Cadent

Your Gas Network

# Engineering Specification for:

## Design specification of system extensions, connections and services to below 7 bar Cadent systems

**Reference: CAD/SP/NP/14E**

**Issued: February 2026**

## Version Control

| | |
|---|---|
| **Approved by** | Geoff Radley |
| **Date of Publication** | February 2026 |
| **Document Owner** | Jessica Jarvis |
| **Version Number** | 4.0 |

## Document History

| Description | Date | Document Number |
|---|---|---|
| Migrated into new template | June 2011 | T/SP/NP/14 |
| Document rebrand to Cadent, references to National Grid removed | June 2022 | CAD/SP/NP/14 |
| Technical review, merge of internal document (NP/10) into document | May 2025 | CAD/SP/NP/14E |
| Text amendment to section 10.1.1 | February 2026 | CAD/SP/NP/14E |

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### Mandatory & Non-Mandatory requirements:

In this document:

**Shall:** Indicates a mandatory requirement.

**Should:** Indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment must be completed to show that the alternative method delivers the same, or better, control of risks.

### Comments and Queries:

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# 1. Scope

The purpose of this specification is to provide a consistent approach to the sizing of services, connections and the quotation of design pressures.

This specification describes how pipes connected to the <7bar system are defined as mains and services. All below ground pipes, above ground pipes (including risers) are within the scope of this document.

This document defines how the physical design of any pipe, subject to a new or modified demand, which is to be connected to a Cadent parent main, shall be undertaken. The connection for all demands shall be designed in accordance with this specification.

This specification outlines the requirements for:

- Defining the factors to be considered when determining whether a pipe is classified as a main or service
- Establishing the charging point for a potential new load
- Designing new mains, services and risers
- Reviewing designs submitted by third parties for evaluation
- Evaluating new or increased loads where there are no new pipes installed

# 2. Records

All records and associated timescales shall be adhered to as per the requirements set out in CAD/PM/RE/8

All assets associated with this Specification shall be recorded in approved Cadent systems.

# 3. Errors

Any asset errors identified during the activities specified within this Specification shall be raised as per the requirements set out in CAD/PM/RE/8.

# 4. Legal obligations

Cadent has specific obligations with regards to future demand, this does not mean that Cadent shall lay pipes in anticipation of connections being made nor does it mean Cadent shall increase the size of its pipes to take account of all possible demands. It does mean that when Cadent is laying a main it shall consider the potential for other demands and the economics of the various options.

# 5. Appendices

This Specification consists of a number of Appendices. Explanatory notes are contained in all Appendices to guide the Responsible and Competent person; the relevant sections provide an overview of when to use a particular Appendix for a specific activity.

# 6. Defining mains & services

This document refers to primary meter installations in the context of what a pipe supplies. However, a service to an individual meter installation terminates at the outlet of the first ECV upstream of the individual meter installation. Refer to IGEM/G/1 ‘Defining the end of the Network, a meter installation and installation pipework’ for the definition of an ECV.

Pipes are laid for the purpose of being a main or service, however the criteria by which pipes are treated may change between the planning stage and commissioning. In addition, a pipes status may change from service to main during its life cycle as a result of re designation. For example, a 90mm PE pipe laid to a factory for the purpose of being a service should be sized according to service pressure drop criteria and shall be constructed and laid to mains standards before being recorded as a service in asset record systems.

Once installed and commissioned it should be re-designated as a main, subject to appropriate integrity checks and review by competent person, to allow other premises to be supplied in the future.

Appendix H provides examples and definitions for possible request types, please note the examples set out are not a definitive list, local work procedures shall be developed to provide more detail.

## 6.1 Main

A main, that is to be recorded as such in the asset record, is a below ground pipe, or exceptionally an exposed pipe (e.g. bridge crossing) laid as an extension of, or change to, the system that supplies, or has the potential to supply, more than 2 primary meter installations.

From the Gas Safety (Installation & Use) Regs.1998 and the Gas Safety (Management) Regs.1996. "Distribution main" means any main through which a supplier or transporter is for the time being distributing gas and which is not being used only for the purpose of conveying gas in bulk.

"Relevant main" means any distribution main in an authorised area, which is used for the purpose of giving a supply of gas to any premises in that area at a rate not exceeding 75,000 therms a year.

Pipes, other than service pipes, which convey gas to premises below 2,196,000kwh (75,000 therms) per annum are likely to be relevant mains, providing they are in Cadent's Licence area.

Cadent shall connect any individual premises, expected to consume less than 2,196,000kwh (75,000 therms) per annum, which is either within 23m of a relevant main or can be connected to one by a fit or purpose self-laid pipe.

## 6.2 Service

A service, that is to be recorded as such in the asset record, is a pipe from a main up to and including the outlet of the 1st ECV to an individual meter installation. This definition may occasionally include a dual service, supplying up to 2 primary meter installations in one or two buildings, with no other potential connections.

From the Gas Safety (Installation & Use) Regs 1998: "Service pipe" means a pipe for supplying gas to premises from a distribution main being any pipe between the distribution main and the emergency control, nearest upstream to the primary meter". From the Gas Act 1986: 'service pipe', means a pipe other than a distribution main of a gas transporter which is used for the purpose of conveying gas from such a main to any premises, and includes any part of such a pipe. (Interpretation of part 1 and savings).

IGEM/TD/4, Gas Services, defines a service as: A service may supply more than one primary meter in a particular building or in two adjacent buildings. A pipe supplying more than two buildings is regarded as a main.

## 6.3 Mains riser

A mains riser is any above ground horizontal or vertical arrangement of pipes that supplies more than 2 primary meter installations in an individual premises or building.

## 6.4 Service riser

A service riser is any above ground horizontal or vertical arrangement of pipes that supplies up to 2 primary meter installations. A lateral is a term in current use to describe an above ground pipe connecting a riser to a single primary meter installation.

# 7. Re-designation

A pipe laid as a service to a large industrial premise might be suitable for re-designation as a main if subsequent connections are required.

This is particularly true of service pipes sized >63mm which have been laid and tested to mains standards, and which had sufficient capacity and adequate pressure. The engineering criteria to be assessed when re-designating are set out in more detail in Appendix I.

With regard to existing assets, a pipe should not be re-designated unless a change of use is required and if a pipe is re-designated a suitable audit trail shall be created.

# 8. Utility Infrastructure Providers (UIPs)

Cadent takes ownership of pipes laid by UIPs and have an obligation to ensure the proposed UIP system is fit for purpose. Reference shall be made to CAD/PM/RE/8.

# 9. Construction standards

All steel and PE pipes laid in sizes >2”/63mm PE or equivalent shall be constructed and tested in accordance with mains standards. All service pipes should be laid to the standards set out in **IGEM/TD/4.**

Regardless of whether they are designed to pressure drop criteria for mains or services, mains and service risers have special construction requirements. Reference should be made to the current versions of mains and service laying procedures for multi storey premises.

New LP dual services, although permitted, should be discouraged wherever reasonably practicable, as the line of the service pipe should be as predictable, and as far as possible, laid within the curtilage of the premises being supplied.

Cadent standards shall be followed by internal resources.

# 10. Specific requirements

This Specification consists of a number of Appendices. Explanatory notes are contained in all appendices to guide the Responsible and Competent person; however the purpose of this section is to provide an overview of when to use any particular appendix for a specific activity.

All Design work relating to new works, modifications or repairs on an IP system shall adhere to ***IGEM/GL/5 edition 3***.

## 10.1 Requirements for Network Analysis

- All requests received for new loads or increased loads shall be assessed to determine if network analysis is required at the quotation stage. **Refer to Appendix A Table A.1.**
- If the request falls outside the scope of **Table A.1** it shall be referred for network analysis.
- Requests which include boosters or compressors fall outside Table A1 and should be referred to **section 9.4** and **Appendix C**.

- Standard or guaranteed pressures have been developed, to avoid the need to undertake network analysis at the quotation stage. The scope of guaranteed capacity extends to all LP and MP requests up to 1733KW and LP requests >900KW <=1733KW off <=2" mains.

**Refer to Appendix A, Tables A.1, A.2 and A.3.**

- Post acceptance security of supply assessment may be required when standard pressures have been taken from **Tables A.2 and A.3.**
- **Security of Supply**(SoS) checks that require referral to network analysis are necessary when the load exceeds the threshold for network analysis using **Appendix A, Table A.1, A.2** or follow a non-typical load pattern.
- The "SoS" check shall be carried out to ensure that capacity is available to support the load increase. Any shortfall in capacity should be met, at Cadent's cost, before the load can be connected.
- The process for undertaking post acceptance "SoS" checks and notifying the customer of any lead times for provision of capacity, shall be in accordance with internal procedures.

### 10.1.1 Minimum parent main pressures for LP networks extensions

- The values in **Table A.2** represent the minimum pressures to be quoted where mains extension for a multiple meter point connection is required and is subject to network analysis. Where a main and service are being laid to a single property, pressure will be capped at 23mbar peak and off-peak.

### 10.1.2 Minimum parent main pressures for MP networks

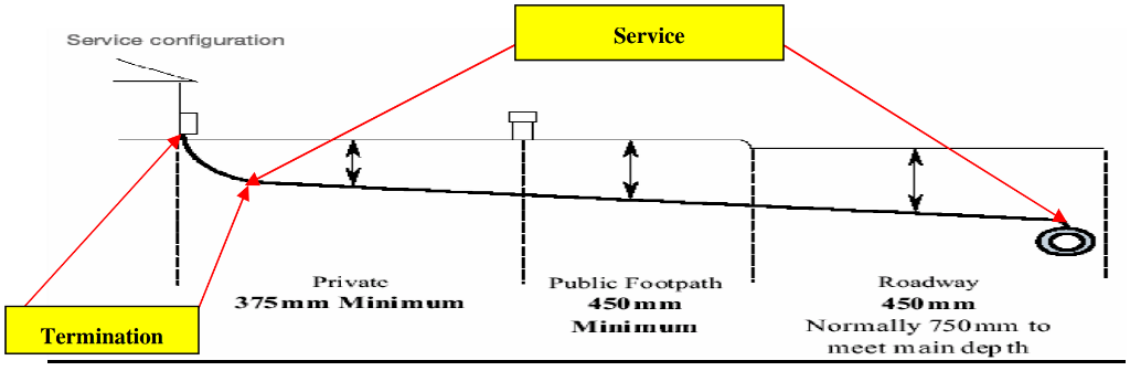
- The values in **Table A.3** represent the minimum pressures to be quoted where there are multiple meter points, mains extension or single service connection is subject to network analysis as part of the quotation process.

## 10.2 Design of Services

- Wherever possible services should be sized in accordance with standard tables.
- Standard sizes does not rule out, in advance, the reduction of nominal diameter for pipework and fittings at the service termination location. In these circumstances, it is not necessary to check the design in Toolbox.
- All other services shall be designed in accordance with **Appendix B.**
- Pipe codes used in design tools shall be in accordance with **Appendix D**
- Cadent is prepared to accept 25mm terminations for services of a minimum diameter of 32mm, subject to the diameter change being made at the base of the swept bend

Additional or simplified requirements for specific areas of service design activities are outlined in the following sub sections.

The definition for the termination criteria for the design of services shall be considered from the base of the riser as detailed in the example below:




### 10.2.1 New LP services

- Where a service is being laid to a single property 21mbar shall be given.
- Standard service sizes, for the range <=1085kW and <=63m, shall be quoted in accordance with the values shown in **Appendix A Table A.5**
- Above ground domestic service laterals <=15m shall be sized in accordance with Appendix A, **Table A.6.**

### 10.2.2 Increased loads to existing LP services

- Existing services, subject to a load increase, are permitted a maximum pressure drop of up to 5mbar where sufficient mains pressure is available.
- The total revised load should be assessed **against Table A.1** to determine any requirement for network analysis.
- To assess whether a standard mains pressure can be utilised, reference shall be made to **Appendix A, Table A.2**, by comparing the total revised load (new plus existing) against mains size. If the total revised load request is <=1083kW and the length <=50m **Appendix A Table A.8** should be used to determine if the existing service is to be replaced.

### 10.2.3 Replacement of services not subject to a load increase

- Where an existing service is identified for replacement due to condition, policy or customer request, and providing the parent mains pressure has been assessed, the service should be designed using the available pressure drop from the value shown in **Table A.2**, corresponding to the total demand. The maximum service pressure drop shall not exceed up to 5mbar.
- Once the available pressure drop has been identified, **Table A.8** should be used to determine the replacement service size in the range <=1083kWh and <=50m.
- All other services should be designed using network analysis values and the New Service Calculator within the Toolbox.

### 10.2.4 New MP services

- Standard service sizes, in the range <=1085kW and <=63m, shall be sized in accordance with **Table A.7.**

## 10.3 Design of mains

Mains shall be designed in accordance with **Appendix B,** and the pipe code table used in design tools shall be in accordance with **Appendix D**.

Additional or simplified requirements for specific areas of mains design activities are outlined in the following sub sections.

### 10.3.1 Standard LP/MP mains connection design sizes for UIP/GT connections

- Where the connected load is <10835kW the standard connection, corresponding to the load size, shall be found in **Table A.4.**

### 10.3.2 Approved mains connection for all pressure tiers and work types

- Manifold connections shall not be used. Mains connections to an existing system should use a Cadent Approved, manufacturer's standard tee or fitting.
- The method for connection shall be in accordance with **Tables A.9 and A.10.**

## 10.4 Non typical demands

A non-typical demand is a demand with a non-typical seasonal and/or daily profile for the customer type. Customers using compressors or boosters fall into this category.

It is important that sufficient information is gathered from the customer to properly assess the impact of non-typical demands on the upstream and downstream system network. Network analysis, including, where necessary, the use of such tools as CompAss shall be carried out. Refer should be made to **Appendix C.**

*Note: anything not temperature sensitive is non typica*

*Note: The fast-track process cannot be utilised*

# Appendix A – Standard design tables

## Table A.1 Network analysis threshold table for low & medium pressure systems

This table shall be used to identify the maximum permissible demand that may be taken from a parent main of defined diameter without the need for network analysis of the model.

This table should be used when considering all types of demands (multiple and single premises sites) unless they have boosters or compressors fitted, then refer to 9.4 and Appendix C.

**Single Premises Services:** Using the diameter of the parent main, compare the maximum permissible demand with the requested hourly/SHQ. Where the hourly/SHQ does not exceed the indicated value, no additional network analysis is required & the design work should progress.

**Multiple Premises Connections:** Using the diameter of the parent main, find the maximum permissible demand for the relevant main and compare it with the requested demand. Where this does not exceed the indicated value, no network analysis is required as part of the quotation process.

| | **Maximum demand (kW) PID for services/Pk6 for multiple premise sites** | | |
|---|---|---|---|
| **Nominal Pipe Diameter** | **LP: DMP <19mb** | **MP: DMP<=65mb** | **MP: DMP >65mb** |
| ≤ 2"/ ≤ 50mm metallic | ≤ 66 | ≤ 110 | ≤ 220 |
| ≤ 63mm/ ≤ 2" PE | | | |
| > 2" - ≤ 4" metallic | ≤ 175 | ≤ 275 | ≤ 435 |
| > 50mm - ≤ 125mm metallic | | | |
| > 63 - ≤125mm PE | | | |
| > 2" - ≤ 4" PE | | | |
| > 4" - ≤ 6" metallic | ≤ 450 | ≤ 545 | ≤ 925 |
| > 100 - ≤ 150mm metallic | | | |
| > 125 - ≤ 180mm PE | | | |
| > 4" - ≤ 6" PE | | | |
| > 6" - ≤ 8" metallic | ≤ 900 | ≤ 1300 | ≤ 1410 |
| > 150 - ≤ 200mm metallic | | | |
| > 180mm - ≤ 250mm PE | | | |
| > 6" - ≤ 8" PE | | | |
| > 8" - ≤ 12" metallic | ≤ 1733 | ≤ 1733 | ≤ 1733 |
| > 200 - ≤ 300mm metallic | | | |
| > 250mm - ≤ 355mm PE | | | |
| > 8" - ≤ 12" PE | | | |
| > 12" / 300mm metallic | ≤ 1733 | ≤ 1733 | ≤ 1733 |
| > 355mm / > 12" PE | | | |

Table A.1

| | Max Permissable Demand (kW) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Diameter | ≤ 66 | ≤ 175 | ≤ 450 | ≤ 900 | ≤ 1733 | ≤ 2160 | ≤ 3240 | ≤ 4325 | ≤ 5410 | > 5410 |
| ≤ 2"/ ≤ 50mm metallic | 23 | 23 | 23 | 23 | 23 | 25 | 26 | 26 | 26 | Supply pressure to be agreed by negotiation with the customer only if the values in the previous column are not stated to be sufficient for the customers design. The values in the previous column must be used as a start point and the agreed values must allow the efficient development of the overall system |
| ≤ 63mm/ ≤ 2" PE | | | | | | | | | | |
| > 2" - ≤ 4" metallic | 23 | 23 | 24 | 24 | 24 | 25 | 26 | 26 | 26 | |
| > 50mm - ≤ 125mm metallic | | | | | | | | | | |
| > 63 - 125mm PE | | | | | | | | | | |
| > 2" - ≤ 4" PE | | | | | | | | | | |
| > 4" - ≤ 6" metallic | 23 | 23 | 24 | 25 | 25 | 25 | 26 | 26 | 26 | |
| > 100 - ≤ 150mm metallic | | | | | | | | | | |
| > 125 - ≤ 180mm PE | | | | | | | | | | |
| > 4" - ≤ 6" PE | | | | | | | | | | |
| > 6" - ≤ 8" metallic | 23 | 23 | 24 | 25 | 25 | 25 | 26 | 26 | 26 | |
| > 150 - ≤ 200mm metallic | | | | | | | | | | |
| > 180mm - ≤ 250mm PE | | | | | | | | | | |
| > 6" - ≤ 8" PE | | | | | | | | | | |
| > 8" - ≤ 12" metallic | 23 | 23 | 24 | 25 | 25 | 25 | 26 | 26 | 26 | |
| > 200 - ≤ 300mm metallic | | | | | | | | | | |
| > 250mm - ≤ 355mm PE | | | | | | | | | | |
| > 8" - ≤ 12" PE | | | | | | | | | | |
| > 12" / 300mm metallic | 23 | 23 | 24 | 25 | 25 | 25 | 26 | 26 | 26 | |
| > 355mm / > 12" PE | | | | | | | | | | |

Table A.2

*Note: Cadent may choose to renegotiate the pressure provided, in order to minimise reinforcement costs associated with connections,*

*Note: When considering discrete systems designed post December 1995, add 1.75mb to the stated values,*

When considering discrete systems designed post December 1995, add 1.75mb to the stated values,

In a scenario where the above definition is achieved and consistent with NP14 Table A2 sub note, the following rules shall apply:

1. Where applicable table pressure plus 1.75mbar shall be provided.
2. If the pressure available over a 1 year and 5 year planning horizon does not maintain the pressure including the additional 1.75mbar but does maintain the original table pressure, contact should be made with the customer to understand if this is sufficient to proceed. If not, reinforcement may be required.
3. If the pressure available over a 1 year and 5 year planning horizon does not maintain the required pressure, including table pressure, reinforcement will be required to maintain the table pressure plus 1.75mbar.

## Table A.2 Connection point pressures for low pressure systems

This table shall be used to determine the minimum pressure to be supplied for a given level of demand and parent main diameter.

- The segment within the box defined by the solid blue boundary line should be used to identify the supply pressure without reference to the network analysis model.
- Loads that fall within the solid blue boundary are guaranteed capacity for all load types, anything that falls within this boundary can be fast tracked.
- The pressures within the boundary define the standard connection point pressures for multiple meter point requests.
- Services should normally be designed with a maximum 2mb pressure drop, i.e. a minimum of 21mb in the parent main. However, the cell pressures can be used as available pressure for new service designs, where the initial design results in a design ≥180mm diameter, (**see note 2 within Table B.1).**
- The cell pressures should also be used for service designs involving a mains element, or increased load to existing services in conjunction with **Table A.8.**
- For all non-domestic loads off peak analysis will be required, off peak pressure is capped at 23mbar.
- The values represent the minimum pressures to be quoted where a multiple meter point connection is subject to network analysis as part of the quotation process.
- In the case of alternative to reinforcement deep connection points the minimum pressure relates to the pressure at the customer's (downstream) end of the system extension.
- Within the solid bold blue boundary non typical loads shall still be assessed using network analysis, however the pressures are applicable for non-typical demand multiple meter point when used for Charging Point purposes only.
- The values outside of the defined box define the minimum supply pressure and the charging point pressure for multiple premises sites where reference to the analysis model identifies the indicated pressure is not available.
- Those multiple premises demands that are outside of the defined solid bold blue boundary shall be subjected to network analysis to identify the available pressure. The values in the table will be the minimum supply pressure for these types of requests where the analysis model shows the table cell pressure is not available.
- Loads falling within the shaded cells will be subject to a post acceptance capacity check (by Cadent) to ensure security of supply. The only exceptions are loads <=66KW, which do not require a security of supply check as per **Table A.1** unless they follow a non-typical load pattern.
- The pressures represent the minimum to be available during peak demand conditions. The pressure may be less than that indicated at off-peak times. The minimum pressure will be identified for inclusion within the quotations document.
- For demands >5410kW the charging point pressure is 26mb.

## Table A.3 Connection point design pressure (load <1733KWh & minimum supply pressure for all MP mains extensions

This table represents the design pressure that should be used as the start pressure for the design of any connection that:

- Has a load less than 1733KWh including services that are not subject to network analysis.
- Provides the minimum design supply pressure from the Cadent parent main for all mains extension systems.

| Pressure / Tier (DMP) | Minimum parent main supply pressure | Design Minimum mains pressure | Max service pressure drop |
|---|---|---|---|
| MP = 270mb | 450mb | 350mb | 70mb |
| MP = 180mb | 350mb | 250mb | 70mb |
| MP = 105mb | 240mb | 140mb | 35mb |
| MP = 65mb | 150mb | 100mb | 35mb |
| MP = 35mb | 95mb | 70mb | 35mb |

Table A.3

- The system Design Minimum Pressure (DMP) is dependent on the Medium Pressure tier. The relevant tier information is available from Cadent on request
- The Minimum parent main pressures will be provided as the ‘source’ pressure for the design of the mains extension. However, they do NOT infer actual mains pressures to be maintained i.e. Cadent may chose, post-acceptance to modify the pipe(s) to meet operational requirements of the system and will fund any subsequent changes.
- When dealing with a UIP submission, any mains that Cadent are requested to adopt shall be designed to ensure the design minimum mains pressure, as stated in the middle column, is maintained.
- Any service that Cadent is to take ownership shall be designed in accordance with the maximum pressure drops shown within Table B.1 and which have been included for easy reference in the right-hand column above. The pressures represent the minimum to be available during peak demand conditions. The pressure may be less than that indicated at off-peak times. The minimum pressure will be identified for inclusion within the quotations document.
- The minimum parent main supply pressures will also be the minimum design pressures to be provided for mains extensions when network analysis is carried out for loads in excess of 1733 KW.
- The cell pressures represent the minimum parent main design pressures to be provided for mains extensions, and/or used for charging point purposes for all load sizes, where reference to the analysis model identifies the indicated pressure is not available.

- Cadent may choose to upsize mains to be laid, and/or takes ownership, to provide enhanced mains extremity pressures (at Cadent's cost) in accordance with current agreement.
- Post acceptance security of supply checks shall be carried when the load/mains size combination would require network analysis in accordance with Table A.1.

## Table A.3.1 Connections point pressures for supplies from IP networks

Where a connection is proposed onto the Cadent Intermediate pressure system, the design minimum pressure will be dependent on the network parameters. The relevant tier information is available from Cadent on request.

Where a connection is proposed onto the Cadent Intermediate Pressure (IP) System, the following standard source pressures will apply for 7bar systems, as per tables A.3.1 below.

| **7Bar - 4.1Bar Systems** | |
|---|---|
| **Single Service Connection** | 3500mb |
| **Network Mains Extension** | 3640mb |
| **4.0Bar - 2.7Bar** | |
| **Single Service Connection** | 2700mb |
| **Network Mains Extension** | 2840mb |

Table A.3.1

Some networks which operate within the 4.0Bar - 2.7Bar pressure range have a higher minimum pressure which will affect the standard design pressure, these networks will be confirmed through a GT1 request, FM176, or a request to connect through the connections processes.

# Table A.4 Standard connection diameter for multiple premise sites (final connection for GT/UIP requests)

This table represents the default connection pipe diameter to supply multiple premises sites for the indicated maximum demand:-

| Max. Permissible Demand (kW) | LP: Diameter (mm) | MP: DMP≤65mb Diameter (mm) | MP: DMP≤105mb Diameter (mm) | MP: DMP>105mb Diameter (mm) |
|---|---|---|---|---|
| <=314 | 63 | 63 | 63 | 63 |
| <=758 | 90 | 63 | 63 | 63 |
| <=1100 | 90 | 63 | 63 | 63 |
| <=1625 | 125 | 90 | 63/90* | 63 |
| <=2167 | 125 | 90 | 63/90* | 63/90* |
| <=3250 | 125 | 90 | 63/90* | 63/90* |
| <=4333 | 180 | 125 | 63/90* | 63/90* |
| <=5416 | 180 | 125 | 90 | 63/90* |
| <=10835 | 180 | 125 | 90 | 90 |
| >10835 | By negotiation | | | |

Table A.4

- For connection to PE mains it is not appropriate to utilise 63mm top tees to PE mains without assessing the impact of the pressure drop through the fitting, hence Cadent will provide a default fitting of 90mm for PE mains.
- Cadent will consider requests for 63mm connections to PE mains when the customer has accounted for the pressure drop as identified by use of the equivalent length in accordance with Table B.3.
- The table values are the diameters to be used for quotation unless requested otherwise (note the value shown is the nominal diameter and may be subject to substitution with a material of similar effective diameter). Diameters greater than the value shown may be provided subject to additional cost.
- The table values are the minimum values that will be accepted as a UIP design.
- See Table A.9 & A.10 for list of approved connection types that shall be used.

## Table A.5 Standard service design LP networks

- To be used for service connections to LP mains only, using a standard manufacturer's connection (see Table A.9 & A.10)
- The lengths indicated represent the allowable plan length from parent main to meter point or to the base of a riser (where appropriate).

| Allowable Length / PID | ≤ 10m | ≤ 15m | ≤ 23m | ≤ 30m | ≤ 50m | ≤ 63m |
|---|---|---|---|---|---|---|
| ≤ 32.5kW | 32mm | 32mm | 32mm | 32mm | 32mm | 32mm |
| ≤ 65kW | 32mm | 32mm | 32mm | 32mm | 63mm | 63mm |
| ≤ 175kW | 63mm | 63mm | 63mm | 63mm | 63mm | 63mm |
| ≤ 275kW | 63mm | 63mm | 63mm | 63mm | 63mm | 63mm |
| ≤ 435kW | 63mm | 63mm | 63mm | 90mm | 90mm | 90mm |
| ≤ 695kW | 90mm | 90mm | 90mm | 90mm | 90mm | 90mm |
| ≤ 1085kW | 90mm | 90mm | 90mm | 90mm | 125mm | 125mm |

Table A.5

*Note: The values indicated can be replaced by the equivalent nominal diameter for an alternative material.*

*Note: An allowance has been made for the presence of standard connection & termination fittings.*

*Note: Standard sizes does not rule out, in advance, the reduction of nominal diameter for pipework and fittings at the service termination location. In these circumstances, it is not necessary to check the design in Toolbox*

## Table A.6 Above ground standard service laterals to domestic premises (LP only)

- To be used when designing above ground service laterals and laterals to be connected to an above ground riser.
- Service laterals with a nominated demand in excess of 65 KW should be designed in accordance with the process defined within Appendix B, taking account of the individual fittings to be used.
- The lengths indicated represent the allowable plan length from parent (riser) main to meter point. Laterals in excess of the lengths indicated should only be installed with the approval of the Responsible Person.

| Length / PID | ≤ 7m | ≤ 15m |
|---|---|---|
| ≤ 32.5kW | ¾"St | ¾"St |
| ≤ 65kW | ¾"St | 1"St |

Table A.6

## Table A.7 Default service design for all MP systems

- Services more than 63m in length should be designed in accordance with the process defined within Appendix B.
- Service excess flow valves should be fitted on all MP domestic services where the PID <= 65kW. Whilst there is no requirement for an additional service isolation valve, all other MP services should be provided with service isolation valves.

| **Length (m) / PID kW** | **<=63 m** |
|---|---|
| **<=175** | 32 mm |
| **<=1085** | 63 mm |

Table A.7

## Table A.8 Maximum length of pipe to be retained where a large pressure drop (>2mb) is available to be used

This Table should be used to evaluate the design or retention of LP services in conjunction with Table A.2 to avoid the need for Network Analysis to evaluate new demands where:

- It is proposed to retain an existing service pipe subject to an increased demand
- It is proposed to replace a domestic service by insertion. Note: Before committing to do a whole street on this basis, the design pressure should be identified from Network Analysis to determine if the area is able to support the large pressure drop.
- It is proposed to install a new service pipe that will result in a pressure drop

The minimum service diameter for all new services (including replacement of existing services where insertion cannot be used) is 32mm, irrespective of the pressure drop used for its design. The use of a smaller pipe for new services is prohibited.

| Maximum pressure drop | ≤ 3mb | | | ≤ 4mb | | | ≤ 5mb | | |
|---|---|---|---|---|---|---|---|---|---|
| Length (m) / Demand | <=10m | <=25m | <=50m | <=10m | <=25m | <=50m | <=10m | <=25m | <=50m |
| <=32.5kW | 20mm | 25mm | 25mm | 20mm | 25mm | 25mm | 20mm | 25mm | 25mm |
| <=65kW | 25mm | 32mm | 32mm | 25mm | 32mm | 32mm | 25mm | 32mm | 32mm |
| <=175kW | 32mm | 63mm | 63mm | 32mm | 63mm | 63mm | 32mm | 63mm | 63mm |
| <=435W | 63mm | 63mm | 63mm | 63mm | 63mm | 63mm | 63mm | 63mm | 63mm |
| <=695kW | 63mm | 90mm | 90mm | 63mm | 63mm | 90mm | 63mm | 63mm | 90mm |
| <=1085kW | 63mm | 90mm | 90mm | 63mm | 90mm | 90mm | 63mm | 90mm | 90mm |

Table A.8

*Note: The values indicated can be replaced by the equivalent nominal diameter e.g. 63mm PE is equivalent to 2" metallic*

## Table A.9 Approved connections for PE mains to PE mains

<table>
<tr><th>Parent<br>Connection</th><th>63mm</th><th>90mm</th><th>125mm</th><th>180mm</th><th>250mm</th><th>315mm</th><th>>315mm</th></tr>
<tr><td>63mm</td><td colspan="7">63mm top outlet ‘service’ tee*<br>– a high volume tee should be used to connect along the length of a pipe &<br>a coupler used to connect to the end of a pipe for continuations</td></tr>
<tr><td>90mm</td><td rowspan="6">63 x 63mm Cut out Tee & Reducers</td><td>Cut out tee</td><td colspan="5">Branch Saddle Connection</td></tr>
<tr><td>125mm</td><td rowspan="5">90 x 90 Cut out Tee & reducer(s)</td><td>Cut out tee</td><td colspan="4">Branch Saddle Connection</td></tr>
<tr><td>180mm</td><td rowspan="4">125 x 125 Cut out Tee & reducer(s)</td><td>Cut out tee</td><td colspan="3">Branch Saddle Connection</td></tr>
<tr><td>250mm</td><td rowspan="3">180 x 180 Cut out Tee & reducer(s)</td><td>Cut out tee</td><td colspan="2">Branch Saddle Connection</td></tr>
<tr><td>315mm</td><td rowspan="2">250 x 250 Cut out Tee & reducer(s)</td><td>Cut out tee</td><td>Cut out equal tee</td></tr>
<tr><td>>315mm</td><td>315 x 315 Cut out Tee & reducer</td><td>Cut out tee</td></tr>
</table>

Table A.9

**** Limited to 435KWh for LP mains, refer to B.2.1. For MP mains refer to Table A.4 notes***

- Some of these techniques are not applicable for PE100 pipe.
- Other approved connections may be utilised in line with Cadent procedures, consideration to be given to the least intrusive method

*Note: Where there is more than one way of installing an approved type of connection, the least cost method will form the basis of any quotation. Only standard manufacturer’s proprietary fittings should be used to provide connection to a Cadent system, i.e. the use of multiple fittings to provide adequate capacity is prohibited.*

## Table A.10 Approved connections for PE/Metallic to Metallic mains

<table>
<tr><th>Parent / Connection</th><th>2"</th><th>3"</th><th>4"</th><th>6"</th><th>8"</th><th>10"</th><th>>10"</th></tr>
<tr><td><=63mm / <=2"</td><td colspan="3">Encirclement tee</td><td colspan="4">63mm or 2“ Metallic Top Tee</td></tr>
<tr><td><=90mm / <=3"</td><td rowspan="6">2" x 2" Encirclement tee & reducer(s)</td><td colspan="6">Encirclement Tee & reducer(s)</td></tr>
<tr><td><=125mm / <=4"</td><td rowspan="5">3" x 3" Encirclement tee & reducer(s)</td><td colspan="5">Encirclement Tee & reducer(s)</td></tr>
<tr><td><=180mm / <=6"</td><td rowspan="4">4" x 4" Encirclement tee & reducer(s)</td><td colspan="4">Encirclement Tee & reducer(s)</td></tr>
<tr><td><=250mm / <=8"</td><td rowspan="3">6" x 6" Encirclement tee & reducer(s)</td><td colspan="3">Encirclement Tee & reducer(s)</td></tr>
<tr><td><=315mm / <=10"</td><td rowspan="2">8" x 8" Encirclement tee & reducer(s)</td><td colspan="2">Encirclement Tee & reducer(s)</td></tr>
<tr><td>>315mm / >10"</td><td>10” x 10” Encirclement tee & reducer(s)</td><td>Encirclement Tee & reducer(s)</td></tr>
</table>

Table A.10

*Note: Please refer to C.8 for metric equivalent*

# Appendix B Specification for the design of pipes

## B.1 General requirements

Wherever practicable, the design of a new pipe should be carried out using the relevant Standard Design Tables detailed in Appendix A. This will avoid carrying out a bespoke design if the demand and the mains system support the use of a standard design.

This Appendix describes the rules to be used where this is not appropriate.

Section 5 shall be used to identify where a supply pipe should be classed as a main, a service or a riser. Once confirmed, the sections below should be used to design the pipe in an appropriate manner.

The following rules assume that no reinforcement of the existing system is required for the post acceptance design.

## B.2 Design considerations

**A main** is a below ground pipe, or exceptionally an exposed pipe (e.g. bridge crossing) laid as an extension of, or change to, the system that supplies, or has the capability to supply, more than 2 primary meter installations.

**A service** is a pipe from a main up to and including the outlet of the 1st ECV to an individual meter installation. This definition may occasionally include a dual service, supplying up to two primary meter installations in one or two buildings, with no other potential connections.

**A mains riser** is any above ground horizontal or vertical arrangement of pipes that supplies more than two primary meter installations in an individual premises or building.

**A service riser** is any above ground horizontal or vertical arrangement of pipes that supplies up to two primary meter installations.

**A lateral** is a term in current use to describe an above ground pipe connecting a riser to a single primary meter installation.

**Length** - The length of the pipe should be identified using MAPS or the customer's site plan.

**Velocity** - For all new services operating at pressures not exceeding 7 bar the design gas velocity shall not exceed 15m/s.

For all new mains operating at pressures not exceeding 7 bar the design gas velocity should not exceed 40 m/s.

**Pipe Code Table** - The pipe code tables given in Appendix D should be used for the design of all new system extensions to the Cadent network. Under the direction of the Responsible Person, other pipe sizes and efficiencies will be used when incorporating existing, or non-standard, pipes within a new design.

**Route planning** - the route should be planned in accordance with the recommendations and guidance given in IGEM/TD/3, IGEM/TD/4, IGEM/GL/1 and IGEM/GL/2.

**Note:** it is Cadent policy to terminate domestic services at meter positions in external meter boxes on the front face of a building or not more than 2m up the gable; or to internal meter positions within 2m of the point of entry.

Meter housing and locations should comply with IGEM/GM/6, IGEM/GM/8 parts 1 - 5 and IGEM/SR/25.

# Table B.1 Maximum design pressure drop

*Note: The following values should be used for the design of all services and must not be exceeded*

| Description/Pressure Tier | Description | Maximum design pressure drop |
|---|---|---|
| LP (DMP <=19mb) | New | 2mb or <=5mb[1,2] |
| | Non-Insertion replacement | 2mb or <=5mb[1,2] |
| | Insertion replacement | <=5mb[3] |
| MP (DMP <=105mb) | All | 35mb |
| MP (DMP >105mb) | All | 70mb |
| IP | All | 20% of available pressure drop (capped minimum of 140mb) |

Table B.1

The design shall include an allowance for connection & termination fittings and shall remain within the defined maximum pressure drop value.

[1] Where the new service contains a pipe >=180mm (nominal) diameter & reference to network analysis confirms the design pressure to be used.

[2] For loads that fall within the Scope of Table A.2, the assumed parent mains pressure will be taken from the appropriate cell.

[3] Where the parent main pressure has been confirmed as acceptable.

# B.2 Design of Mains

## B.2.1 Pipe and Fittings

The impact of minor fittings (connections, bends, valves etc.) should be managed within the design tool through a reduction in the hydraulic efficiency of the pipe system, so no allowance should be made in the design for any fittings associated with the mains connection. However, if the Responsible Person directs that a non-standard connection (less than the nominal diameter of the extension) be used, the fitting (in the form of an extension of the pipe equivalent to the length shown within Tables B2 & B3) should be added to the network model.

The minimum supply pressure (defined within Table A.2), for multiple premises sites, is the pressure to be supplied at the outlet of the Cadent system i.e. at the outlet face of the valve or “pup” fitting provided to allow connection to the main. The pressure loss across this fitting should not exceed more than 10% of the available pressure for the design of the system extension.

## B.2.2 Mains extensions designs arising from request for supply to individual premises

### B.2.2.1 Pre-Acceptance Design

For a single premises design where a main is to be provided, the main should be designed using the pressure indicated within Table A.2 or A.3 as the source pressure.

If Table A.2 or A.3 cannot be used, reference should be made to Network Analysis to identify the allowable pressure drop.

The pipe should be designed as a single diameter and should not be less than 63mm PE in diameter (or equivalent for steel pipes).

#### B.2.2.2 Post-Acceptance Design

Upon receipt of an Acceptance, reference should be made to Network Analysis to identify the allowable pressure drop. The “Industry least cost” solution should be identified and installed; the main should not be less than 63mm PE in diameter (or equivalent for steel pipes).

### B.2.3 Design of mains extensions to sites with multiple premises

#### B.2.3.1 Demands

Post-acceptance, the mains should be designed to supply the requested demand identified by Cadent.

#### B.2.3.2 Connection point pressures

Where the level of demand does not exceed the value in Table A.2 or A.3 for the diameter of supply pipe, the indicated supply pressure should be used.

Where the requested demand exceeds these maximum values, the connection pressure on the parent main should be obtained through network analysis using the appropriate FY model (subject to the minimum value shown within Tables A.2 or A.3).

#### B.2.3.3 Routing and service termination

A service shall not be laid within the grounds of another premise that it does not supply, unless a legal agreement has been reached with the appropriate property/landowner with protection, safety precautions measures and future maintenance arrangements clearly defined and documented.

## B.3 Services

### B.3.1 Pipe and fittings

An allowance should be made in the design for all fittings used as part of the service installation. This should be done using the equivalent length of pipe associated with each fitting component, as shown within Table B.2 & B.3, for any pressure tier. The calculations should be carried out to ensure that pressure drop within the pipe does not exceed the maximum value shown in Table B.1.

Notwithstanding the above, 63mm tapping tees connected to low pressure PE mains should be limited to a maximum flow of 435 KWh.

### B.3.2 Design new service

#### B.3.2.1 Pressure

The service should be designed using the pressure drop shown in Table B.1 and minimum pressure associated with the relevant pressure tier.

#### B.3.2.2 Routing and service termination

A service shall not be laid within the grounds of another premise that it does not supply, unless a legal agreement has been reached with the appropriate property/landowner with protection, safety precautions measures and future maintenance arrangements clearly defined and documented.

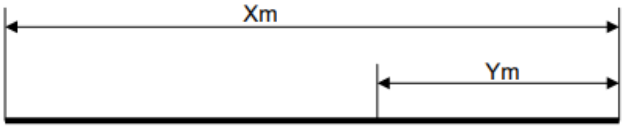
### B.3.2.3 Pipe diameter and fittings

The minimum diameter used for all new services is 32mm PE or equivalent. Figure B.1 details the rules when a composite pipe should be considered. Services up to 63m long should be designed as a single diameter.

### B.3.2.4 Design of composite pipes for use in new services

Composite pipes should be designed using two diameters only, with the larger diameter as the connection pipe, and the smaller as the termination, taking into account the pressure losses arising from the equivalent lengths of fittings. Fittings should be designed to be the same size as the service pipe to which they are connected.

This composite pipe rule does not apply to retention of existing pipe for load increases to existing services.




| Length | Criteria | Service configuration |
|---|---|---|
| Xm <=63m | N/A | Single diameter |
| Xm > 63m | Where Y <= 30% X | Single diameter pipe |
| | Where Y > 30% X | Composite pipe |

Figure B.1 design single diameter pipe

A service should not be designed as a composite service where the length of either part is very small (<30% of the total length). Consideration can still be given to reduce the termination down one size.

For example, on domestic installations, it is anticipated a ¾" x 25mm house entry tee will normally be used; however this change in size should not be considered to constitute a composite pipe.

The equivalent lengths for fittings are to be used within composite pipe calculations are defined within Appendix B, Tables B.2 & B.3.

### B.3.2.5 Remote pressure reduction

Services from MP and IP mains may be designed with the pressure reduction unit remote from the meter unit.

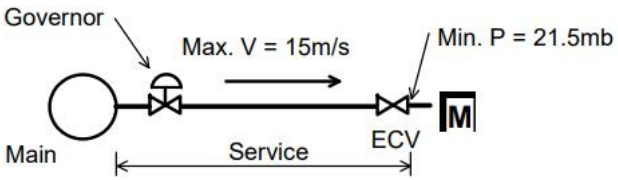



Figure B.2: Service with Remote Pressure Reduction

Where this is the case, the full pressure drop between the outlet of the pressure reduction unit and the normal pressure required at the ECV should be used in the service design. In such installations, the pressure drop associated with the LP service may exceed the standard value shown within Table B.1, and the limiting design criterion may be the gas velocity.

# Table B.2 Equivalent lengths of standard service components

| Fitting description | Pipe Diameter | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **<=32mm or <= 1" St.** | **<=63mm or <=2" St.** | **<=90mm or <=3" St.** | **<=125mm or <=4" St.** | **<=180mm or <=6" St.** | **<=250mm or <=8" St** | **<=315mm or <=10" St** | **<=355mm or <=12" St** | **>355mm or >12" St** |
| **Elbow** | 0.5m | 1m | 1.5m | 2.5m | 3.5m | 5.0m | 7.0m | 10.5m | 14.5m |
| **Tee - flow straight through** | 0.5m | 1m | 1.5m | 2.5m | 3.5m | 5.0m | 7.0m | 10.5m | 14.5m |
| **Tee - flow through branch** | 1.5m | 3m | 4.5m | 7.5m | 10.5m | 14.5m | 19.0m | 25.0m | 31.0m |
| **Swept bend** | 0.3m | 0.45m | **Use Elbow** | | | | | | |
| **All valves** | 0.45m | 0.68m | 1.0m | 1.8m | 2.7m | 4.2m | 6.0m | 8.0m | 10.5m |
| ***PECAT*** | *1m* | *2m* | *3m* | *5m* | *7m* | *10m* | *14m* | *21m* | *29m* |
| **HET (house entry tee)** | 1.5m | 3m | N/A | | | | | | |
| **Meter box entries** | 0.5m | **Use 3x Elbows** | | | | | | | |

Table B.2

# Table B.3 Service components – specific fittings

| Description of connection fitting | Equivalent length | Equivalent Diameter |
|---|---|---|
| **32 Tee off any PE Diameter** | 4.0m | 32mm PE |
| **63 Tapping Tee of any PE Diameter (MP mains only)** | 30.0m | 63mm PE |
| **1½" x 2" Flex Top Tee** | 4.0m | 1½" Steel |
| **1" Metallic Top Tee** | 4.0m | 1" Steel |
| **Reduced branch tee** | Length of "Tee - flow through branch" | Use diameter of Branch/Larger Pipe (e.g. 63>32 Reducer = 3m) |

Table B.3

## B.3.3 Increased demand in existing service

For the purposes of this document, an existing service should be assumed to exist where there is a live service identifiable in Cadent's Engineering Asset Repository.

Where there is no record of an existing "live" service, unless a site visit identifies otherwise, it should be assumed that any existing pipe is not suitable for use to transport gas. In such circumstances, a new service design should be undertaken.

## B.3.3.1 Evaluation of the configuration of an existing service

Where possible, the configuration (length and diameter) of the service should be identified from Network "as laid" records.

In the absence of this information, it should be assumed that the service is constructed in one pipe diameter, with a standard connection and termination configuration.

## B.3.3.2 Assessment of existing design

The connection and termination fittings should be taken into account when calculating the pressure drop associated with the total increased demand.

Where the identified pressure drop exceeds that given for the relevant pressure tier in Table B.1, the existing service should be replaced, with the service being designed to meet this defined pressure drop limit.

## B.3.3.3 Velocity

Following an increase in demand, an existing service should not be replaced because of the maximum velocity being exceeded.

# B.4 Riser design and premises with banks of meters and manifolds

## B.4.1 Pressure

The pressure at the extremity of a mains riser should be the same as the system minimum mains design pressure.

## B.4.2 Design of riser and associated approach main

### B.4.2.1 Design connecting to LP mains

The approach main and above ground mains riser should be designed as a single unit and be based on the available pressure drop in the parent main or, where appropriate, the standard pressure taken from Table A.2.

### B.4.2.2 Designs connecting to MP or IP mains

Approach mains should be designed as a single unit using the available pressure drop.

The available pressure drop should be the difference between the outlet of the pressure reduction unit and the minimum pressure at the extremity of the riser.

### B.4.2.3 Fittings

No allowance should be made for the presence of fittings in the design of the mains riser or the approach main.

### B.4.2.4 Lateral design

Where the use of Table A.6 is not possible, for example the demand or length exceeds the values, individual laterals should be designed using the service calculator, with a maximum pressure drop of 2mbar. Laterals should be designed as single diameter pipes, with an allowance made for the presence of fittings.

## B.4.3 Design of above ground rails

This Table should be used for the design of single column above ground risers, when used with standard design above ground service laterals. It should also be used for the design of manifolds, i.e. blocks of flats with ground floor banks of meters.

| Length / Maximum Design demand | ≤ 15m | ≤ 23m | ≤ 30m | ≤ 50m |
|---|---|---|---|---|
| ≤ 65kWh | 32mm / 1"St | 32mm / 1"St | 32mm / 1"St | 63mm / 2"St |
| ≤ 175kWh | 63mm / 2"St | 63mm / 2"St | 63mm / 2"St | 63mm / 2"St |
| ≤ 275kWh | 63mm / 2"St | 63mm / 2"St | 63mm / 2"St | 63mm / 2"St |
| ≤ 435kWh | 63mm / 2"St | 63mm / 2"St | 90mm / 2"St | 90mm / 2"St |
| ≤ 695kWh | 90mm / 2"St | 90mm / 2"St | 90mm / 2"St | 90mm / 2"St |
| ≤ 1085kWh | 90mm / 2"St | 90mm / 2"St | 90mm / 2"St | N/A |

Table B.4 Standard designs for single column risers and manifolds

- To be used to design single column above ground risers and multiple, above ground manifolds connected to LP mains.
- Assumed that the nominal mains connection fitting is not less than the downstream pipe.
- The lengths indicated represent the total length from parent main to end of “main”, the mix of below/above ground pipe work is not considered significant.
- Total diversified demand is assumed to be at end of “main”.
- Service laterals should be designed in accordance with the requirements of Table A.6.
- Where it is not possible to design the rail using this approach, it should be designed in accordance with Section B.4.2.1.

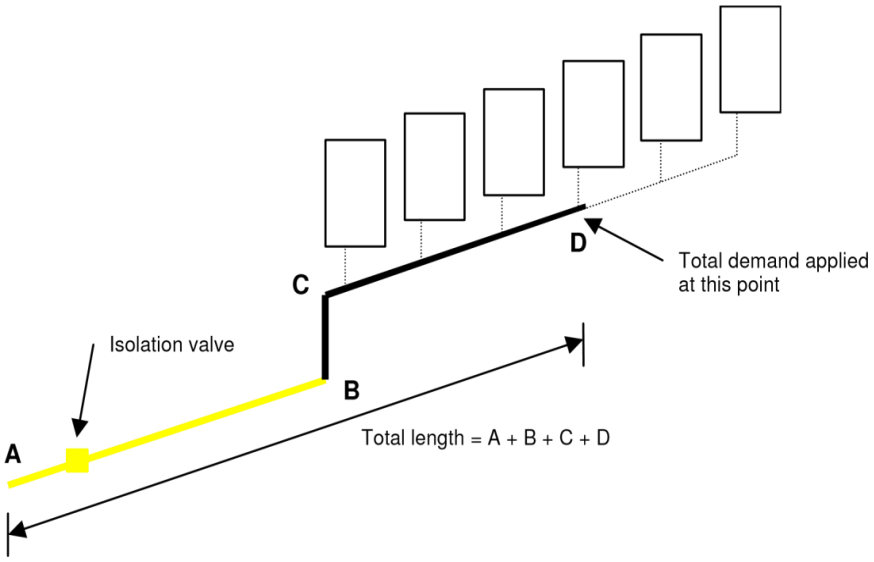



**Figure B.4 LP above ground rail, meters at separate locations – typical configuration**

# B.5 Design of connections to a Cadent parent main

Where a GT has stipulated a connection diameter less than that given in Table A.4, the GT should be asked to confirm the requirement before a quotation is issued.

Where a UIP indicates a diameter less than the value within the Tables, the design should be evaluated to confirm they are suitable and should be rejected where appropriate.

Refer to Tables A.9 and A.10.

# Appendix C Evaluation and design of connections to non-typical demands

The relevant demand profile / gas use information should be provided under the Business Rules to allow the provision of a practical design solution. Where, at the outset of the design process this information is incomplete, a number of assumptions may be applied resulting in a sub-optimal design solution and additional assessment as the type and nature of the installation becomes clear.

The information that is required is shown in Tables C.1 and C.2.

## Table C.1 Where a non-typical demand profile is identified

The details in this table represent the basis for discussion with the end-user or their representative.

| To identify the proposed profile of gas use, it is necessary to understand the time(s) of day and year at which the gas demand is required and if the demand varies from this level at the other key times/conditions of the day and year. | | | | |
|---|---|---|---|---|
| Please complete the following boxes as is appropriate for the demand: | | | | |
| Period | Please indicate with a tick the times of the day and year when the peak demand may occur | | | |
| | 0600-1000 | 1000-1600 | 1600-2000 | 2000-0600 |
| Beginning Oct – end March | | | | |
| Beginning June – end August | | | | |
| Other periods of the year | | | | |

Table C.1

# Table C.2 Where a compressor or booster is identified as being installed

Where the customer has identified a non-typical demand, it should be assessed using network analysis and, where appropriate, Cadent's design assessment tool 'CompAss' or approved equivalent.

| | | | | |
|---|---|---|---|---|
| Peak Instantaneous Demand to be compressed/or boosted and the pressure required: | ……kW/m³/hr | ……mbar/bar | | |
| Compressor Types<br>(Reciprocating/Fan/Screw/Booster/Other): | …… | | | |
| Number of Compressors/Boosters and the Peak Instantaneous Demand to each excluding standby: | Plant 1 ……kW/m³/hr<br>Plant 2……kW/m³/hr<br>Plant 3……kW/m³/hr | | | |
| Time taken to achieve full load from start up: | Time taken …….. seconds | | | |
| Profile provided for non-linear start up profile: | Yes/No/Not Applicable | | | |
| Number of burners to be installed? | | | | |
| Will burners be operated in parallel? | Yes/No/Not Applicable | | | |
| Typical burner stages: | Start-up / Pre-purge | Pilot fire | Low fire | High fire |
| Flow as % of burner's PID – burner 1: | | | | |
| Minimum time for each stage (s) – burner 1: | | | | |
| Flow as % of burner's PID – burner 2: | | | | |
| Minimum time for each stage (s) – burner 2: | | | | |
| Flow as % of burner's PID – burner 3: | | | | |
| Minimum time for each stage (s) – burner 3: | | | | |

Table C.2

# C.1 Assessment of individual non-typical demands

Where a demand is to be used at a specified off-peak period only, its impact should be assessed, using the relevant model, against the specified period. The limited period identified will be clearly stated on all quotation's correspondence as a condition of supply.

For pressure managed networks, the impact of the demand, unless specified by the customer, should be assessed against the worst-case pressures. This will be clearly stated on the quotations correspondence to ensure the customer is aware that additional information may significantly change the response. Refer to Table C.3.

The design of the system extension should then be undertaken ensuring that system minimum pressures are maintained under all conditions. If the pressure provided results in an inefficient design the pressure can be negotiated on the least cost industry solution principle.

# Table C.3 Conditions to be modelled for non-typical off-peak demands on LP networks and direct fed MP demands

The figures shown in this table shall be used to ensure consistent design output is provided. No additional demand modifications should be made to model demands being absent, or present, for the time the analysis being carried out.

Any "Commercial" demand should be assumed temperature sensitive and any "Industrial" demand as being constant throughout the day and across the year.

For MP networks assume downstream demand is per the domestic tag.

For the design of single and composite pipes and mains, see Appendix B.

| Source Settings | Standard Conditions | Scale for Demand Types | | |
|---|---|---|---|---|
| | | Domestic | Commercial | Industrial |
| Winter Day | Peak Hour, Peak Day Pressure | 100% | 100% | 100% |
| Winter Night | Minimum Hour, Peak Day Pressure | 40% | 40% | 100% |
| Summer Day | Peak Hour, Minimum Day Pressure | 20% | 20% | 100% |
| Summer Night | Minimum Hour, Minimum Day Pressure | 10% | 10% | 100% |

Table C.3

# C.2 Supplies to elevated pressure demands

Contact should be made with any consumers requesting an elevated pressure to identify when this pressure is required.

Where a specific period is specified, analysis should be undertaken to identify how it can be provided. Where the customer is not able to define a period the range of pressures associated with the point of connection should be identified using the settings shown in Table C.3

## C.3 Supplies to CSEPs containing non-typical demands

Where a CSEP site includes a non-typical demand or a demand that has downstream compressor or booster or has requested specific off-peak pressures, the GT should be requested to supply:

- The demands it anticipates at the four standard conditions (see Table C.3), or the demands it anticipates at specific times requested.

These demand levels should be applied to the relevant model(s) and the GT provided with the resultant pressures at the ISEP connection.

Where a GT is unable to specify the demand details, the demand types should be assumed to be non-temperature sensitive attached to a reciprocating compressor. The assumption shall be stated within the quotation.

The demands should be scaled for the four standard conditions in accordance with the scaling factors given in Table C.3.

Additionally, where a GT has identified that the CSEP site includes a supply to a compressor or booster, the four standard pressures should be quoted. The GT should be requested, as part of the Quotation, to confirm the supply pressures are adequate, and the impact of the demand at the worst-case condition will not materially affect the parent system.

Where higher, peak or off-peak, pressures are required by the GT than are indicated as being available, reinforcement should be evaluated inline with Cadent policy and quoted.

The off-peak demand data should be retained for future modelling off peak conditions and maintenance of the required pressures.

The connection to the GT site should be designed in accordance with Appendix B, or as requested by the GT.

## Table C.4 Demand types for use within CompAss

This table identifies the types of demand for which CompAss is required.

For connections to all pressure tiers below 7bar, when using CompAss, network analysis of the appropriate FY models and the relevant conditions should be undertaken to derive the steady state pressures available in the network.

| **Demand Type** | **CompAss assessment required?** |
|---|---|
| Non-typical consumption profile to individual demand | No |
| Non-typical consumption profile to CSEP | No |
| Downstream compression to individual demand | Yes |
| Downstream boosting to individual demand | Yes |

| | |
|---|---|
| Elevated pressure to individual demand | No |
| Downstream compression or boosting to CSEP | In agreement with GT |

## Table C.5 Typical worse-case pressure conditions for assessment in CompAss

This table identifies the typical periods when the network is likely to experience maximum pressures under shut down conditions and minimum pressures under start up conditions.

Reference to the table ensures that the level of demand which causes a rapid change, and the service design will not give rise to unacceptable pressures in the network at these times.

| Assessment | Type of network pressure management | Source Setting | Condition |
|---|---|---|---|
| Start-up | Fixed | Winter Day | Peak Hour, Peak Day Pressure |
| | Clocked pressure | Winter Day | Peak Hour, Peak Day Pressure |
| | Profiled<br>(closed loop control or pressure profiling) | Variable | Min Hour, Min Day Pressure |
| Shut-down | Fixed | Summer Night | Min Hour, Min Day Pressure |
| | Clocked pressure | Winter Night | Min Hour, Peak Day Pressure |
| | Profiled<br>(closed loop control or pressure profiling) | Variable | Peak Hour, Peak Day Pressure |

Table C.5

# Table C.6 Factors to use in CompAss

To evaluate the impact of the specific compressor, the appropriate factor, as shown in Table C.6, should be applied to the steady state flow when using CompAss.

Applying this factor takes account of the different ways that the equipment operates and ensures that its impact is known.

| Type | Factor |
|---|---|
| Booster | 0 |
| Reciprocating compressor | 2.3 |
| All other compressor types | 1.0 |

Table C.6

# C.4 Pipes for input into CompAss

Wherever possible the mains and service assessment option of CompAss should be used to ensure that the impact on the parent main is taken into account. This allows the maximum benefit of the dissipation of the wave to be assessed and lessens the distance to any critical point in the network where there is a constraint on the pressure required.

Rules for the ratio of service length to mains length are detailed below and should be applied unless specifically directed by the Responsible Person. Where the application of these rules is not possible, the impact on the service alone should be evaluated.

## C.4.1 Ratio of service length to mains length

The following constraints should be taken into account when using CompAss to evaluate the impact of a compressor / booster:

- The maximum length of the main, upstream and downstream from the service, should be as far into the mains system as possible, but not greater than 10 times the length of the service.
- The minimum length of the main, upstream and downstream from the service, is not less than the length of the service.
- The cut off points for the main are a change in pipe diameter / material, or a pipe junction / connection.
- Where the service connection is supplied from a number of directions, the direction of flow should be taken to be the one with the greatest supply volume.
- Where the minimum length of the main, upstream or downstream from the service, is less than the length of the service, the CompAss “service” option should be used.
- Where the direction of the flow of gas to the service is from both directions, the CompAss “service” option should be used.

## C.4.2 Transient pressure constraints for the assessment of non-typical demands

The maximum permissible transient pressure constraints, shown in Table C.6, should not be exceeded when evaluating the impact of a non-typical demand. These values should be used within CompAss in the appropriate boxes.

## Table C.7 Transient pressure for the assessment of non-typical demands

| Constraint | | Pressure Tier | Pressure level |
|---|---|---|---|
| Transient pressure at connection point | Maximum Pressure | LP | 75mbar |
| | | MP | 2bar |
| | | IP | 7bar |
| | Minimum Pressure | LP – highest of: | 21mbar[1]<br>22.75mbar[2] |
| | | MP | Minimum 6-minute mains design pressure |
| | | IP | |
| Transient pressure at meter point | Maximum Pressure | LP | 75mbar |
| | | MP | 2bar |
| | | IP | 7bar |
| | Minimum Pressure | LP | 19mbar[1]<br>20.75mbar[2] |
| | | MP | Minimum 6-minute system design pressure[3] |
| | | IP | |

Table C.7

Note: [1*] systems designed pre-1997, [2*] Discrete systems designed post 1996, [3*] See Appendix A Table 10 LOP

## C.4.3 Service design for supplies to demand requiring CompAss assessment

The following rules should be applied to the design of the service:

- The service should be designed using the PID identified by the customer and include the sum of any compressed demand plus all other demands.
- The diameter of the service shall not exceed the diameter of the main from which the connection is taken.
- The initial service should be designed using the service design criteria for the relevant pressure tier. The rules for the use of single and composite pipes should be adhered to, see Appendix A.
- The resulting service layout should be input into CompAss, together with the appropriate mains. Where the assessment of this design results in system constraints being violated, the diameter(s) of the service should be increased, and the results reassessed.
- Where modifying the service pipe diameter (bearing in mind the constraints on size of service) does not provide an acceptable solution, the provision of supply from a higher-pressure tier(s) should be considered. Where this is not possible, the customer should be advised that the supply couldn't be provided without control being provided for the start-up and/or shut down of the compressor.
- Reference should be made to Tables A.9 & A.10 for the details of the acceptable connection fittings and methods to be used.
- Where changing the diameter of the service does not prevent in the system constraints being violated, and a feasible higher-pressure tier connection is not available, the "ramp rate" will be identified and the customer advised as one of the conditions of supply (the original service design (Item 4.4.1) will be quoted when defining a "ramp rate").
- The ramp rate is a coarse term to describe the cycle that starts with the booster turning on to pressurise the downstream pipework to 100% burner flow.
- For conventional burner type appliances e.g. boilers there are typically 4 stages, booster on to pressurise pipework (<1% flow), burner start-up / pre-purge (<1% flow), burner pilot (<20% flow), burner low fire (<40% flow) and burner high fire (100% flow).
- Each stage can be modelled in CompAss providing the information is available.
- "Snubbers" or other short length increases in pipe diameter should not be used to mitigate the impact of compressors or boosters, as they are not considered effective in dissipating the transient wave.

Table C.8 represents the standard approved PE & steel design pipes associated with CompAss.

Pipes other than those shown are not approved for use and shall not be employed for quotations purposes. The equivalent nominal diameters in each row represent the maximum size of the parent main to which connection can be made, whilst meeting the requirements of this Instruction.

It has been assumed that only metric equivalent steel pipe will be used for service installation in the column showing the maximum permissible service diameter.

### C.4.3.1 Ramp calculations

The ramp rate can be calculated from the formula:

- T = 0.436*D,

Where T is the ramp rate time (seconds) & D = upstream mains diameter (mm).

For example, for a 250mm PE SDR17 pipe (ID 220.75mm), the Ramp Rate = 0.436*221 = 96 seconds.

Where a constant ramp rate is maintained for at least 96 seconds, no additional control is required to overcome the start-up/shut down affect.

*Note: the "ramp rate" is generally only effective on compressors which are not feeding a burner, i.e. process loads/NGV filling stations, etc.*

## Table C.8 Standard pipe diameters – comparison table

To ensure that the relevant non-PE diameters are clearly understood, reference should be made to the following table.

| PE (mm) | Metallic (Metric) | Metallic (Imperial) | Rounded Metallic (Metric) | Maximum service diameter<br>PE / metallic |
|---|---|---|---|---|
| 16 | - | - | - | - |
| 20 | - | ½" | - | - |
| 25 | 20mm | ¾" | | - |
| 32 | 25mm | 1" | | - |
| 63 | 50mm | 2" | 50mm | 63 / 50 |
| 90 | 80mm | 3" | 80mm | 90 / 80 |
| 125 | 114mm | 4" | 100mm | 125 / 114 |
| 180 | 168mm | 6" | 150mm | 180 / 168 |
| 250 | 219mm | 8" | 200mm | 250 / 219 |
| 315 | 273mm | 10" | 250mm | 315 / 273 |
| 355 | 324mm | 12" | 300mm | 355 / 324 |
| 400 | 406mm | 15" | | 400 / 406 |
| 450 | 425mm | 16" | | 450 / 425 |
| 500 | 440mm | 17" | | 500 / 440 |
| 560 | 457mm | 18" | | 457 |
| 630 | 508mm | 20" | | 508 |
| 800 | 610mm | 24" | | 610 |

**Table C.8 standard design pipe nominal diameters – default comparison**

## C.5 Quotation

All assumptions made during the assessment of non-typical demands will be recorded and made clear in any quotation to the customer.

# Appendix D Specification for Standard Pipe Code Table for New Lay Pipes

When undertaking the design of new system extensions or the review of a 3rd party submissions to be connected to a Cadent network, the following pipe parameters should be used. As appropriate, Cadent may allow supplementary pipes to be added to the list, i.e. where a UIP proposes to use a non-standard pipe size, which is considered suitable for adoption.

## Table D.1 PE Pipes

The values within this table are common for both the design of new, and review of existing, PE pipes.

| Nominal Diameter | Material | Internal Diameter | SDR | Pipe Efficiency Factor | | |
|---|---|---|---|---|---|---|
| | | | | Electro Fused & Butt Fused De-beaded | Butt Fused Non Debeaded 6 | Butt Fused Non Debeaded 12 |
| 16 | PE | 11.15 | 7 | 0.97 | - | - |
| 20 | PE | 15.15 | 9 | 0.97 | - | - |
| 25 | PE | 20.15 | 11 | 0.97 | - | - |
| 32 | PE | 25.75 | 11 | 0.97 | - | - |
| 63 | PE | 50.9 | 11 | 0.97 | - | - |
| 90 | PE | 79.2 | 17 | 0.97 | - | - |
| 125 | PE | 101.3 | 11 | 0.97 | 0.89 | 0.93 |
| 125 | PE | 110.3 | 17 | 0.97 | 0.89 | 0.93 |
| 180 | PE | 145.95 | 11 | 0.97 | 0.89 | 0.93 |
| 180 | PE | 158.75 | 17 | 0.97 | 0.89 | 0.93 |
| 250 | PE | 202.95 | 11 | 0.97 | 0.89 | 0.93 |
| 250 | PE | 220.75 | 17 | 0.97 | 0.89 | 0.93 |
| 250 | PE | 226.2 | 21 | 0,97 | 0.89 | 0.93 |
| 315 | PE | 255.75 | 11 | 0.97 | 0.89 | 0.93 |
| 315 | PE | 278.25 | 17 | 0.97 | 0.89 | 0.93 |
| 315 | PE | 285.0 | 21 | 0.97 | 0.89 | 0.93 |
| 355 | PE | 288.1 | 11 | 0.97 | 0.89 | 0.93 |
| 355 | PE | 313.5 | 17 | 0.97 | 0.89 | 0.93 |
| 355 | PE | 321.19 | 21 | 0.97 | 0.89 | 0.93 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 400 | PE | 327.27 | 11 | 0.97 | 0.89 | 0.93 |
| 400 | PE | 353.2 | 17 | 0.97 | 0.89 | 0.93 |
| 400 | PE | 361.90 | 21 | 0.97 | 0.89 | 0.93 |
| 450 | PE | 407.14 | 21 | 0.97 | 0.89 | 0.93 |
| 500 | PE | 409.09 | 11 | 0.97 | 0.89 | 0.93 |
| 500 | PE | 441.7 | 17 | 0.97 | 0.89 | 0.93 |
| 500 | PE | 452.38 | 21 | 0.97 | 0.89 | 0.93 |

Table D.1

## Table D.2 Steel Pipes

| Nominal Diameter | Material | Internal Diameter | Pipe Efficiency Factor | | Mains or Service Design |
|---|---|---|---|---|---|
| | | | Fillet Welded Screwed | Butt Welded | |
| 0.5 | ST | 19.93 | 0.86 | - | S |
| 0.75 | ST | 19.67 | 0.86 | - | S |
| 1 | ST | 26 | 0.86 | - | M |
| 1.25 | ST | 33.92 | 0.86 | - | M |
| 1.5 | ST | 38.67 | 0.86 | - | M |
| 2 | ST | 49.86 | 0.97 | 0.97 | M |
| 2.5 | ST | 65.43 | - | 0.97 | M |
| 3 | ST | 78.13 | - | 0.97 | M |
| 4 | ST | 103.53 | - | 0.97 | M |
| 6 | ST | 157.51 | - | 0.97 | M |
| 8 | ST | 206.38 | - | 0.97 | M |
| 10 | ST | 260.35 | - | 0.97 | M |
| 12 | ST | 311.15 | - | 0.97 | M |
| 16 | ST | 390.55 | - | 0.97 | M |
| 18 | ST | 441.35 | - | 0.97 | M |
| 20 | ST | 492.15 | - | 0.97 | M |
| 24 | ST | 593.75 | - | 0.97 | M |
| 30 | ST | 739.75 | - | 0.97 | M |
| 32 | ST | 793.75 | - | 0.97 | M |

| | | | | | |
|---|---|---|---|---|---|
| 36 | ST | 889 | - | 0.97 | M |
| 42 | ST | 1,066.8 | - | 0.97 | M |
| 48 | ST | 1,225.55 | - | 0.97 | M |

Table D.2

# Appendix E – Minimum system pressures for charging point purposes services

The Charging Point is the nearest point on a main of the requested pressure tier, where the fully developed load can be supplied with no other loads on the network. The charging point is a theoretical entity that creates the financial distinction between the ‘connection’, which is fully charged to the customer, and the ‘system reinforcement’, which should be funded by Cadent (subject to the economic test).

For maximum design pressure drop for all services see Table B.1

## Table E.1 Charging point pressures for <7bar services

| Pressure Tier | MOP/DMP | Charging Point Pressure |
|---|---|---|
| **LP** | MOP Pre Jan 1996 | 21mb |
| | <=75mb Post Dec 1995 | 22.75mb |
| **MP** | DMP <= 270mb | 350mb |
| | DMP <= 180mb | 250mb |
| | DMP <= 105mb | 140mb |
| | DMP <= 65mb | 100mb |
| | DMP <= 35mb | 70mb |
| **IP** | MOP <= 7000mb | 3500mb |

Table E.1 System Extensions

| Pressure tier | MOP / DMP | Charging Point Pressure |
|---|---|---|
| **LP** | MOP <= 75mb | Appendix A Table A2 |
| **MP** | DMP <= 270mb | 450mb |
| | DMP <= 180mb | 350mb |
| | DMP <= 105mb | 240mb |
| | DMP <= 65mb | 150mb |
| | DMP <= 35mb | 95mb |
| **IP** | N/A | 3640mb |

Table E.1 Elevated Pressure Request

The charging point relates to entitled pressure subject to the pressure tier and design (mains/ Services). If an elevated pressure is requested this will not be taken into account for the purpose of the charging point analysis.

Any reinforcement required above the standard pressure would be directly charged to the customer and does not form part of the Economic test. Please see Cadent’s Charging methodology for more information.

*Note: IP networks - subject to operating pressure the design minimum pressures may change subject to the >2Bar network they are connecting too*

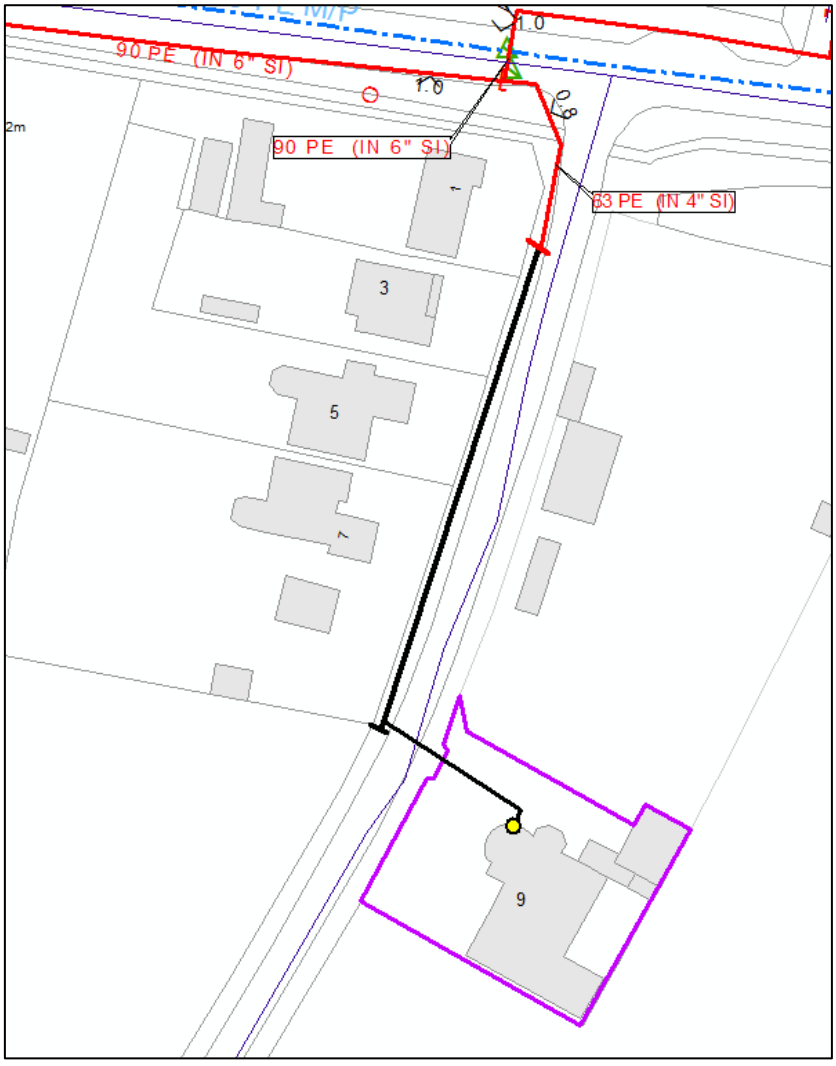
# Appendix F – Application of Definition Factors

This section provides examples of requests, local work procedures shall set out all potential scenarios and the responsible person shall ensure those processing these requests have been assessed as competent to do so.

## F.1 Single service request

In this scenario there is a request for a new supply to Number 9.

Before any system extension is undertaken an assessment of the infill potential should be made, however in this example it should be assumed there is not a viable infill.

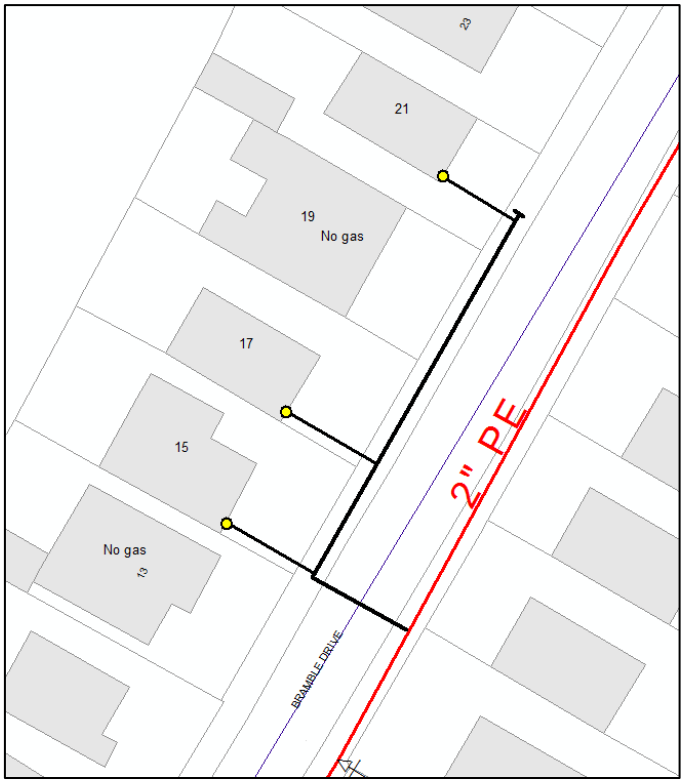



System extensions that travel parallel to the street should be treated as mains. In this example a main is extended to Number 9 to the point where the pipe diverts into the premises along the line of the service. The service is normally perpendicular to the main and/or building. Future statutory obligations should be taken into account. The main passes number 3, 5 & 7 and ends in line for new service to be laid & allowing for future potential further down the road.

These properties are not on gas, and with no viable alternative source of supply hence it would be normal to ensure sufficient capacity exists in the mains extension to provide supplies to numbers 3,5 & 7. Since the scheme is not considered a viable infill there is no requirement to consider the potential to supply number 9 as part of this request.

## F.2 Multiple premises request >2

This example is a Local Authority refurbishment of 3 properties (numbers 15, 17 & 21). This is one of a number of refurbishments in the area and it has been established that future requests for properties currently without gas is likely.




This configuration has been designed to minimise the number of road crossings, and overall cost, both now and in the future. The main should be sized to cater for future potential load, in this case numbers 13 and 19, and this will avoid potential future service road crossings to 13 and 19.

The mains extension finishes o/s number 21 on the basis that:

- there is another distribution main, albeit on the other side of the road, that would allow other properties without gas beyond number 23 to have a supply
- it minimises the amount of service pipe laid in the footpath; hence this would normally exclude laying service pipe that passes other properties that are not supplied e.g. number 19
- Please note: Dual service criteria must be met or approval policy deviation, if not; these must be laid as single services.

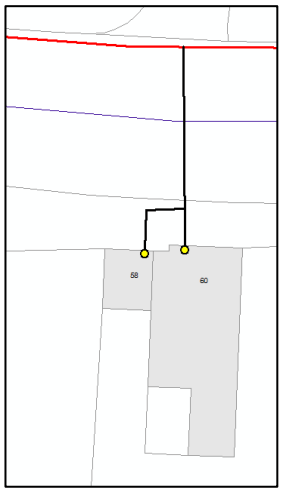
The mains pipe extension is designed, costed, constructed and recorded as a main.

## F.3 Multiple Service Request - 2

In this scenario there is a request for a new supply to Number 58 & 60.

This configuration has been designed to minimise the number of road crossings, and overall cost, therefore it is suitable to lay a Dual Service, without the need for a policy deviation.

The ‘tee’ should always be located within public land.



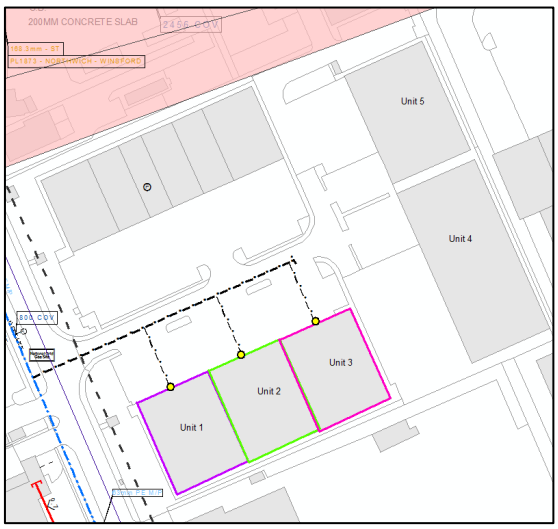

## F.4 New supply to 3 industrial units

This request is for an existing industrial site development with probability of future connections, either within or outside the site boundary.

This design reflects the same principle applied to domestic premises, in that services supply no more than 2 primary meter installations. Please note: Dual service criteria must be met or approval policy deviation, if not; these must be laid as single services.

In this scenario the customer has specified the meter positions, however the exact layout of the mains and services will rely upon the relative costs of long dual services (subject to the demand at each meter) and the cost of main(s).

Depending on the site layout, an alternative fit for purpose option resulting in 2 separate mains connections may be considered but, in this scenario, it has been discounted on the basis that there is only 1 access route into the site & all new services are to be laid perpendicular.

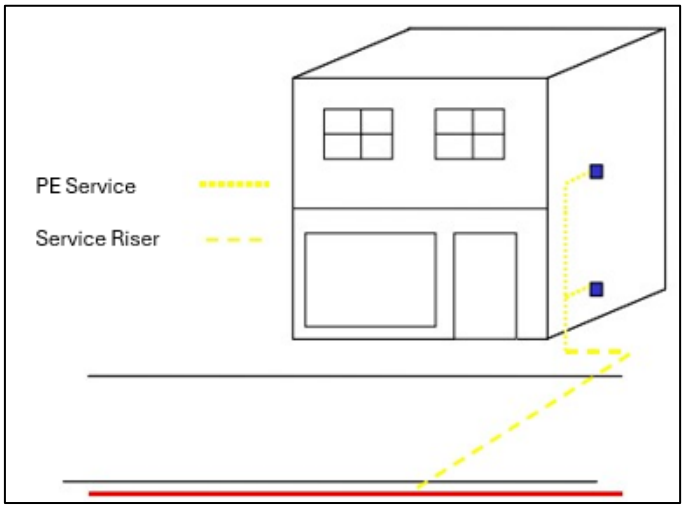


## F.5 Flats and complexes <= 2 meter installations

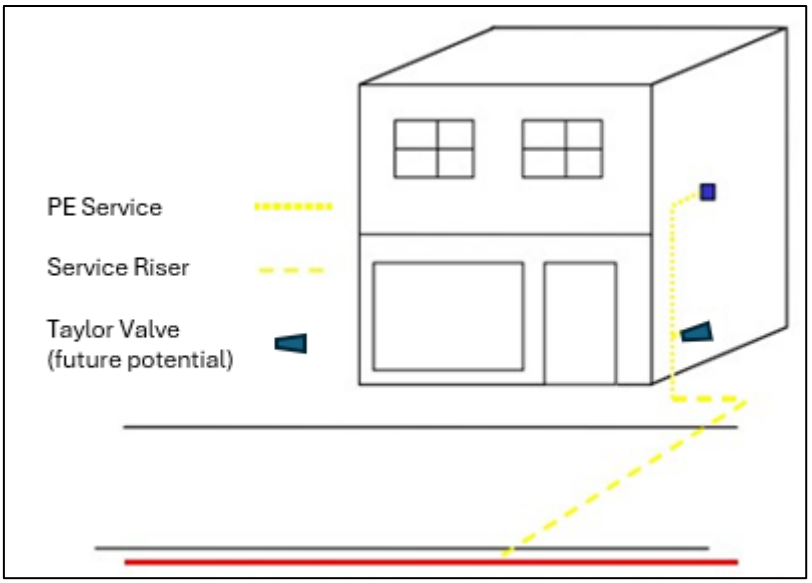
The pipe supplies 2 meter installations. The pipe(s) are designed and constructed as services, with the above ground pipework constructed as a service riser in accordance with riser constructional Procedures.

The pipe(s) are recorded as services and are not digitised in ESRI unless any part of the pipework is >= 63mm or equivalent.

There is no requirement for a policy deviation as the steel pipework can be laid as a dual service, there is no future potential to be considered.




Where only 1 property has requested a new connection, the other property shall be considered as future potential & taylor valve should be fitted to reduce overall cost & works required in the future.



## F.6 Flats and complexes >2-meter installations

In this example the supply is to 4 flats, the underground pipe is designed and laid to mains standards.

The costing/charging of the main and risers shall be within the relevant scope of any mains or service charging schedules/contracts in place.

The mains riser is the above ground pipe supplying in excess of 2 primary meter installations. The below ground main and mains riser are designed using mains design pressure drop criteria, which depends on available pressure and/or use of any standard pressures in use.

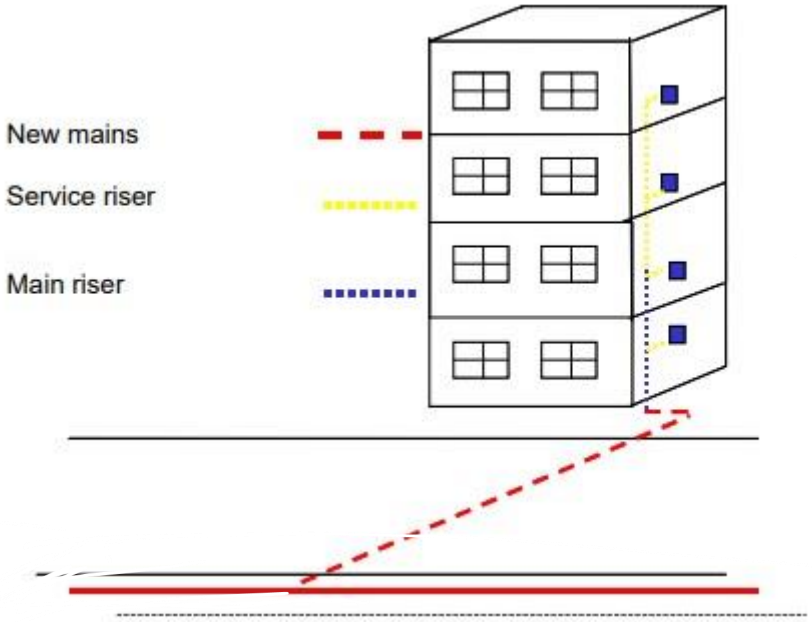
The mains riser, supplying more than 2 primary meter installations, shall be recorded in the Cadent system as an above ground main, and shown graphically as either an internal or external riser pipe.

Where available an isometric drawing of the layout should be added as a background.

The service riser and individual services supplied from the mains riser shall be designed using service pressure drop criteria and recorded as services in the Cadent system. In this scenario there is no requirement to digitally record the service riser pipework <=63mm/2”

All above ground pipework is designed using constructional work procedures appropriate for risers.

All MOBS and risers have a pre design review by the GT/UIP design team and then a secondary design review by our Cadent MOBS team before design authorisation is given.



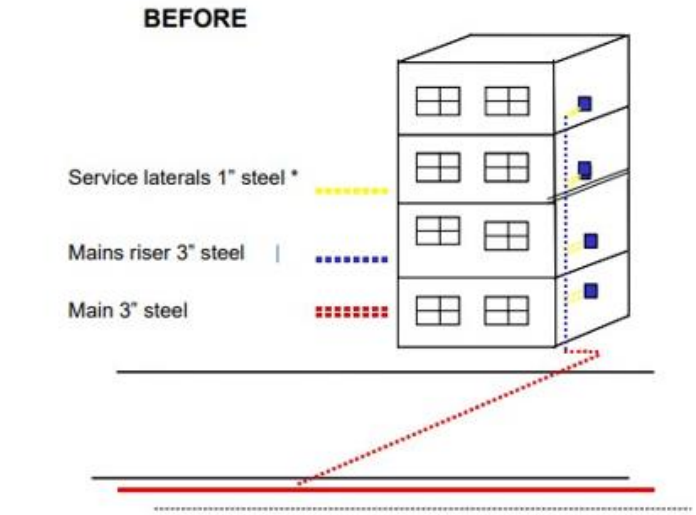
## F.7 Flats and Complexes >2-meter installations - replacement

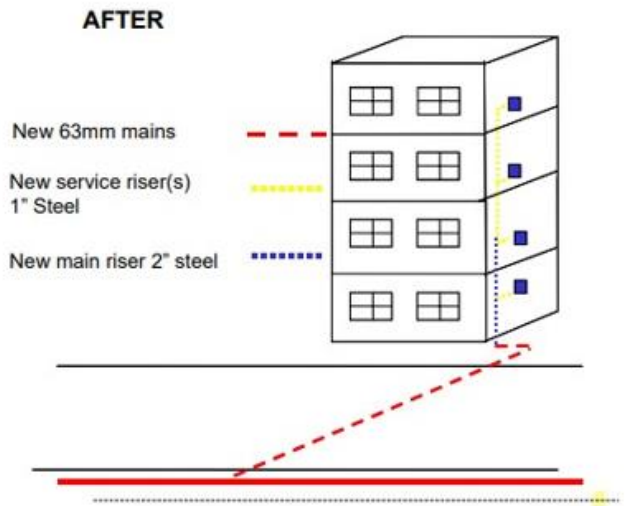
In this example the existing 3”/1” pipework is to be replaced.

The whole length of 3” main and mains riser pipework is claimable under the mains incentive mechanism.

The new pipes are treated in the same way as in example H.6 in that the recording in Cadent systems as main and mains riser is limited to the pipework supplying >2 primary meter installations.

All MOBS and risers have a predesign review by the GT/UIP design team and then a secondary design review by our Cadent MOBS team before design authorisation is given.



# Appendix G – Redesignation of a pipe (not associated with a change in MOP)

The practicalities of re-designating a pipe are directly related to its installation procedures which will determine its integrity and fitness for purpose. For metallic pipes the inherent problems of fracture and corrosion shall be considered if change of use is intended.

The process of changing from main to service is acceptable as the installation and testing are at the higher level, with satisfactory depth of cover. However, there will be a need to consider Approved Code of Practice requirements stated under Gas Safety (Installation & Use) Reg. 9 (1) & Reg. 15 (section 79) regarding fitting appropriate emergency notices and ensuring suitable and accessible emergency controls are available.

The process from service to main is more restrictive. Up to 63mm diameter the laying and testing procedures are not sufficient for main's applications with proximity also being a major factor. This aspect is defined in the Pipelines Safety Regs.1996 Reg. 5 where it states - "the operator shall ensure no fluid is conveyed in a pipeline unless it has been so designed, so far as is reasonably practicable, it can withstand:

- forces arising from its operation.
- the fluids that may be conveyed in it.
- the external forces and the chemical processes to which it may be subjected."

Above 63mm the situation is eased because of the increased installation standards. A re-testing programme and risk assessment would need to be conducted if fitness for purpose is to be demonstrated. Refer also to Distribution Pipe Replacement Procedure CAD/PM/REP/2, particularly when considering steel pipes.

Service isolation valves also create a significant obstacle if the intention is to retain part of the pipes duty as a service, since the installation of a service isolation valve would necessitate either moving the valve to the part service, fit a new one, or replace the existing one.

Proximity is also a major consideration, particularly at Medium and Intermediate Pressures.

For modification to pipe operating above 2bar reference should be made to IGEM/GL/5..

**Key differences**

- Testing - Testing requirements for services is less onerous than for mains
- Depth of cover - Mains and services are subject to different requirements for depth of cover depending on surface category
- Proximity - Mains are subject to varying proximity restrictions dependant on material, operating pressure and size

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*Note: Services above 63mm diameter are constructed as mains.*

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# Appendix H – References

| Reference | Name |
|---|---|
| CAD/PM/REP/2 | Engineering Management Procedure for: the replacement of below 7 barg mains and services |
| IGEM/TD/3 | Edition 5 Steel and PE pipelines for gas distribution |
| IGEM/TD/4 | Edition 5 PE and steel gas services and service pipework |
| IGEM/G/1 | Defining the end of the network, a meter installation and installation pipework |
| IGEM/GL/1 | Planning of gas distribution systems of MOP not exceeding 16 bar |
| IGEM/GL/2 | Planning of transmission and storage systems operating at pressures exceeding 16 bar |
| IGEM/GL/5 | Managing new works, modifications and repairs |
| GIS/L2:2018 | Gas industry standard: Steel pipe 21.3mm to 1219mm outside diameter for operating pressures up to 7 bar |
| GD/IT/PL/003 | Records Management, Retention and Disposal Policy |
| GIS/PL2-8:2014 | Gas industry standard: Specification for Polyethylene pipes and fittings for natural gas and suitable manufactured gas |
| IGEM/GM/6 | Nondomestic meter installations |
| IGEM/GM/8 | Nondomestic meter installations flow rate exceeding 6m.3h |
| IGEM/SR/25 | Hazardous area classifications of natural gas installations |
| Gas Safety (Installation & Use) Regs 1998 | Approved Code of Practice requirements stated under Gas Safety (Installation & Use) Reg. 9 (1) & Reg. 15 (section 79) |
| Gas Safety (Management) Regs.1996 | Regulation that applies to the conveyance of natural gas (methane) through pipes to domestic and other consumers |
| Pipelines Safety Regs.1996 Reg. | The Pipelines Safety Regulations 1996 are a set of regulations established in the United Kingdom to ensure the safe operation and maintenance of pipelines, focusing on preventing accidents, leaks, and other potential hazards associated with pipeline. |