.3.9. 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 PRS will be standardized to optimize operational and maintenance effort and to reduce spare parts.
- 7.3.10. All material, assemblies, and installations will assure correct functionality and operability under local ambient conditions and will be subject to Client approval.
- 7.3.11. The design will allow construction to be completed using existing and/or reasonably available methods, tools and equipment.
- 7.3.12. The design of the facilities shall provide for ease of all operation and maintenance activities
- 7.3.13. Due to the possible future conversion from LPG to NG the following parameters shall be considered during the design;
Designs shall ensure specific considerations are taken to accommodate the significant difference in specific gravity of LPG and future NG supplies; the value of 0.64 (relative to air) shall be assumed for NG.

7.4. 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 m ³ /hour (NG)	Peak Hour m ³ /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. INSTALLATION OF GAS PIPING INSIDE BUILDING REQUIREMENTS

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

- 8.1.1. All piping, fittings and equipment used shall be suitable for purpose and in compliance with the UAE civil defense standards and specifications
- 8.1.2. 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.
- 8.1.3. Designer shall ensure the gas pipes service to the plot is accurate.
- 8.1.4. Customer Installation piping work extends from the outlet valve of the Pressure Reducing & Metering Station (Customer Primary Meter) to the consumer appliances.

- 8.1.5. 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.
- 8.1.6. 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.
- 8.1.7. Gas regulator in the building shall be able to operate with 75mbar incoming pressure from the main Pressure Reducing and Metering Station.
- 8.1.8. Risers/droppers shall be installed external to the building or in shafts/ducts ventilated.
- 8.1.9. Risers/droppers installed in the shaft/duct shall be steel, of fully welded construction.
- 8.1.10. Droppers will be in steel / copper and installed in ventilated shafts/ducts and copper pipes cannot be used for droppers with length above 20m.
- 8.1.11. An isolation valve will be installed at the top of each dropper
- 8.1.12. Shaft dedicated for gas distribution system for building shall be 2 hr. fire rated
- 8.1.13. 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.
- 8.1.14. 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.
- 8.1.15. For residential units an automatic shut off valve / manual ball valve shall be installed downstream of the consumer meter unit.
- 8.1.16. Pressure loss calculations and friction factor shall be in accordance with IGE/UP/2 standard.
- 8.1.17. Diversity should be taken into account when determining pipe sizes.

8.2 RESIDENTIAL VILLAS

- 8.2.1. 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 (with GRP Sleeve) 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.

- 8.2.2. 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.
- 8.2.3. Maximum operating pressure within the building should be 75mbar.
- 8.2.4. 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.
- 8.2.5. Secondary regulator 37mbar shall be installed inside kitchen and incorporate with UPSO
- 8.2.6. 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.
- 8.2.7. The building internal piping shall be designed to deliver at least the minimum operating pressure of all connected appliances.
- 8.2.8. 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.

8.3 RESIDENTIAL AND RESIDENTIAL / COMMERCIAL MULTI-STORY BUILDINGS.

- 8.3.1. Pressure from the gas distribution system at the outlet of the primary PRMS should not exceed 75mbar for residential building.
- 8.3.2. Pressure from the gas distribution system at the outlet of the primary PRMS should not exceed 350mbar for residential/commercial building.
- 8.3.3. Diversity factor should be taken into account when determining pipe sizes.
- 8.3.4. 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.
- 8.3.5. Expansion joints and flexible connections shall be considered to avoid unacceptable stresses being inflicted on any lateral pipe work.
- 8.3.6. Pipe work shall be supported adequately along its entire length.
- 8.3.7. Threaded steel pipework $\leq 2"$ shall be of schedule 80 and $> 2"$ schedule 40

- 8.3.8. 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.
- 8.3.9. Risers should be installed external to the building or inside shaft with 2hr. fire rated.
- 8.3.10. All risers and droppers shall be provided with isolation valve at the top of each dropper.

8.4 DUCTS AND SHAFTS

- 8.4.1. Ducts or shafts used to convey gas pipework in buildings shall be dedicated for gas, and incorporating the following requirements into the design;
- 8.4.2. Ventilated by means of both an open to sky and base level opening that will direct any leakage to outside the building.
- 8.4.3. Sealed from the building such that gas leakage into any duct shall not be able to enter any part of the building other than the duct/shaft.
- 8.4.4. Fitted with sealable access panels to enable operation and maintenance activities to be undertaken.
- 8.4.5. Fitted with a gas detection system at suitable locations.
- 8.4.6. Provision must be made for safe and adequate access for inspection of any riser, valve, lateral, meter and other gas equipment.

8.5 GAS METER IN HIGH RISE BUILDING

- 8.5.1. A meter installation shall be located in a cupboard or compartment, designed for the purpose and ventilated to outdoor atmosphere.
- 8.5.2. All meters should be located in well-ventilated areas and be easily accessible to allow them to be read, maintained and isolated when necessary.
- 8.5.3. Meters must not be exposed to extreme temperatures, excessive humidity, vibration, corrosive substances, accidental damage, or ignition sources.

- 8.5.4. Gas meter installed in individual apartment shall be located in individual compartment designed for the purpose.
- 8.5.5. Gas meter installed in high rise building (multi dwelling building) shall have smart metering capability that should include for billing, monitoring and controlling. Gas smart meter reading facilities shall be able to be connected using TCP/IP communication protocol to **South Energy** main control center.
- 8.5.6. Gas meter shall be installed at minimum 3 meter away from any building opening and source of ignition, and not installed above basement.

8.6 Small Commercial Installation

- 8.6.1. Meter installation should connect into the customer internal pipework as close as possible to the entry point to the building
- 8.6.2. Isolation valve are required immediately downstream of the point of entry into any building.
- 8.6.3. Delivery pressure shall be not excess of 350mbar.
- 8.6.4. Secondary pressure regulator shall be installed in customer PRMS with UPSO
- 8.6.5. All above ground pipe works should be carbon steel schedule 40 Grade B.
- 8.6.6. The maximum allowable pressure drop is 10% of the delivery pressure.
- 8.6.7. Diversity should not apply to the design of commercial piping systems.
- 8.6.8. Pressure loss calculation and friction factors shall be in accordance with IGE/UP/2.
- 8.6.9. Equivalent lengths of valves and fittings will be added to the pipe length.
- 8.6.10. 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.

8.7 Medium / Large Commercial

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

- 8.7.2. 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.
- 8.7.3. All above ground pipe works should be carbon steel schedule 40 Grade B
- 8.7.4. Delivery pressure shall be not excess of 350mbar.
- 8.7.5. Regulator installations within installation pipe work shall incorporate OPSO and UPSO capabilities.
- 8.7.6. Pressure loss calculation and friction factors shall be in accordance with IGE/UP/2.
- 8.7.7. Equivalent lengths of valves and fittings will be added to the pipe length.
- 8.7.8. 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.
- 8.7.9. Where the gas installation has multiple branches an isolation valve shall be installed on each branch.
- 8.7.10. All Risers / droppers shall be running inside 2hr fire rated dedicated shaft (Minimum 30cmx30cm) and shaft shall be naturally ventilated to open to air.

8.8 Kitchen Safety Devices

- 8.8.1. The solenoid valve should be located upstream of the regulator and as close as possible to the ECV
- 8.8.2. The solenoid valve is activated by either output from the gas detector or the wall mounted “on-off” switch.
- 8.8.3. 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
- 8.8.4. Pipe work to each appliance shall terminate with an appropriately anchored fitting.
- 8.8.5. An automatic shut off valve / manual ball valve shall be installed downstream of the meter for residential kitchen.

9. MATERIAL TECHNICAL SPECIFICATIONS & REQUIREMENTS

9.1 Piping Materials

9.1.1. 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

9.2. Carbon Steel Seamless Pipes

9.2.1. 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.

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

9.2.3. Test pressure will be 1.5 x MOP.

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

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

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

9.2.7. 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:

9.2.8. 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

9.3. Steel pipe Fittings

9.3.1. Flanges:

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

9.3.2. Welded Fittings

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

9.3.3. Threaded fittings

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

9.4. Gaskets, Bolts and Nuts

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

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

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

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

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

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

9.5. Copper Piping and Fittings

9.5.1. Copper piping 15mm may be used for kitchen pipe work with MOP below 75 mbar only

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

9.5.3. 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).

9.5.4. Below provide support spacing details

Minimum Support intervals - Copper Pipe

Nominal Diameter	Horizontal	Vertical
15mm	1.5m	2.0m

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

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

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

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

9.6. Jointing

All joint shall be as per codes, standard and manufacturer requirements and recommendation. Ream ends of pipes and tubes and remove burrs. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

9.6.1. Threaded Joints:

9.6.1.1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.

9.6.1.2. Cut threads full and clean using sharp dies.

9.6.1.3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.

9.6.1.4. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.

9.6.1.5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

9.6.2. Welded Joints:

9.6.2.1. All welding of metallic piping shall be in accordance with ASME Boiler and Pressure Vessel Code, Section IX or API1104, using qualified processes and welding operators.

9.6.2.2. All welding end preparation shall be in accordance with ANSI B16.25

9.6.2.3. All joints to be welded unless otherwise required example the connection to threaded valves or pressure gauge.

9.6.2.4. Steel pipe fitting shall be in accordance to ANSI ASME B16.9

9.6.2.5. Welded pipe joint shall be tested with Non Destructive Test, X –ray, Dye Penetration Test, Magnetic particle Test or Ultra Sound Test. See Section 18.

9.6.3. Brazed Joints:

9.6.3.1. Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube".

9.6.3.2. Brazing Filler Metals: Alloy with melting point greater than 540 Degree Celsius complying with AWS A5.8/A5.8M.

9.6.3.3. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

9.6.4. Flanged Joints:

9.6.4.1. Flanged joint shall be to ASME B16.5

9.6.4.2. Install gasket material, size, type, and thickness appropriate for natural- gas service. Install gasket concentrically positioned.

9.6.5. Flared Joints:

9.6.5.1. Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not over-tighten.

9.6.6. PE Piping Heat-Fusion Joints:

9.6.6.1. Pipe fittings shall be clean and dry joining surfaces by wiping with clean cloth or paper towels. Join shall be according to ASTM D 2657.

9.6.6.2. Plain-End Pipe and Fittings: Use butt fusion.

9.6.6.3. Plain-End Pipe and Socket Fittings: Use socket fusion.

9.7. Ball Valves

9.7.1. 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.

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

9.8. Strainers / Filters

9.8.1. 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.

9.8.2. 100% Factory Pressure Tested

9.8.3. 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.

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

9.9. Pressure Regulators

9.9.1. 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).

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

9.9.3. 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.

9.10. Pressure Relief Valves

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

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

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

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

9.11. Gas Meters

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

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

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

9.11.4.BS EN 1359 or Equivalent for Diaphragm Meters

9.11.5.EN 14236 Ultrasonic domestic gas meters.

9.12. 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

9.13. Range ability

9.13.1.Not Less than 1:20 for Turbine Metes

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

9.14. 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

9.15. Solenoid valve

9.15.1.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.

9.15.2.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.

9.15.3. 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.

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

9.16. Pressure Gauges

9.16.1. Pressure gauges shall be fitted with isolation valve.

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

9.16.3. Material: 316L stainless steel

9.16.4. Dial Size minimum: 63mm

9.17. PE – Pipes (Below Ground)

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

9.17.2. PE pipe shall be for buried used only.

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

9.18. PE– Fittings

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

9.18.2. 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.

9.19. PE – Ball Valves

9.19.1. 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.

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

9.20. Auto shutoff valve

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

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

9.21. Gas Hose

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

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

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

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

9.22. Gas Leak Detector

9.22.1. The primary objective of the gas leak detector is to provide for safety, in a means of 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.

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

9.22.3. Installation shall be as per manufacturer recommendation.

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

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

9.22.6. 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.

9.22.7. 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.

9.22.8. 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.

9.22.9. 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.

9.23. Containment

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

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

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

10. PAINTING AND COLOR CODES

10.1. 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.

- 10.2. The Copper pipes shall be marked with yellow color band around the pipes every 2 meter.
- 10.3. The Material surface to be painted shall be cleaned from any welding slag, dust, grease or debris.
- 10.4. Various methods of surface preparation can be adopted e.g. degreasing, high pressure fresh water hosing, hand tool cleaning, power tool cleaning etc.
- 10.5. Color of LPG Steel piping shall be yellow and paint shall be in 2-layer coating.
- 10.6. Material surface to be painted shall be dry.
- 10.7. Paint shall be fully cured before another layer to be applied.
- 10.8. Paint application shall follow manufacturer specification or procedure.

11. PIPE MARKING

- 11.1. All the above ground gas pipe shall be provided with arrow marking with flow direction of the gas.
- 11.2. Arrow marking shall be black with word “LP GAS”
- 11.3. The vapor LPG pipelines (CS) in “Yellow” with the marking of the word “LP GAS” at intervals of not more than 3M.
- 11.4. Copper pipe can be marked with yellow color band around the pipes every 2m.
- 11.5. The marking of pipework is essential for correct meter reading, safe operation, maintenance and accurate billing of gas consumed.

12. GAS PIPE ROUTING PROHIBITED AREAS

- 12.1. LPG pipe installation or distribution shall not be permitted in the following areas.
- 12.2. In the ground under concrete flooring within building
- 12.3. Under building foundations / structure

- 12.4. Within lift shafts and cavity walls.
- 12.5. 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.
- 12.6. Adjacent to pipes and vessels containing flammable, oxidizing, corrosive and other hazardous liquids and materials.
- 12.7. 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.

13. GAS LEAK DETECTION AND SAFETY SHUT OFF EQUIPMENT

- 13.1. Gas detection equipment shall be installed in pipe in pipe systems, PRMS, gas shafts, kitchens, and any other areas where there is a potential for gas release inside the building and any other area where there is a potential for gas release inside building.
- 13.2. PRMS, shaft and gas detector must be explosion proof type.
- 13.3. The coverage ranges from both sides of the gas detector to be considered as per manufacturer specification or 20m for pipe in pipe applications.
- 13.4. 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
- 13.5. Location of gas detector for LPG should be at low level 300mm from floor or bottom (for shafts) level.
- 13.6. 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.

- 13.7. 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).
- 13.8. All cables for gas detection system shall be fire protection type.
- 13.9. The gas detection system should be approved by Dubai Defence.
- 13.10. Gas detection equipment should be positioned per manufacturers' instructions.

14. PRESSURE AND LEAK TEST

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

- 14.1. The Pressure Test shall be witnessed by South Energy responsible person with customer. The Contractor is required to liaise with Local Authority on the arrangement and should advise South Energy (SE) the parties involve accordingly.
- 14.2. 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.

15. TESTING AND COMMISSIONING

- 15.1. 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.
- 15.2. Before carrying out any test, the Contractor shall ensure that the installation fully complies with the relevant statutory obligations and regulations.

- 15.3. 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.
- 15.4. Meters, regulators and associate equipment shall not be subjected to on site pneumatic or test it shall be tested by manufacturer in factory.
- 15.5. 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.
- 15.6. South Energy (SE) will reserve the right not to connect / gasify the building internal piping if the testing result is not satisfactory.
- 15.7. South Energy (SE) will commission the gas facilities with LPG only after customer/contractor obtaining No Objection Certificate (NOC) from Authority on the internal piping installation.

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

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

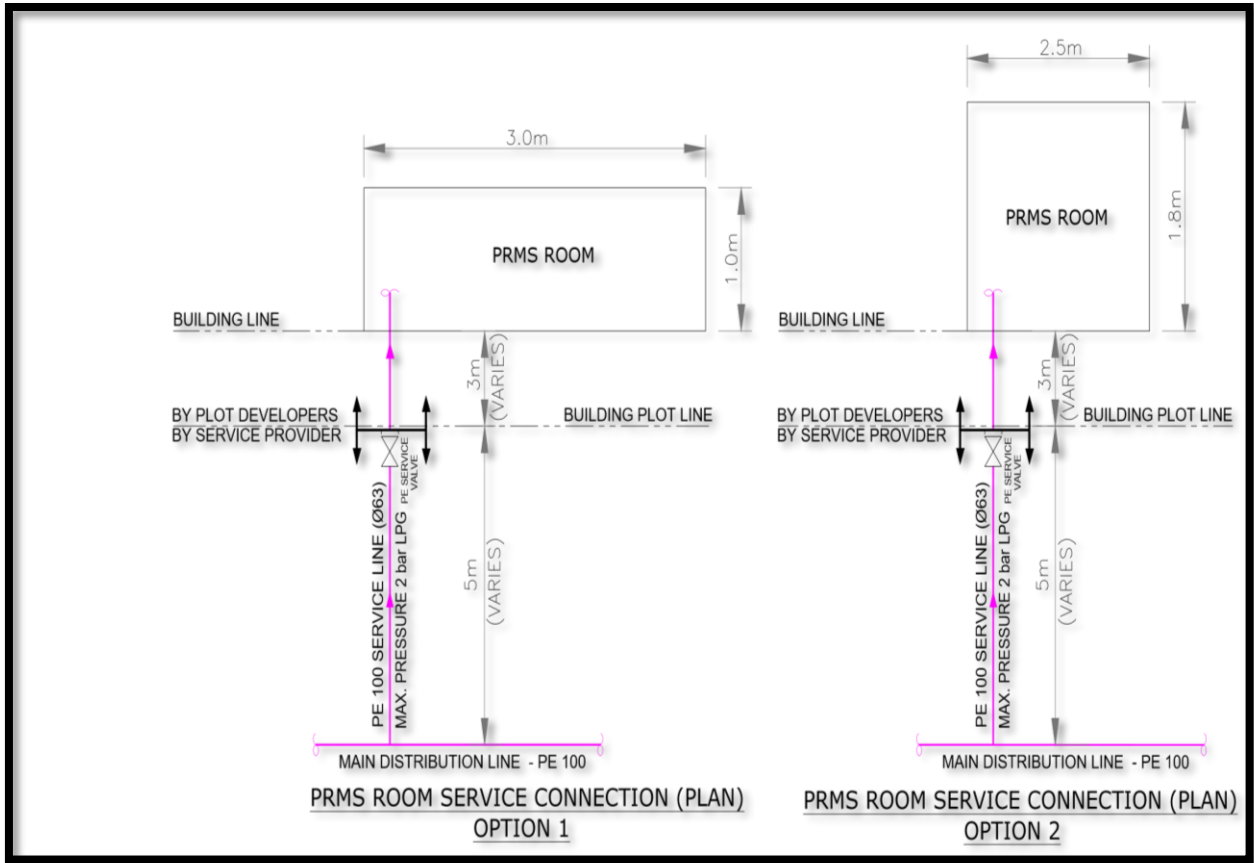
		4	GEORGE FISCHER (GF)	USA
24	GAS LEAK DETECTION PANEL	1	OLDHAM	FRANCE
		2	TECHNO CONTROL	ITALY
		3	EDS	UK
25	GAS DETECTOR	1	OLDHAM	FRANCE
		2	SITEX	CHINA
		3	TECHNO CONTROL	ITALY
		4	EDS	UK
26	PIPE SUPPORT	1	DIAMOND	ITALY
		2	FLAMCO	NETHERLANDS
		3	WEICCO	INDIA
27	PAINT	1	NATIONAL PAINT	UAE
		2	HEMPEL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

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

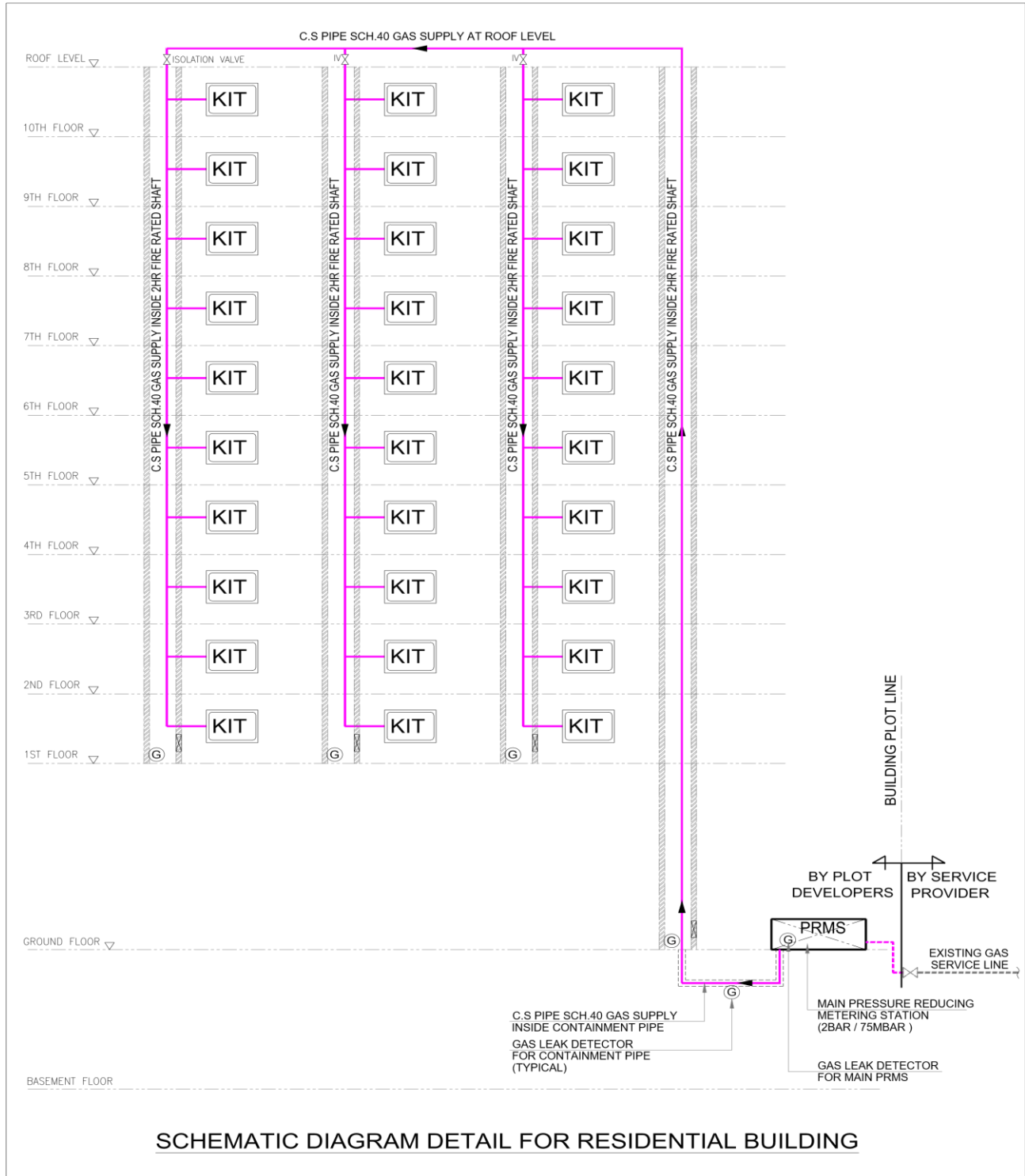
17. APPENDICES: SCHEMATIC DRAWINGS OF PRMS ROOM AND ITS CONNECTION BASED ON MAXIMUM REQUIRED CAPACITY

- 17.1. Appendix A – Physical Demarcation between Gas Service Provider and Plot Developers
- 17.2. Appendix B -Schematic Diagram Detail for Residential Building
- 17.3. Appendix C- Schematic Diagram Detail for Residential / Commercial Building
- 17.4. Appendix D- Typical Kitchen Detail for Residential Connection
- 17.5. Appendix E- Typical Customer PRMS Detail for Retails/Restaurants

Appendix A – 17.1 Physical Demarcation between Gas Service Provider and Plot Developers

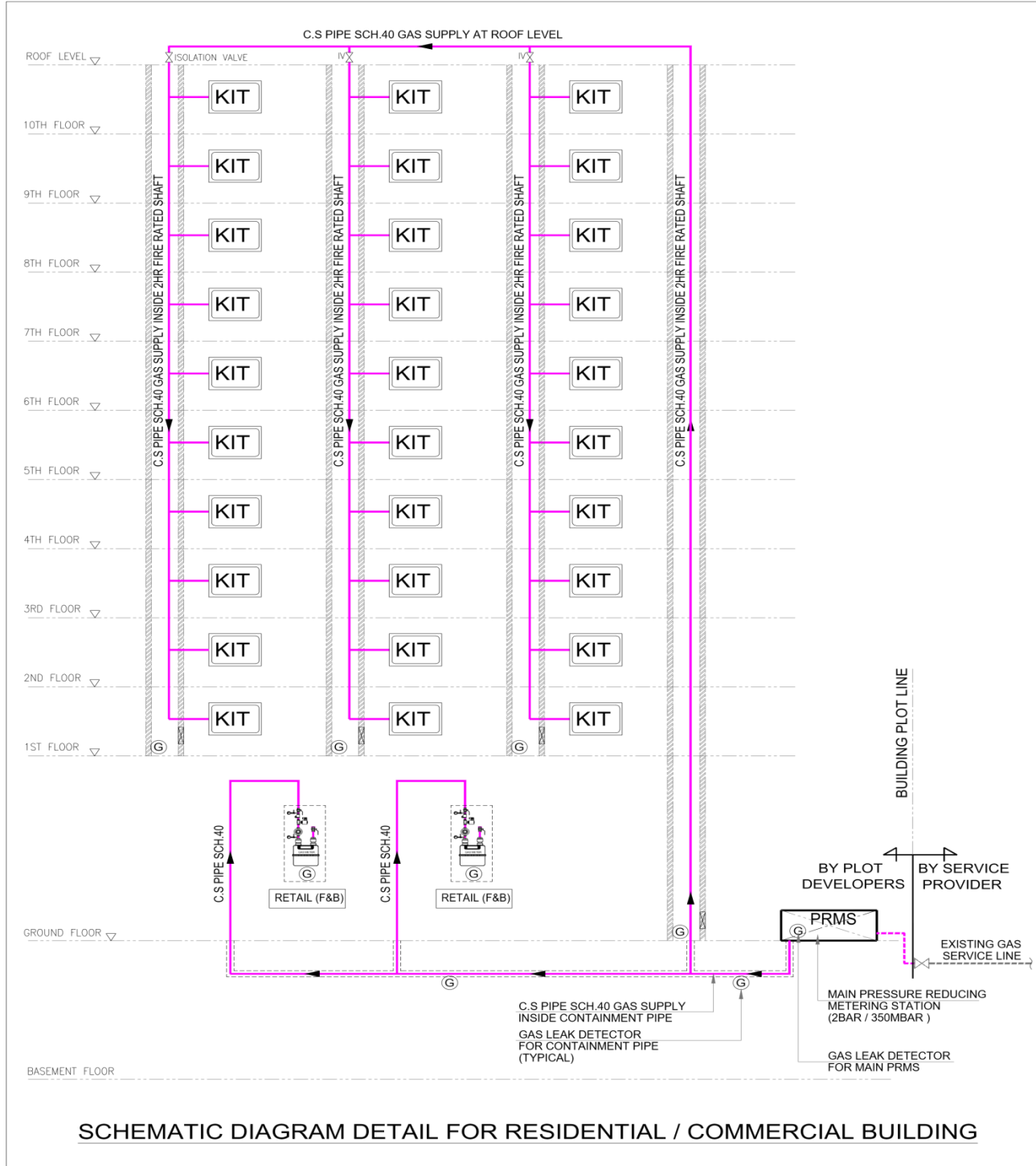


Appendix B -17.2 Schematic Diagram Detail for Residential Building

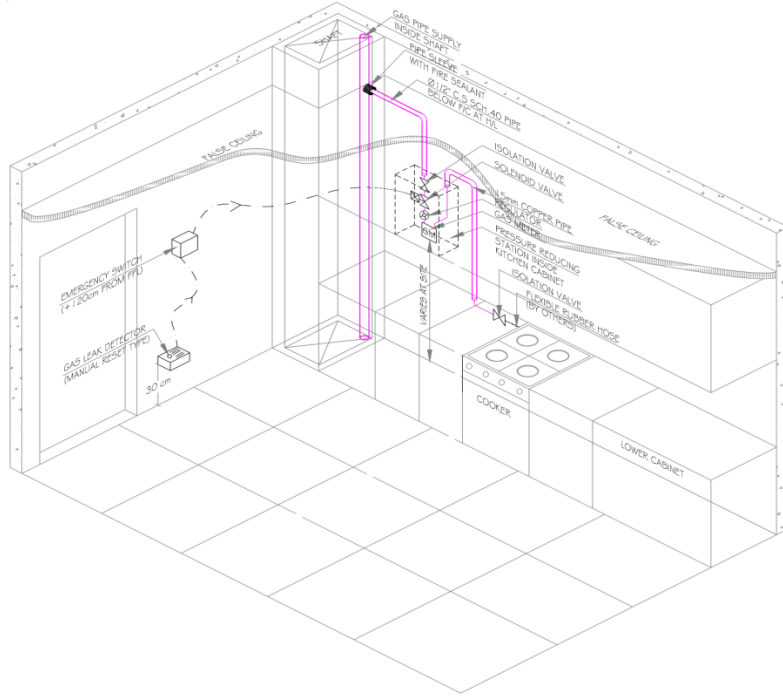
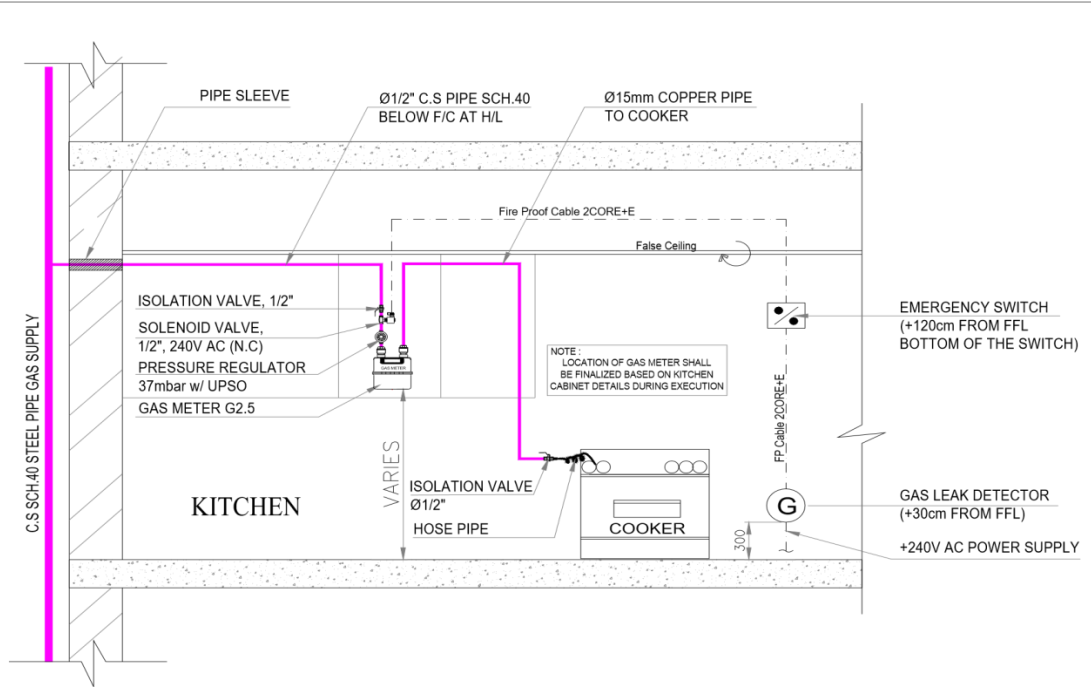


SCHEMATIC DIAGRAM DETAIL FOR RESIDENTIAL BUILDING

Appendix C- 17.3 Schematic Diagram Detail for Residential / Commercial Building



Appendix D- 17.4 Typical Kitchen Detail for Residential Connection



TYPICAL KITCHEN DETAIL FOR RESIDENTIAL CONNECTION

Appendix E- 17.5 Typical Customer PRMS Detail for Retails/Restaurant

