Distribution Manual

Design guidance for water mains and services on new development sites

Document Reference 20368

Issue 3 **November 2015**

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Design guidance for water mains and services on new development sites

AMENDMENT SUMMARY

Issue	Date	Details	Prepared by	Verified by
1	Dec '11	First issue.	S Atkinson	N Harper
2	May '12	Changes made to Section 3, pressure and flow principles for new mains, to align with new UUW technical guidance document 'Network Modelling of Water Mains (Doc 60114, issue 1)'	S Atkinson	N Harper
3	Nov '15	Changes made to section 11, Fire Fighting, to align with water UK guidance document Guidelines for the supply of water to automatic fire sprinkler systems.	Kye Smith	Anna Provost

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1 Scope and Definitions

UUW have a statutory duty under the Water Industry Act 1991 to provide new water mains and service connections when requisitioned and to facilitate the provision of self lay schemes by self lay organisations. This design manual is intended to provide guidance to designers and installers and to encourage the use of best engineering practice for these installations.

1.1 Legislation

For the purposes of this document, UUW means United Utilities Water plc. The primary legislation for UUW's licence (appointment) and for conducting our business is the 1991 Water Industry Act.

Under powers given in this Act, the Secretary of State has made the:

- Water Supply (Water Fittings) Regulations 1999, Covering Waste, Misuse, Contamination, Undue Consumption, or Erroneous measurement of the water supplied.
- Water Supply (Water Quality) Regulations 2000 (amended 2001)

Setting standards etc for Water Quality at the customers tap.

Also from powers in the 1991 Water Industry Act, OFWAT has introduced various reporting requirements; DG2 low pressure, DG3 interruptions etc, and Guaranteed Standards. The Water Act 2003 adds provisions to:

- Improve water resources management, with amendments to the Water Resources Act 1991 and the Water Industry Act 1991.
- Strengthen the regulatory framework, and give customers a Consumer Council for Water to replace the Director General.
- Impose duties for sustainable development.
- Increase opportunities for competition; strengthen legislation for DWI, particularly fluoridation, plus drought & flood plans. Also renewal of fire hydrants.

These are almost all incorporated in the 1991 Acts by reference.

1.2 Competition.

The framework for Competition is set out in the WIA 91, and is extended by:

- Competition & Services (Utilities) Act 1992
- Competition Act 1998 (applicable from 1 Mar 2000)
- Water Act 2003
- Inset Appointments – where the appointed water or sewerage company can be replaced by another for a specific geographic area
- Water Supply Licensing:- New companies can obtain a licence to supply water, competing in one of two ways:

(1) By developing their own source.
(2) By retail selling (currently commercial only, and >50Ml/year, and on a single site). For more information, see www.ofwat.gov.uk

1.3 OFWAT Level of Service Indicators (water services)

DG2: Properties at risk of low pressure:

UU must keep a register of properties at risk of receiving less than the "Reference Level of Service"*. The allowable exclusions are:

Short occurrences < 1 hour

Abnormal demand event (max 25 days in 5 years, per property)

* The *Reference Level of Service* is defined as 9 litres per minute, at 10 metres head, measured at boundary stop tap, where one is present.

As this cannot easily be measured, UUW has agreed with OFWAT a *Surrogate Reference*, which is 15m head in the adjacent supplying main, measured at the nearest hydrant or washout.

DG3: Properties subject to Unplanned supply interruptions of 12 hours or more. Briefly,

reports are now required in more detail, in categories:

- Unplanned
- Planned & warned
- Caused by third party
- Planned & warned over-run

and each of these for 3, 6, 12, 24 hours

2 Design principles for new mains

This section is intended to provide designers and constructors with guiding principles which will cover the great majority of situations encountered on new developments. Nothing contained in this guidance shall relieve the designer from using their skills and experience to produce a cost-effective and sensible proposal. This document provides examples of designs for new mains that can be used to assess how mains, services and metering should be arranged.

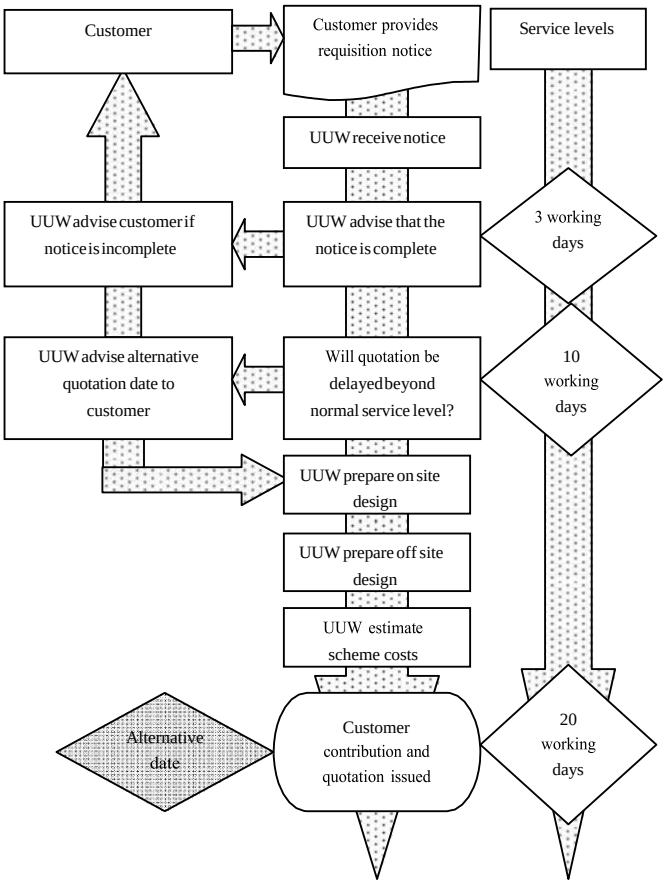
2.1 Point of Connection

The start of any new water main design is the point or points at which the planned main will be connected to the existing network. This point(s) will be calculated using the anticipated flows and demands as indicated on the application form to UUW, together with any known future demands that are intended to be supplied through the new main. The calculated point of connection may also include a requirement for off site reinforcement the cost of which will form part of the overall cost of the new main.

S41 of the Water Industry Act 1991 makes it the duty of an undertaker to provide a new water main when they are served with a notice to supply water for domestic purposes to either existing or proposed premises in a locality. The person(s) who have the right to require such water are the owner or occupier of premises in that locality, or an authorised person acting on their behalf.

S55 of the Water Industry Act 1991 imposes a duty to provide water for non-domestic purposes. An undertaker may refuse this request if it is likely to cause unreasonable expenditure or is likely to put at risk the undertaker's ability to provide water for domestic purposes to meet existing and future obligations.

The point of connection can only be established by UUW and once calculated is normally available for acceptance for up to 6 months, after this time a new application will be needed. As the network is a dynamic system, it is not usually possible to extend the validity of a point of connection beyond 6 months.



Requisition quotation service levels and flow chart

2.2 Routing, positioning and location of new assets.

All possible routes should be considered to identify the most suitable route for new mains taking account of whole life costs arising from construction, operation, maintenance, & eventual de-commissioning.
Consideration should also be given to ensuring that all existing assets are fully utilised. In

selecting a route, the following should be investigated, as appropriate:

- Adverse ground conditions e.g. rock, groundwater,
- Contamination,
- Existing & future land use,
- Land ownership as it affects the company's powers to install and operate apparatus.
- Allow for lead-time where it is necessary to serve notices,
- Traffic management,
- Environmental impact of the works,
- Ease of access for safe construction and future operation/maintenance of the assets,
- Proximity of other utilities,
- Risk of disturbance from second-comers,
- Probability of failure of the pipeline and its consequences,
- Operability assessment e.g. automation, remote monitoring, balanced against manual operation,
- Operating pressures at key points,
- Requirement for air valves, sluice valves, pressure controlling valves etc,
- Requirement for washouts – including means to dispose of water released,
- Security of supply/cross connections to adjacent areas,
- Potential betterment, statutory contributions, or compensation claims,
- Available pressures – the new development must not cause pressures anywhere to fall below the reference level of service DG2 (see detailed guidance).

Undertakers have the power (S159 WIA 1991) to lay mains in a street,

Note: The Water Act 1991 s219 (as amended by the Water Industry Act 2003), provides that the meaning of "street" shall be as in Part III of the New Roads and Street Works Act 1991.

Extract: New Roads and Streetworks Act 1991S48, Streets, street works and undertakers.(1)In this Part a "street" means the whole or any part of any of the following, irrespective of whether it is a thoroughfare;

(a) any highway, road, lane, footway, alley or passage,

(b) any square or court,

(c) any land laid out as a way whether it is for the time being formed as a way or not.

Where a street passes over a bridge or through a tunnel, references in this Part to the street include that bridge or tunnel.

2.3 Depth of mains

Plastic water mains should be installed at a minimum 750mm cover, except where there is a risk from, for example, agricultural activities where 900mm cover is required.

All metallic pipes should be installed at 900mm cover.

2.4 Pipe materials, sizes and pressure rating

It is UUW policy to use plastic pipes for all new pipes up to and including 630mm diameter and pressures up to 16 bar. New pipe systems should be designed for a maximum of 8 bar and coiled pipes should be used for pipes sizes up to and including 180mm.

For PE pipe in sizes 90-630mm, UUW preferred material is PE100 skinned pipe, although normal PE80 and PE100 will still be acceptable from 3rd party organisations. A summary of UUW's preferred PE pipe materials, sizes and pressure rating for use in land that is not contaminated is provided below: -

Size	Material	Pressure Rating	SDR
25mm	PE80	12.5 bar	11
32mm	PE80	12.5 bar	11
63mm	PE80	12.5 bar	11
90mm	PE100 skinned pipe	10 bar	17
110mm	PE100 skinned pipe	10 bar	17
160mm	PE100 skinned pipe	10 bar	17
225mm	PE100 skinned pipe	10 bar	17
315mm	PE100 skinned pipe	10 bar	17

Where new pipes are required in contaminated land UUW's preferred material is Type A barrier pipe, other barrier pipe materials are available for use by 3rd party organisations. A summary of UUW's preferred barrier pipe materials, sizes and pressure rating are provided below: -

Size	Material	Pressure Rating	SDR
25mm	PE80 Type A barrier pipe	12.5 bar	11
32mm	PE80 Type A barrier pipe	12.5 bar	11
63mm	PE80 Type A barrier pipe	12.5 bar	11
90mm	PE100 Type A barrier pipe	16 bar	11
110mm	PE100 Type A barrier pipe	16 bar	11
160mm	PE100 Type A barrier pipe	10 bar	17
225mm*	PE100 Type A barrier pipe	10 bar	17
315mm*	PE100 Type A barrier pipe	10 bar	17

*****Dispensation is required from UUW Engineering. Dispensation from UUW Engineering is also required for the use of any other sizes other than stated above (ie. 125mm, 140mm, 180mm etc).

Further guidance on preferred material choices to meet UUW requirements is set out in 'UUW pipeline materials selection policy (Ref: 20971)'.

2.5 Standard Dimensional Ratio (SDR)

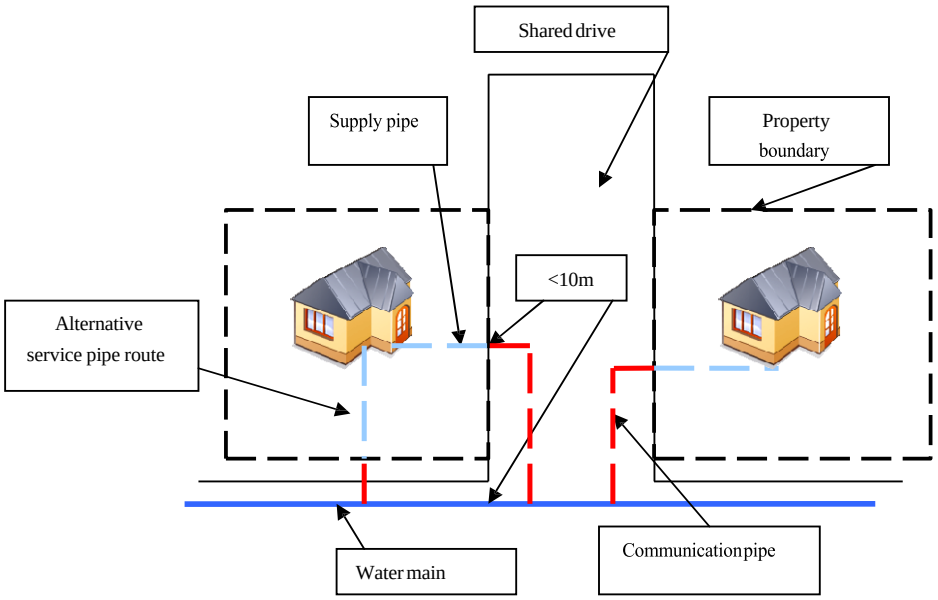
The ratio between wall thickness and outside diameter remains constant for a given pressure rating of the pipe. This relationship, called the standard dimensional ratio or SDR, can be expressed as an equation:

SDR = nominal (minimum) outside diameter / minimum wall thickness

2.6 Design criteria for mains within new development areas.

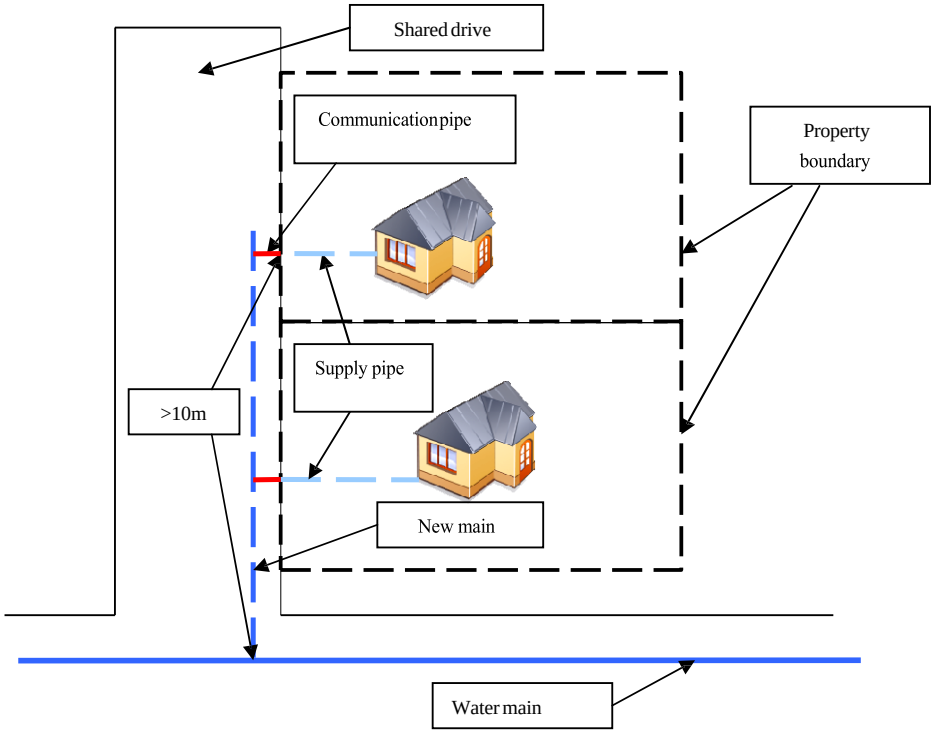
The design layout for water mains in a new development, i.e. in new streets, should be such that the installation is economic to install, operate and maintain during its designed lifetime. Mains should be provided in a street as far as the point at which it is practicable to connect the service pipe, at reasonable cost and consistent with hydraulic efficiency.

A main should be laid in any street where 2 or more premises are being served and the communication pipe (i.e. that part of the service pipe outside the boundary of the premises being served) would be longer than 10m. End washouts will be required on mains of 63mm and above and must be located to suit hydraulic and operational convenience, including consideration as to how any wash out water will be drained.



Service pipe layout where supply pipe exit is less than 10m from a water main.

2.6 Contd. Design criteria for mains within new development areas.



Mains and service pipe layout where supply pipe exit is more than 10m from a water main.

Where mains are being laid on new developments, the main should be located on that side of the street with the highest number of service connections; installation of new mains on both sides of a street should only be made where for example, possible future development may occur, or the street is exceptionally wide or traffic sensitive.

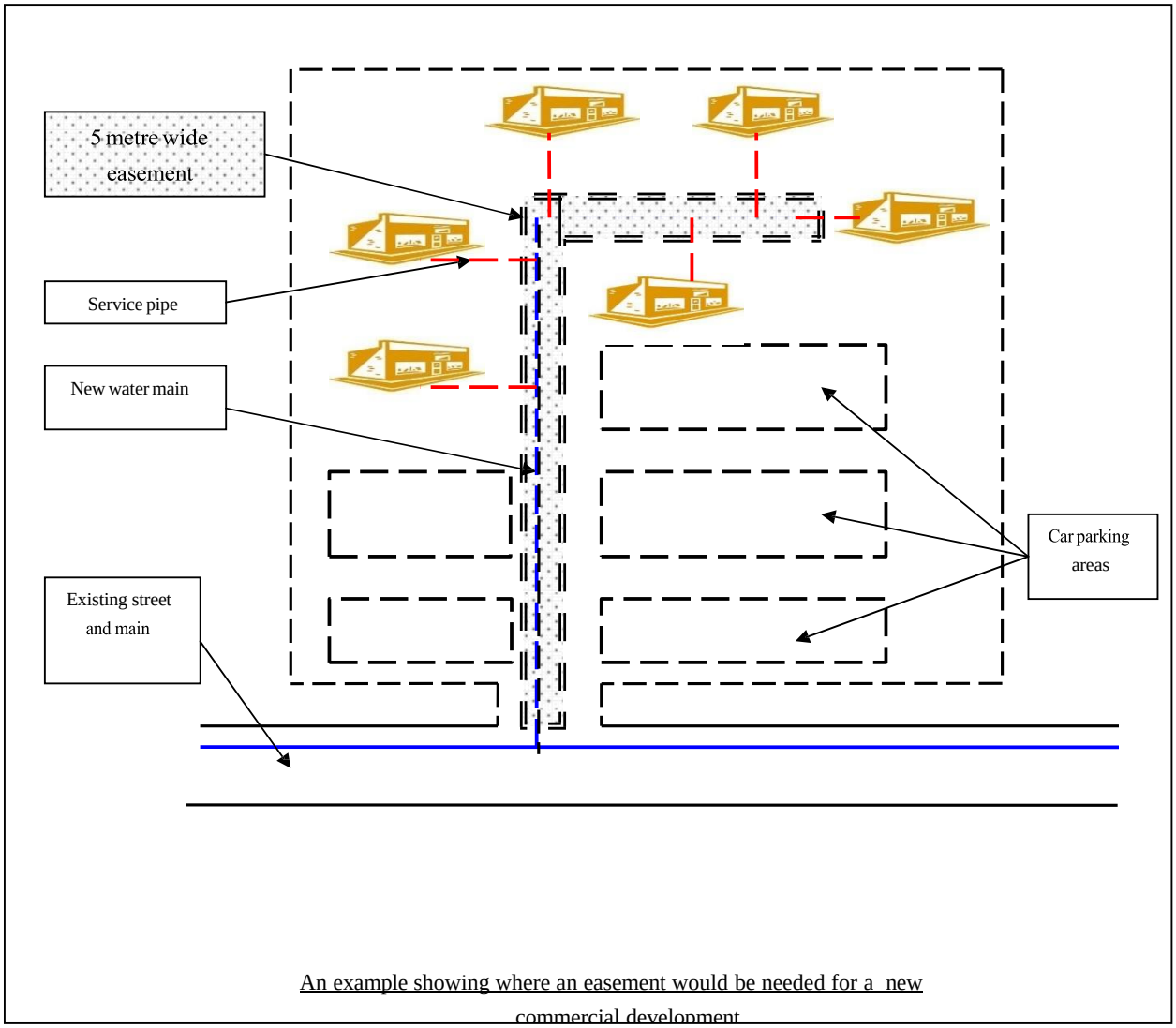
Mains should normally be installed in an area laid out as a street. If other utilities are being laid e.g. gas and electricity, in addition to water, then a service strip should be provided and utilities laid in accordance with the current NJUG requirements. The overriding principle is to design for the most economic layout, with equal consideration being given to both initial installation cost and whole life operation and maintenance requirements. Where mains are of such a size that NJUG spacing in the footpath cannot be achieved then consideration should be given to placing the main in a separately designated area.

2.7 Design criteria for mains in existing streets.

Where a new main is required in an existing street to serve premises i.e. infill type developments or urban renewal schemes then new mains should be located such that the number of road crossings made for both mains and planned service connections is minimised. Consideration should be given to installing a new main on both sides of a street, thereby reducing the total number of road crossings**.** Where a new main has not been requisitioned and the development scheme is such that an unacceptable number of long side service road crossings to an existing main will be made, then consideration should be given to installing a main in front of the premises and using short side service connections. (See also Section 9.4.2)

2.8 Design criteria for mains in Retail Parks, Commercial and Industrial areas.

Wherever possible new mains should be located in an area designated as a street. In retail parks, commercial and industrial areas it may not always be clear which areas are streets and there is a particular risk that layouts of buildings, car parks and access roads may be changed without consultation with UUW. In such areas consideration should be given to protecting UUW's assets with an easement. New water mains should be co-coordinated with other services such as gas, electricity and telecoms and laid in accordance with NJUG guidelines.



An example showing where an easement would be needed for a new commercial development

2.9 Unadopted Roads.

It cannot be assumed that all roads on new estates will be adopted. However, since they will almost certainly be classed as a street, the adoption of a road should not be a factor when determining the optimum design route for route for a new main.

2.10 Gated developments.

Gated sites should be treated in the same way as any other development. Where a main is installed within the gated area, consideration should be given to installing an isolating valve just outside the development such that any main within the gated area can be isolated without delay if needed.

2.11 Service Strips

There is no legal definition or land category for a service strip. It is a common term to mean “a strip of land intended to be used for the permanent installation of utilities apparatus, and intended always to be kept clear”. They are generally a 2m wide strip of private land beside the road. Utility services will be installed in accordance with the current NJUG guidance, and the householder’s deeds will restrain any activity which obstructs access (by virtue of an easement in favour of UUW). Service strips are generally unadopted, but the highway authority may still “maintain” them in respect of records, notices etc.

2.12 Mains located in areas with restricted access

In most circumstances the main will be in a footpath or service strip adjacent to a highway which will provide adequate maintenance or operational working space for the main. Where the main is in a street, and the street is immediately adjacent to a building, the main may be laid no less than 600mm away from the building or foundation, provided there is still a total 5m working width for access, (this would typically be the width of the pavement, plus part of the carriageway, as required). Where there is no other option, a reduced working width of no less than 2m is acceptable, provided that:

- The main is no larger than 160mm outside diameter
- That any joints, fittings or service connections are kept to a minimum within the restricted width area.

2.13 Land Rights

Before any water mains are laid, either for a requisition or by a self lay organisation it is necessary to establish if any land rights will be required. Any main installed in third party land, which is not a street may require land rights to be obtained. This requirement should be assessed at design stage and indicated on the approved layout drawings prior to any acceptance of the scheme by the developer. UU Property Services team should be advised when any proposed land rights are needed so that all required documentation is in place at the earliest possible stage. It is of particular importance that any “as laid” record is fully in accordance with the planned position of the main that was shown in any notice or proposed easement before the main is connected to UUW’s existing network.

2.14 Water mains that are to be laid in a street.

UUW are able to lay mains or adopt mains that have been laid in a street, this may be:

- an adopted street on land which is owned by a Local Authority,
- a street on land which is owned by the developer and which may or may not be adopted in the future,
- a street on land which is in third party ownership.

There is no need for UUW to obtain any permission for any of the above if mains are requisitioned and then laid by UUW or their contractor, unless the nature of the development is such that the area defined as a street is likely to be changed such that the main is no longer in a street. This consideration is particularly applicable to commercial and industrial developments where development may take place without any reference to UUW, and in these areas it may be advisable to take out an easement or other charge to preserve UUW’s rights.

2.15 Water mains that are to be laid in land which is not a street.

UUW are able to lay and operate water mains in third party land by issuing a notice to the land owner and occupiers, this right is set out in S159 of the Water Industry Act 1991, this will also need to be supplemented by acquiring a deed of grant of easement.

Any access to private land should be preceded by an appropriate notice to the land owner and occupier, a summary of notices requirements is provided below: -

- 3 months for installing a new pipe.
- 42 days for altering an existing pipe.
- 7 days for site investigation or surveys.

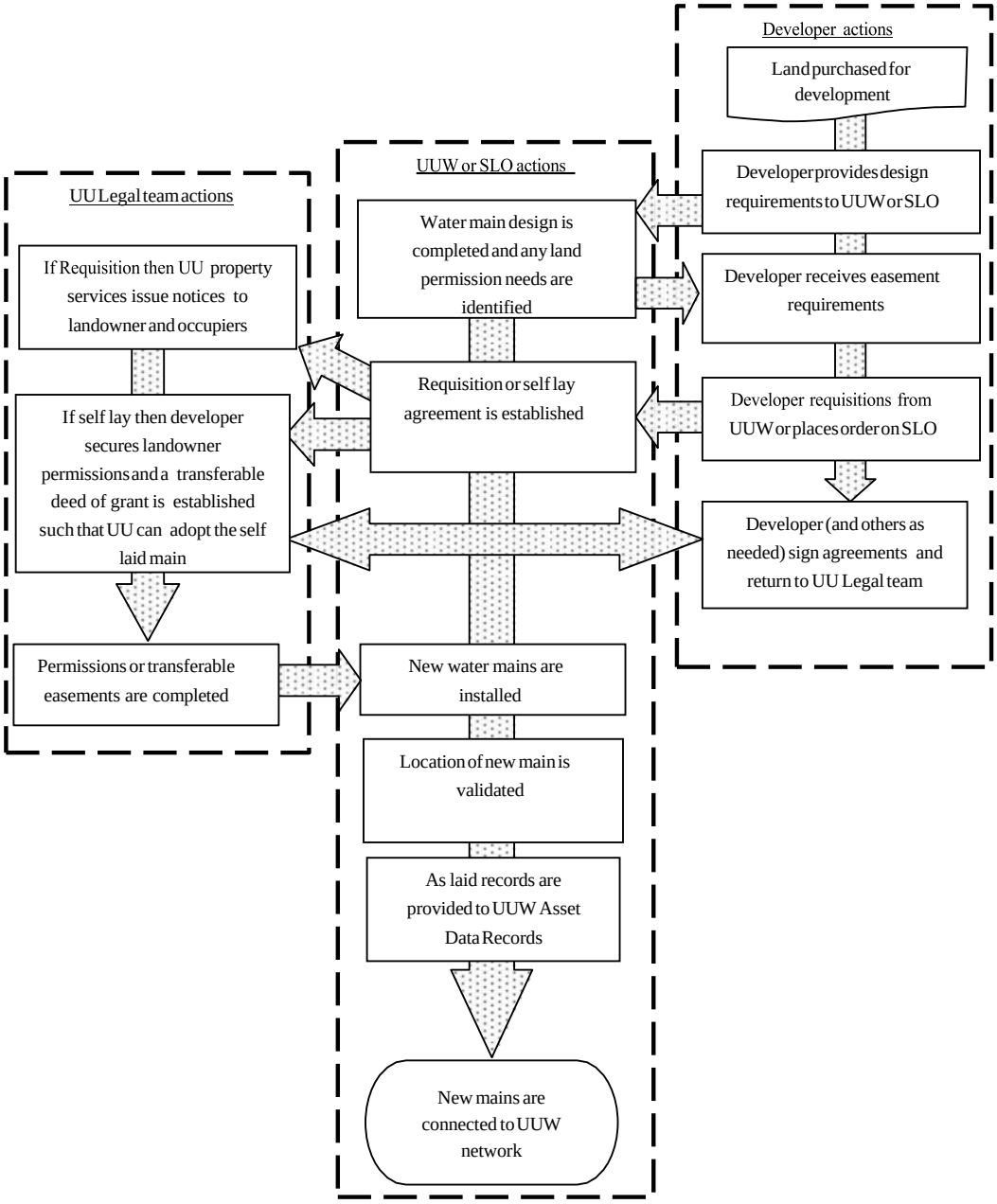
These notice periods are considered as reasonable under the Water Industry Act, but where new mains are required to satisfy a requisition then a reasonable alternative period can be agreed.

2.16 Self laying of water mains in land which is not a street.

Where mains are to be self laid and are intended to be subsequently adopted by UUW, the rights provided to UUW by the Water Industry Act do not apply to the self lay organisation.

The developer will need to obtain permissions from the land owner to install the pipes and then arrange for a deed of grant of easement in favour of UUW to be in place before the new mains can be adopted by UUW and connected to the existing water network, it may be possible to achieve this by using a suitable multi- partite agreement.
Any costs that are incurred in arranging the permissions and subsequent transfer to UUW are to be paid by the developer.

Advice on all issues concerning pipes in private land should be sought, initially from UUW Property Services. For further detailed guidance refer to 'UUW Procedure for entering onto private land (Ref: 50385).



Flow chart indicating process where a new main is not laid in a street

3 Pressure and flow principles for new mains

The successful hydraulic design of new mains and changes to the network should take into account demand, velocity, head loss and pressure. Guidance on these key design parameters is provided below and in more detail within UUW Technical Guidance for Network Modelling of Water Mains (60114 Issue 1).

3.1 Definitions

Reference level of service:

A flow of 9 litres per minute at a pressure of 10 metres head (1bar), measured at the boundary.

Surrogate to Reference level of service:

15 metres head (1.5 bar) static pressure at nearest hydrant.

3.2 Design guidance - Pressure

The Network should be designed for a minimum pressure of 2 bar (approx. 20 metres head) at any hydrant or node. Any new development which would cause the pressure at any point to fall below 2 bar will require appropriate system reinforcement. The only exception to this would be if the topography is such that new mains pass through an area of high ground where there are no service connections, and are never likely to have service connections (e.g. remote moor land), then the design minimum operating pressure can be lower; in this circumstance the pressure must not drop below 5m available head.

Maximum mains pressure should not normally exceed 6 bar (approx 60 metres head), and mains pressure reduction schemes should be considered for all areas where the pressure can be reduced by 1 bar at night. Most domestic water-using fittings and appliances are designed for a maximum working pressure of 10bar. Minimum working pressures are generally in the region of 0.5 bar, but some appliances will not perform well below say 1.5 bar.

3.3 Design guidance – Velocity of Flow

The optimum design velocity of flow in mains is 1.0 m/s, with minimum and maximum design parameters of 0.2 m/s to 1.5 m/s.

3.4 Design Guidance – Head loss per 1000m (Hydraulic Gradient)

Any new pipe or network change should be designed so that the hydraulic gradient is typically in the range of 2m to 4m per 1000m in the proposed main, and in any existing mains that may be influenced by the proposal. However, if downstream pressure is available in sufficient quantity and its reduction is not a concern, then a hydraulic gradient not exceeding 10m in 1000m can be used.

3.5 The reference level of service

Undertakers are required to record the number of domestic properties identified as receiving less than the Reference Level of Service. These are to be reported annually under the performance indicator DG2. The Reference Level of Service is set at 10m head at the boundary stoptap, at a flow of 9 litres/min for a single property, measured at the customer side of any boundary fitting.

Checking compliance against this standard would require excavation and is clearly impractical. The "Surrogate Pressure Reference" is agreed as a static pressure of 15m head at the nearest hydrant.

The Reference Level of Service is specific to a single 25mm domestic connection. A customer with say, a 63mm connection, could expect a flow somewhat greater than 9 litres per minute, even when there is only the surrogate 15m head at the nearest hydrant.

3.6 Universal pressure statement

The mains water pressure in the UU area varies due to elevation, and diurnal and seasonal fluctuations, but is generally between approx 15m (1.5 bar) and 60m (6 bar) head. This is static pressure and will be reduced inside the building depending on the length and size of the service pipe and the rate of flow. A standard 25mm (o.d.) service pipe will normally provide 15-20 litres per minute.

Mains pressure is adequate for all normal domestic situations but developers should satisfy themselves that it is sufficient for their purposes, particularly in buildings above 2 storeys, or those including fire sprinkler systems. UU has separate guidance notes for such situations.

Most domestic water using appliances will have manufacturers design and operating instructions. Installers must consider the minimum and maximum pressure requirements, and additional protection to avoid possible damage to fittings and appliances. Some appliances, notably combination boilers, may not perform well at pressures

below 1.5 bar.

3.7 General requirements

All new mains must be designed to ensure that the pressure and flow for water provided for domestic and fire fighting purposes is in accordance with s65 and s66 of the Water Industry Act 1991. There is no requirement for new mains to be upsized to provide water specifically for fire fighting purposes.

S65 requires an undertaker to provide a constant pressure such that water can reach the top most storey of every building within the undertaker's area. However, an undertaker is not required to provide a supply of water at a height greater than that which it will flow by gravitation from the service tank or reservoir from which that supply is taken; additionally an undertaker is entitled to choose the reservoir or tank from which the supply will be taken.

S66 allows an undertaker to require a float operated cistern which will provide at least 24 hours supply to any premise where water is delivered at a height greater than 10.5m below the draw off level of the service reservoir or tank from which the supply is taken. This means that the maximum pressure that is required to be provided is 1.5 bar.

The definition of water for domestic purposes is provided in s218 of the Water Industry Act 1991 and refers to water used for drinking, washing, cooking, central heating and sanitary purposes. It also includes water used for business purposes within premises where the greater part of the premises is occupied as a house, provided that:

- no water is used for the business of a laundry or,
- for a business preparing food or drink for consumption off the premises,
- or for the use of a bath with a capacity exceeding 230 litres.

If an undertaker provides water for purposes other than domestic use, as defined above, in accordance with s55 of the Water Industry Act 1991, then the cost of providing such mains and additional capacity shall be borne fully by the person(s) requisitioning the new main. Where water to a new development is required for both domestic and non-domestic capacity, then this shall normally be provided through a single main, unless the non domestic demand is such that the water quality of any water provided for domestic purposes will not meet that required by the Water Industry Act 1991.

3.8 Sizing new mains for domestic premises

As a guide the typical size of pipe for a given number of properties is shown in the table below. The values given should not be a substitute for conducting an adequate hydraulic assessment taking into account all pertinent factors.

Number of individual dwellings	Typical pipe outside diameter (PE pipes)	Nominal bore (other materials)
1	25mm	20mm
2	32mm	25mm
3-5	50mm	40mm
5-20	63mm	50mm
20-40	90mm	80mm
40-95	110/125mm*	100mm
95-300	160/180mm*	150mm
300-700	225mm	200mm

*125mm/180mm shown in the table are UUW non-preferred sizes and should not be used without dispensation, refer to 2.4.

3.9 Sizing mains for non domestic and mixed demands

When a main intended purely for non-domestic demand is being sized, the estimated process demand and flow should be used.

In practice, most non domestic water is provided through mains that also provide domestic water; the combined demands should be used when sizing the main. An exception to this is water used for fire fighting purposes; UUW water mains should not be upsized to include this demand. UUW are permitted to allow a reduction in pressure and flow to domestic customers during a period when water is being drawn for fire fighting purposes.

3.10 Managing water quality in new mains.

Management of water quality in network mains is the responsibility of UUW. Mains that have been correctly sized and designed will maintain water quality under normal operational circumstances i.e. when the designed demand is connected. There may be circumstances, such as during the construction phase, when the actual demand is too low to ensure adequate turnover of water within the connected main. When a new main is connected to UUW's existing network, service connections should be planned to be made within 7 days of the new main being connected.

Water demand on a new main should be sufficient to ensure refresh within 10 days, if this is unlikely then a flushing and sampling regime will need to be implemented by UUW. It should be noted that a flushing regime is an undesirable option due to the inherent waste of water, and should only be implemented where no other option, such as cross connection to an existing network, is available.

The cost of any cross connection or flushing and sampling regime would normally be attributable to the developer. An exception to this would be where the need to flush is due to a main being upsized by UUW to provide supplies for another unrelated development.

4 Valves

Valves shall be installed to control the flow within the network and enable all components to be isolated, drained and recharged for maintenance purposes. The number, size and position of valves at the point of connection (see 2.1) to the existing main will be determined by UUW.

A valve should be located at all branch locations and the maximum spacing of isolation valves on distribution mains shall be 1000m or to shut off a maximum of 50 properties.

All valves must be anti-clockwise closing. Spindles must be installed on all valves which should end 200mm below the cover to facilitate ease of future operation.

5 Air Valves

Air valves shall be installed at the highest point on a section of main and at points of changing gradient. If the main is relatively flat with no discernable high points they should be positioned at intervals of, say, 800m, however they are not required where customer connections will release air from the system. They should be capable of isolation for maintenance purposes without shutting off the main to which they are connected.

6 Washout Hydrants

Washout hydrants should be installed on the end of every main and at any low point on the network that may be required to drain the main for maintenance purposes. Where washout hydrants are required on mains 200mm or greater they shall be installed with a valve controlled branch. Washout hydrants shall be installed ensuring the outlet is no more than 300mm from the surface upon completion.

7 Financial considerations for new water mains

The financial considerations for new water mains are set out in s42 and s43 of the Water Industry Act 1991. These provide methods to calculate the developer contribution to a new main, such that either a Relevant Deficit (RD) amount is paid over a 12 year period, or a single sum known as a "discounted aggregate deficit sum" (DADS) is paid following installation of the new main. The remainder of the cost of the new main is funded from actual revenue that is collected over the 12 year period for an RD, or estimated revenue over the 12 year period for a DADS calculation. UUW use a financial model to calculate both RD and DADS values, this model is updated regularly to reflect changes in interest rates, revenue and other factors and it is essential that only a current model is used when calculations are made.

7.1 Scheme cost

The scheme cost is the basis for all financial calculations and should include the cost of the following when water is requisitioned for domestic purposes: All new mains and associated equipment installed within the boundary of the development site.

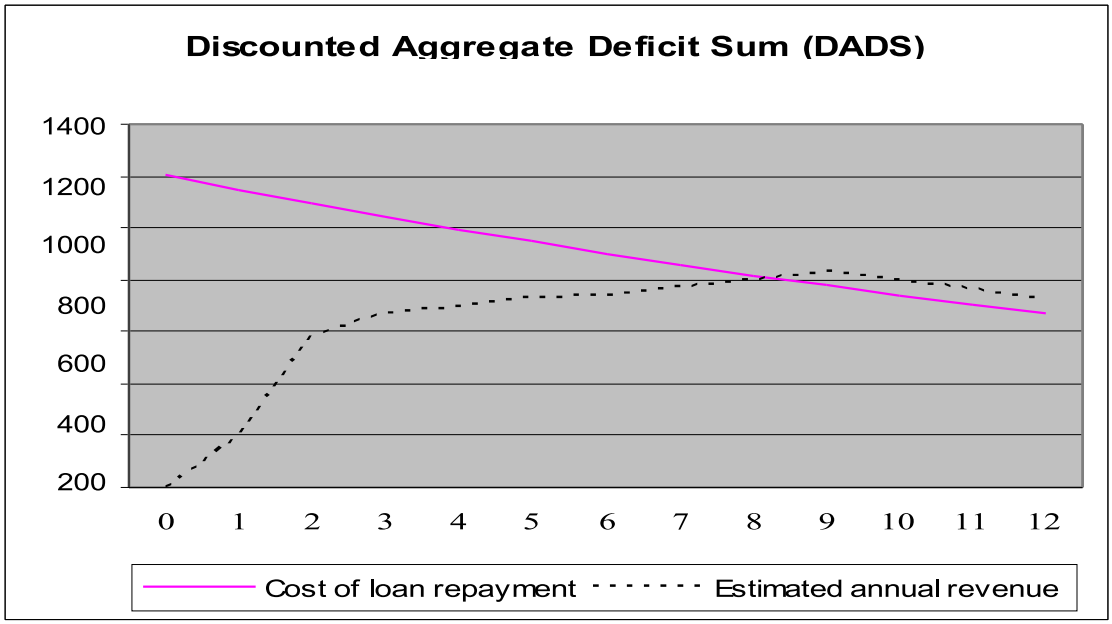
- All off site mains and associated equipment that are required to provide additional capacity for the new development.
- Such proportion as is reasonable of the costs incurred in providing any additional capacity in an earlier main, which falls to be used in consequence of the provision of the new main. This provision applies to any requisitioned or adopted main that has been provided in the 12 years immediately before the provision of the new main.

Any water design should reflect the most economical method of constructing a safe maintainable and extensible network. The following factors should be considered:

- Validation for the type of pipe being installed e.g. barrier pipe, PE pipe, ductile iron etc.
- The possibility of future demand from the planned network.

7.1 **Scheme cost contd.**

An example of a discounted aggregate deficit sum (DADS) graph is given below; this is used to calculate the single payment (commuted sum) option for a developer contribution to a requisitioned main. The other option i.e. relevant deficit (RD) is based on the actual revenue and the actual cost of the loan for each of the 12 years following commissioning if the requisitioned main. It should be noted that the graph is based on discounted values, such that future values are discounted to reflect current cost values.



For each of the 12 years following connection of the new main any difference between the cost of the loan to fund the scheme and the estimated revenue is calculated and summated, this provides the value for the single payment commonly referred to as the "commuted sum". For self lay schemes, the "asset payment" is the lesser of the summated values of the estimated annual revenue or the annual cost of the loan. It should be noted that for self lay schemes certain deductions, in accordance with provisions of the Water Industry Act 1991, may be made from this asset payment.

7.2 **Phased Developments.**

Where a requisitioned water main is increased in capacity to provide water for domestic purposes for future development phases (not necessarily connected with the current development), then the additional cost of up-sizing will be recorded and then recovered on a proportional basis from any subsequent developer for a period of up to 12 years following the commissioning of the upsized main. This applies to both on site mains and to any off site reinforcement provided for a previously requisitioned main.

7.3 **Water for domestic purposes.**

S41 of the Water Industry Act 1991 sets out an undertaker's duties when a supply for domestic purposes is requested. The person requesting the supply must be the owner or occupier of the premises, or an authorised person acting on their behalf, and must provide sufficient information to allow the undertaker to proceed with the request. An undertaker cannot refuse to provide a main where water has been requested for domestic purposes. The financial requirements of this provision are set out in s42-43A of the Water Industry Act 1991. There is an approved model that must be used to calculate the contributions required from the applicant for a new main.

7.4 **Water for non-domestic purposes.**

Obligations relating to the provision of water for non-domestic purposes are set out in s55 of the Water Industry Act 1991.
In simple terms, we must provide non domestic water unless the provision is likely to restrict our ability to provide water for existing or future obligations for water, for both domestic and non-domestic purposes. The cost of providing water wholly for non-domestic purposes is fully attributable to the person requiring the new main

7.5 **Mixed water use (domestic and non-domestic use).**

The costs associated with provision of non domestic water are fully attributable to the person(s) requesting the supply. The approved DADS financial model will provide a default position, based on Building Research Establishment data, where an applicant is unable to provide a substantive split between domestic and non-domestic water.
The following examples set out how the scheme cost calculation is carried out:

(a) **Where water is to be used entirely for domestic purposes and an upsize/reinforcement is provided on the site for a future demand on the same development:**

Cost of on site main required for the development	(a)
Cost of upsized main to serve future demand (same developer)	(b)
Costs included within the scheme cost	**(c) = (a) + (b)**

(b) **Where water is to be used entirely for domestic purposes and a previous upsize/reinforcement is utilised by a subsequent developer:**

Cost of on site main required for the development	(a)
Cost of previously installed upsized main	(b)*
Proportioned cost of upsized main to serve future demand	(c) = (b) x (f)**
Where (f) is a proportioning factor	
Costs included within the scheme cost	**(d) = (a) + (c)**

*(b) applies where an upsize/reinforcement was provided within a period of 12 years prior to this provision.
**(f) this factor is derived from the usage of previously installed additional capacity.

(c) **Where water is to be provided for both domestic and non-domestic purposes and an upsize/reinforcement is provided for a future demand by the same developer**

Cost of on site main required for the development	(a)
Cost of on site main for non - domestic purposes	(b)*
Cost of upsized main to serve future demand (same developer)	(c)
Costs included within the scheme cost	**(d) = (a) - (b)* + (c)**

***** The value at (b) is to be fully recovered from the developer

(d) **Where water is to be provided for both domestic and non-domestic purposes and an upsize/reinforcement is utilised by a subsequent developer:**

Cost of on site main required for the development	(a)
Cost of on site main for non - domestic purposes	(b)^
Cost of previously provided upsized main to serve future demand(c)*	
Proportioned cost of upsized main to serve future demand	(d) = (c) x (f1)** x (f2)***
Costs included within the scheme cost	**(e) = (a) - (b) + (d)**

^ (b) is to be fully recovered from the developer.
* applies where an upsize/reinforcement was provided within a period of 12 years prior to this provision.
** (f1) this factor is derived from the usage of previously installed additional capacity.
*** (f2) this factor is the ratio of domestic to non-domestic water provided

7.6 **Deposit provisions**

A water company is allowed under s42 of the Water Industry Act 1991 to take a deposit from the person requisitioning the new main. The deposit should not be any greater than the estimated developer contribution.

8 Financial considerations for new service connections

The financial implications for new domestic service connections are set out in s46 of the Water Industry Act 1991. The person requiring the connection, who should be the owner, occupier or an authorised person acting on their behalf, is responsible for paying the reasonable costs of connecting the premises to the water main.

8.1 Connection charges

UUW publish a list of charges for making standard connections (25mm outside diameter pipe) to a water main. These charges include installation of the communication pipe and provision and installation of a meter, other sizes are quoted individually. Where multiple service connections are requested, then UUW may choose to lay a main rather than a number of adjacent communication pipes. The charge payable in such circumstances will be based on laying the equivalent number of communication pipes.

8.2 Infrastructure Charges

Water companies are permitted to make an infrastructure charge, when premises are connected to their sewage and water network for the first time. Where the new premises occupy land that is being redeveloped, there may, under certain circumstances, be infrastructure credits available in respect of previous premises on that land. Any infrastructure credit that may be available, and its expiry date, will be advised when we quote for the new connection.

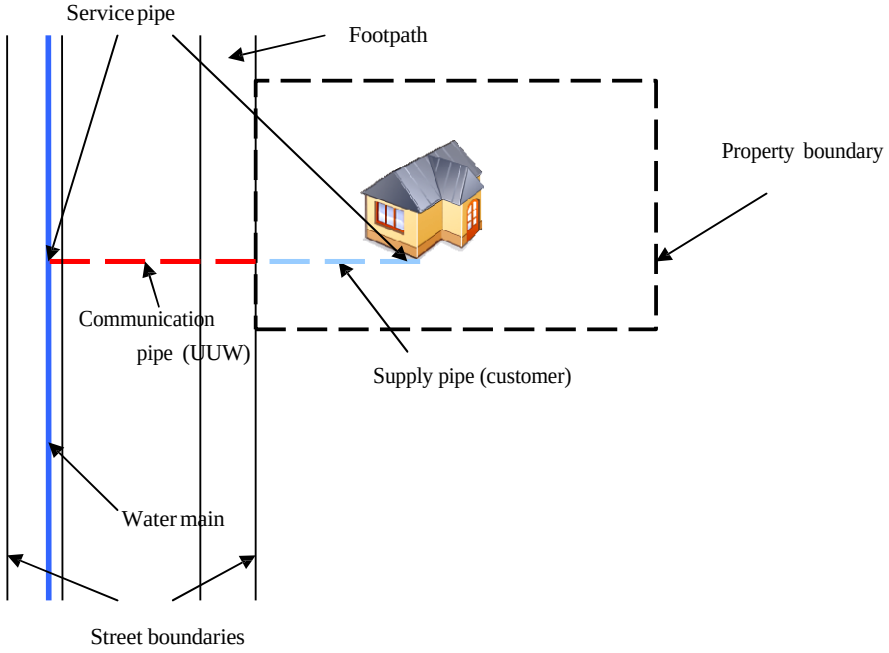
8.3 Deposit

Water companies are able to take a deposit equal to the estimated reasonable cost of the connection, before the work commences. Under normal circumstances UUW would only accept a deposit payment up to 3 months before the work is due to commence.

9 Requirements for service pipes

9.1 Definitions

Service pipe: the length of pipe that connects a water main to the premises being served.
Supply pipe: that part of a service pipe which is laid within the boundary of the premises being served.
Communication pipe: that part of a service pipe which is laid from the water main to the point of delivery.



Service pipe, communication pipe and supply pipe

9.2 Conditions for connecting a service pipe to a water main (s47 WIA)

When a connection notice is served on a water company by the owner or occupier of premises, S47 of the Water Industry Act, permits a water undertaker to require that any of the following conditions are complied with before a service pipe is connected to a water main. These conditions must be notified to the customer no later than 14 days after a connection notice has been provided.

- A requirement that a reasonable security has been provided in respect of any work that will be carried out by the undertaker.
- A requirement that a meter has been installed either by the undertaker or another party fully in accordance with the specifications approved by the undertaker.
- That any part of the service pipe not laid by the undertaker and the plumbing of the premises comply fully with the specifications approved by the undertaker.
- That a separate service pipe has been provided to each house or building on the premises, or to those different parts of a building on the premises which are separately occupied. Where a building is in multiple occupancy other arrangements are not prohibited, provided that the undertaker remains able to efficiently perform all its functions in relation to the supply of water to those premises or any part of those premises.
- Where the building e.g. a high rise building is not capable of being supplied at a pressure in accordance with the requirements of the WIA, a requirement that a cistern with a float operated valve and capable of providing 24 hours water supply is provided within the building.
- A requirement that any water fittings used in connection with the supply of water to the premises, and that all the plumbing in the premises have been installed fully in accordance with the Water Supply (Water Fittings) Regulations 1999.

9.3 General requirements for Service Pipes

Modern developments are arranged in many different ways and it is difficult to be specific about the location and provision of service pipes. Mains, service pipes, stop taps and meters for any new development should be configured for optimum hydraulics, construction, and maintenance. Specifically the arrangement should not cause unreasonable cost or difficulty to either Water Company or customer to construct or to undertake any future maintenance

(1) The normal rule is one premise – one service pipe – one meter

(2) Supply pipes i.e. that part of the service pipe laid within the boundary of the premises served should be laid such that the communication pipe will be generally perpendicular to the main to which it will be connected, and such that no part of the supply pipe is laid in any land that is not within the boundary of the premises being served.

(3) A shared service pipe can serve any number of properties (typically in a multi-occupied building). It will not normally be in a street or in land protected by an easement, but should be installed such that it remains accessible for repair. It remains a shared service pipe, not to be confused with a Common Supply Pipe.

(4) For low-rise buildings, in multiple occupancy, the number of separate service pipes to the building should be minimised. Ideally, 2 or more occupancy units should have a suitably sized shared service pipe, with separate meters inside the building, preferably accessible from a common area. The developer should be encouraged to provide a ground floor services cupboard, where individual stop taps and supply pipes may be taken from a common manifold arrangement. Meters for each dwelling may be located either at the intake position manifold or within the individual dwelling. A multiport box at the end of a shared service pipe can be located adjacent to premises to provide individual external control to each occupancy unit, but this should not be used to house water meters for individual service connections. In such cases the meter should be located within the premises being served; multiport boxes should not be used in a cascade arrangement.

(5) For high-rise buildings, characterised by the requirement for pumping to upper floors, a shared service pipe from the tank/pump to each floor is often installed. A single common tank and pump is usually acceptable where a building has more than one tower, whether or not the buildings are linked at the ground floor. Meters may be installed in service cupboards where individual stop taps and supply pipes are fitted to a common manifold arrangement or within each individual dwelling.

(6) For high or low rise multi-occupancy premises, a common billing agreement is available as a non- preferred option, but may be allowed after consultation with UUW. Irrespective of the agreed billing arrangement, the water service pipe work within the building must be arranged such that individual metering to each dwelling or to any shared water provision can be installed without the need to carry out any modification.

9.3.1 Sizing service pipes

The sizing or service pipes to new developments is governed by the requirement that there should be an adequate supply to meet customer demands, at the point of delivery, at all times while ensuring that water quality is not compromised through the use of oversized pipes.

As a guide the typical size of pipe for a given number of properties is shown in the table below. The values given should not be a substitute for conducting an adequate hydraulic assessment taking into account all pertinent factors.

Number of individual dwellings	Typical pipe outside diameter (PE pipes)
1	25mm
2	32mm
3-5	50mm*
5-20	63mm

*UUW non-preferred size but can be installed for customer supply pipe where appropriate.

9.4 Service connection arrangements

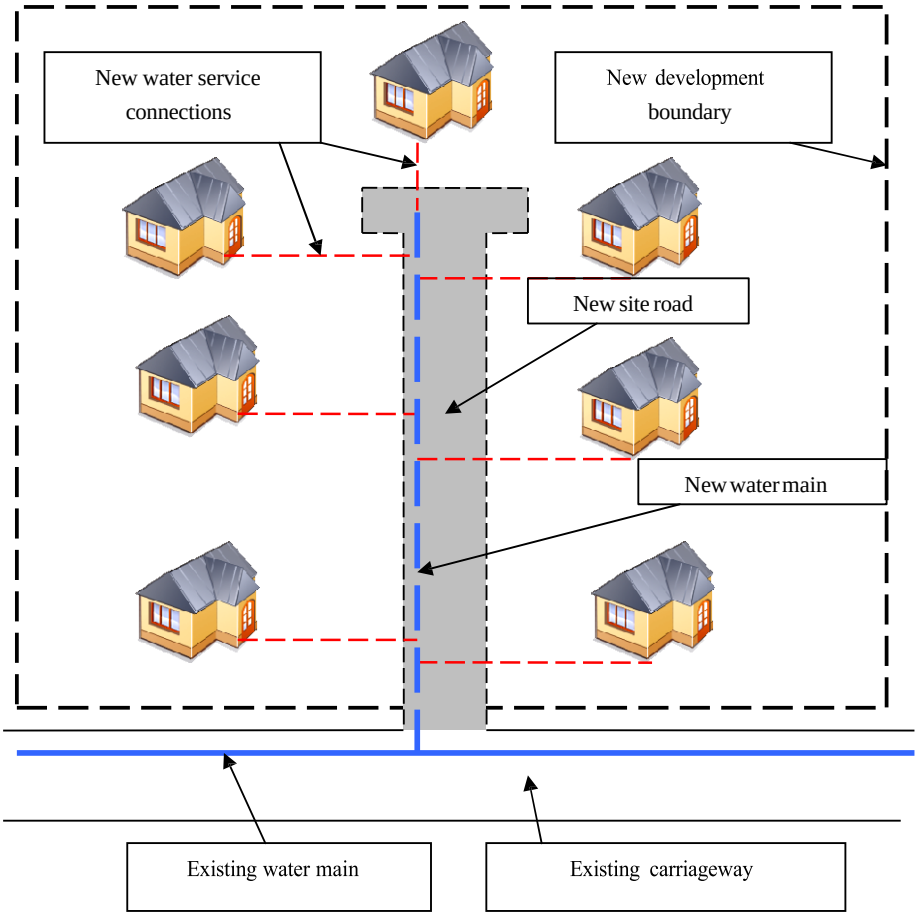
When a new development is being planned service connections should be designed in conjunction with both new and existing mains such that services are:

- laid in a position agreed with UUW,
- generally perpendicular to the main,
- are not crossing others land,
- Are a minimum of 25mm diameter blue PE (or barrier pipe as required), min depth 750mm, max depth 1350mm,
- are spaced (service tapping into the main) in accordance with the table below: -

Main Material	Minimum spacing for tappings
PE (PE80/PE100 including PE barrier pipe)	300mm
Iron (cast/spun/ductile)	300mm
PVC-U	500mm or 5 x main diameter (whichever is the greater)

9.4.1 Service connections in new streets or a street where a main is not installed.

Developers requiring new water supplies are able to choose to requisition a main, or to request service connections. Where no main currently exists in a street, or where a new development and associated streets are being created it is likely that a new main will be requisitioned, although that may not always be the case.

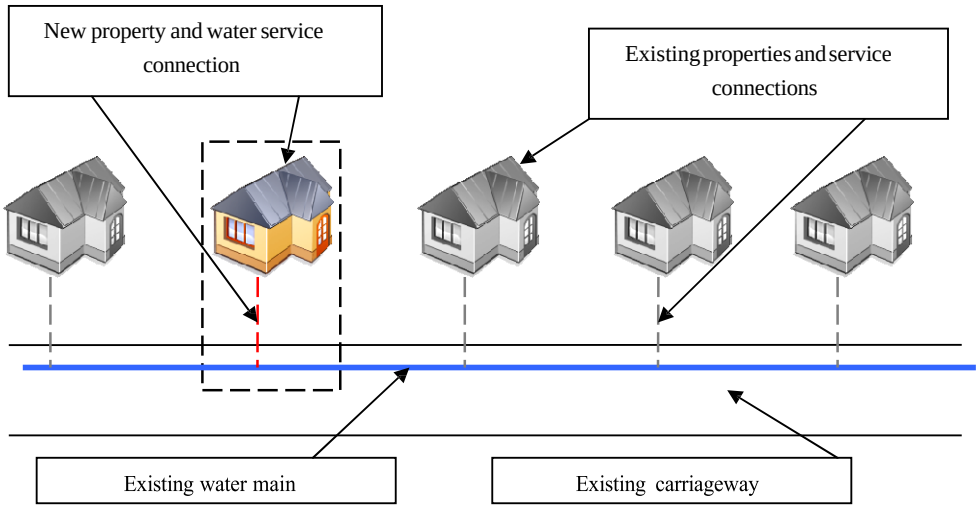


Example showing where new service connections would require installation of a new main

9.4.2 Service connections to existing mains

Example 1: New development is on the same side as an existing main

Where a new development is on an existing road and new services are being connected to an existing main which is located on the same side as the new properties, then the service would usually be connected to that main.



Example 1 - showing where a new services would be connected to an existing main

Example 2- New development is on the opposite side to an existing main

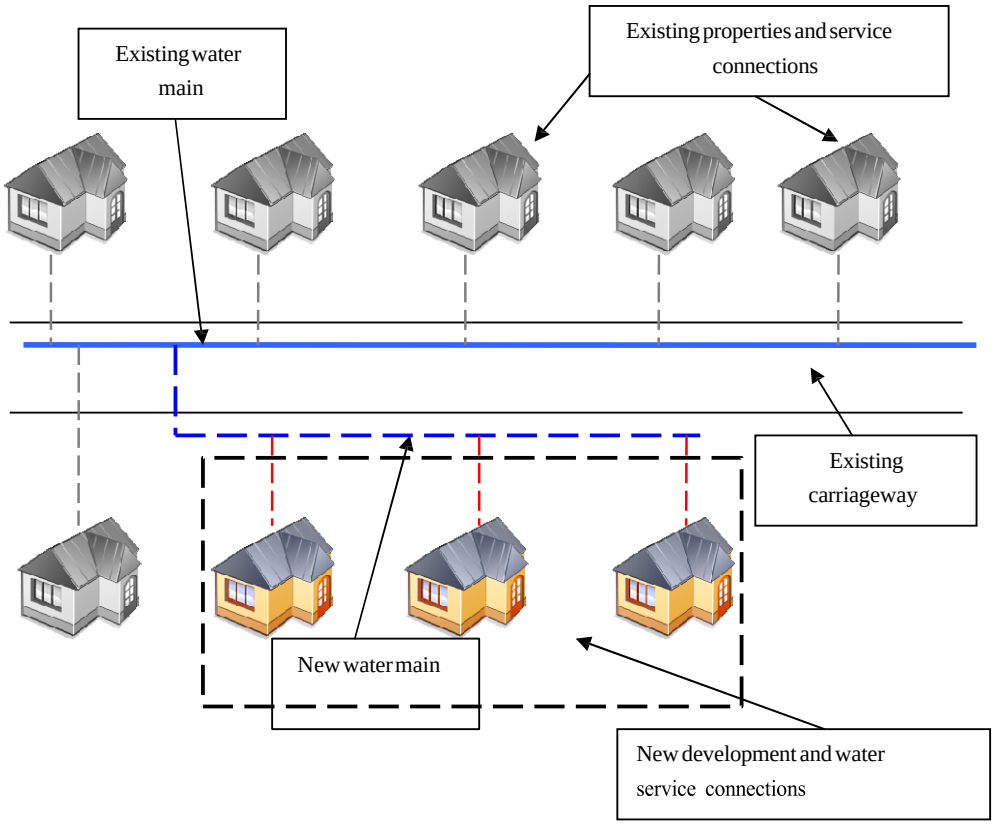
Where an existing main is located on the opposite side of the road to the new premises, it is often preferable to install a new main on the side adjacent to the new premises using a single road crossing, rather than use a separate road crossing for each property.

The following considerations should be made when deciding how to plan this type of connection:

(1) Is the street traffic sensitive,

(2) Is the footpath in front of the new development being renewed,

(3) Is it likely that further connections to properties will be needed?



Example showing where a new main would be installed to avoid multiple road crossings

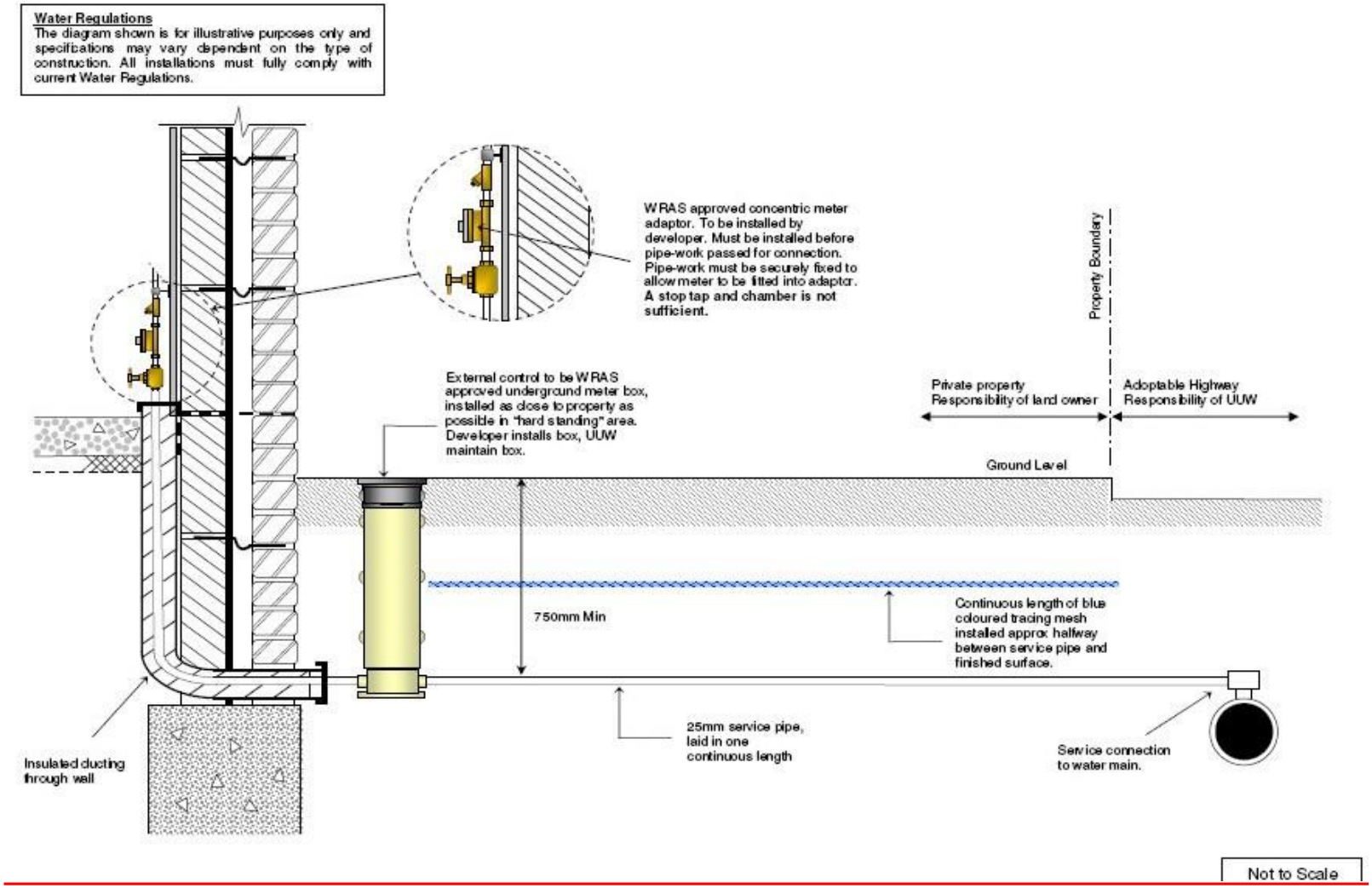
9.5 Standard service connection details

UUW do not require boundary stop-taps on new household connections where the meter arrangement on the property is in an in-wall or wall-mounted meter box. (These have an integral quarter-turn control valve, which can be operated from outside the property). In a difficult situation it is possible to squeeze-off the PE service pipe. Where meters are located within the premises, a stop tap located in an approved boundary box positioned in a hard standing area outside the premises at the point where the service pipe enters the building.

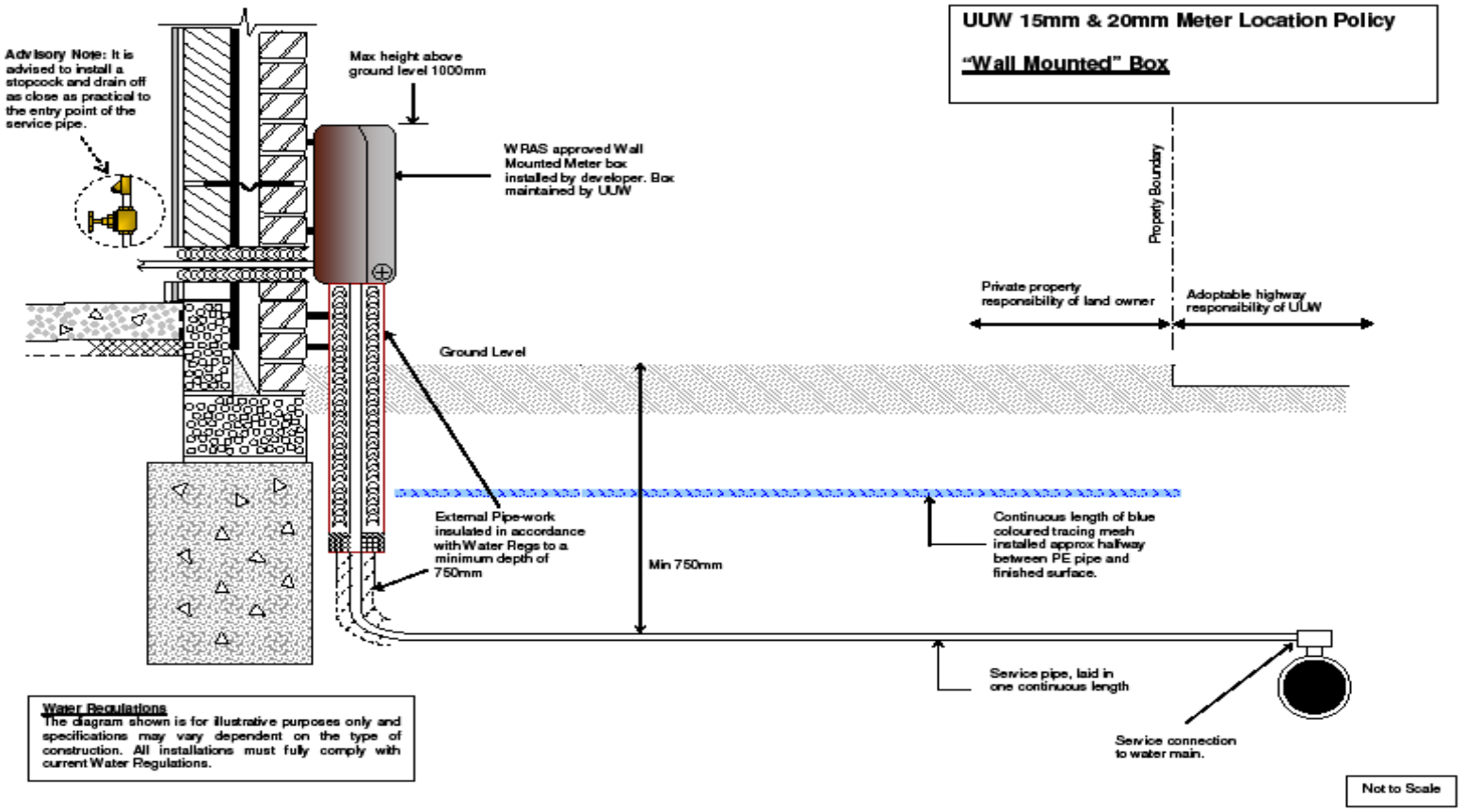
The following pages indicate the arrangements available for standard service connections to new household premises, and for a temporary supply.

- A developer may choose to use any of the following service arrangement options, and is also able to choose which building elevation to use for any external, in wall or wall mounted equipment.
- Where an internal meter option is chosen then the boundary box in which the stop tap is located should be in a hard standing area adjacent to the premises being served.
- Supply pipes should leave the land associated with the connected premises so that the communication pipe is laid perpendicular to the connected main.
- These arrangements together with additional information on how the various options must be installed, are provided in UUW's "New development information pack" a current version of which is available at www.uuplc.com

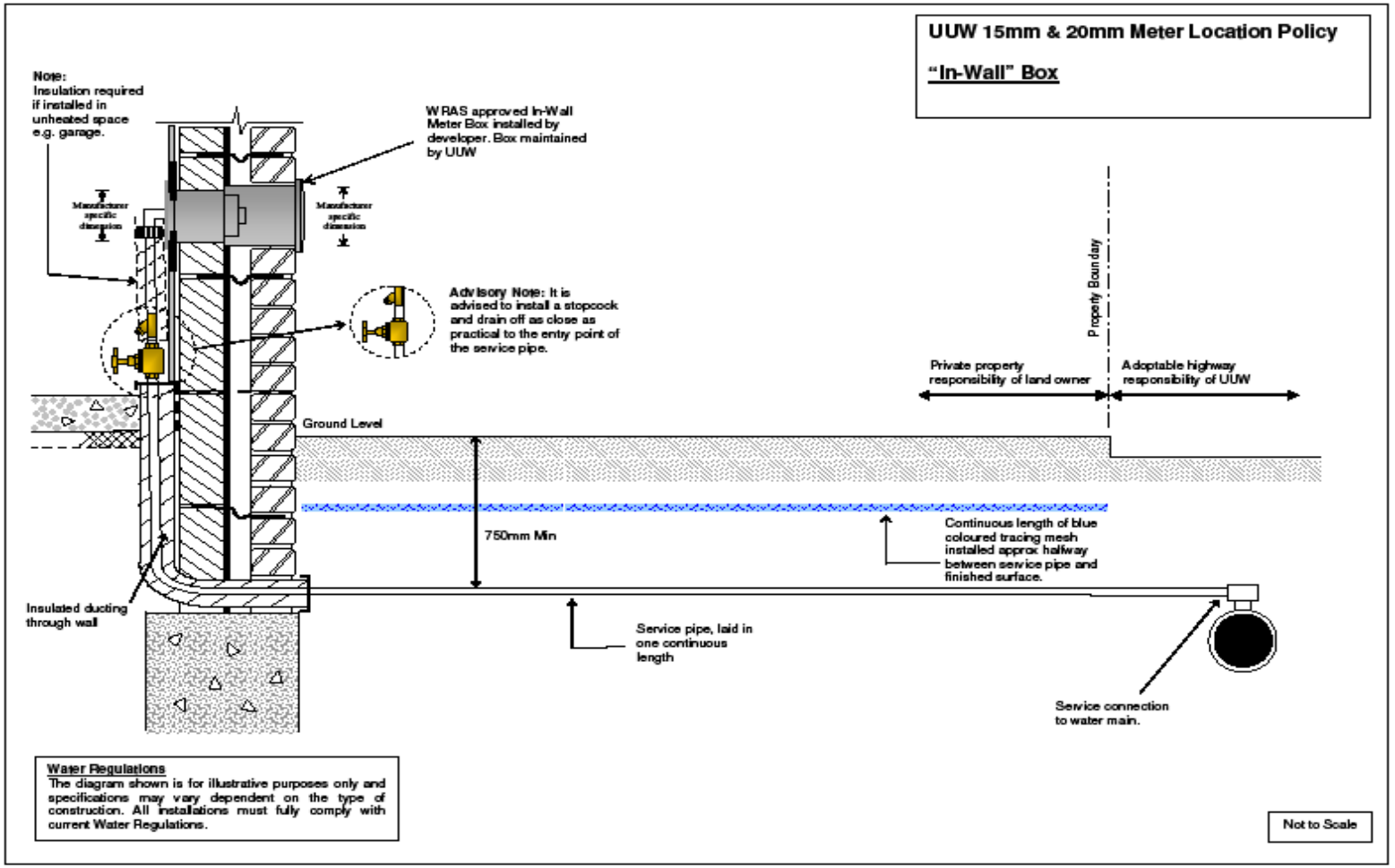
9.5.1 Internal meter installation



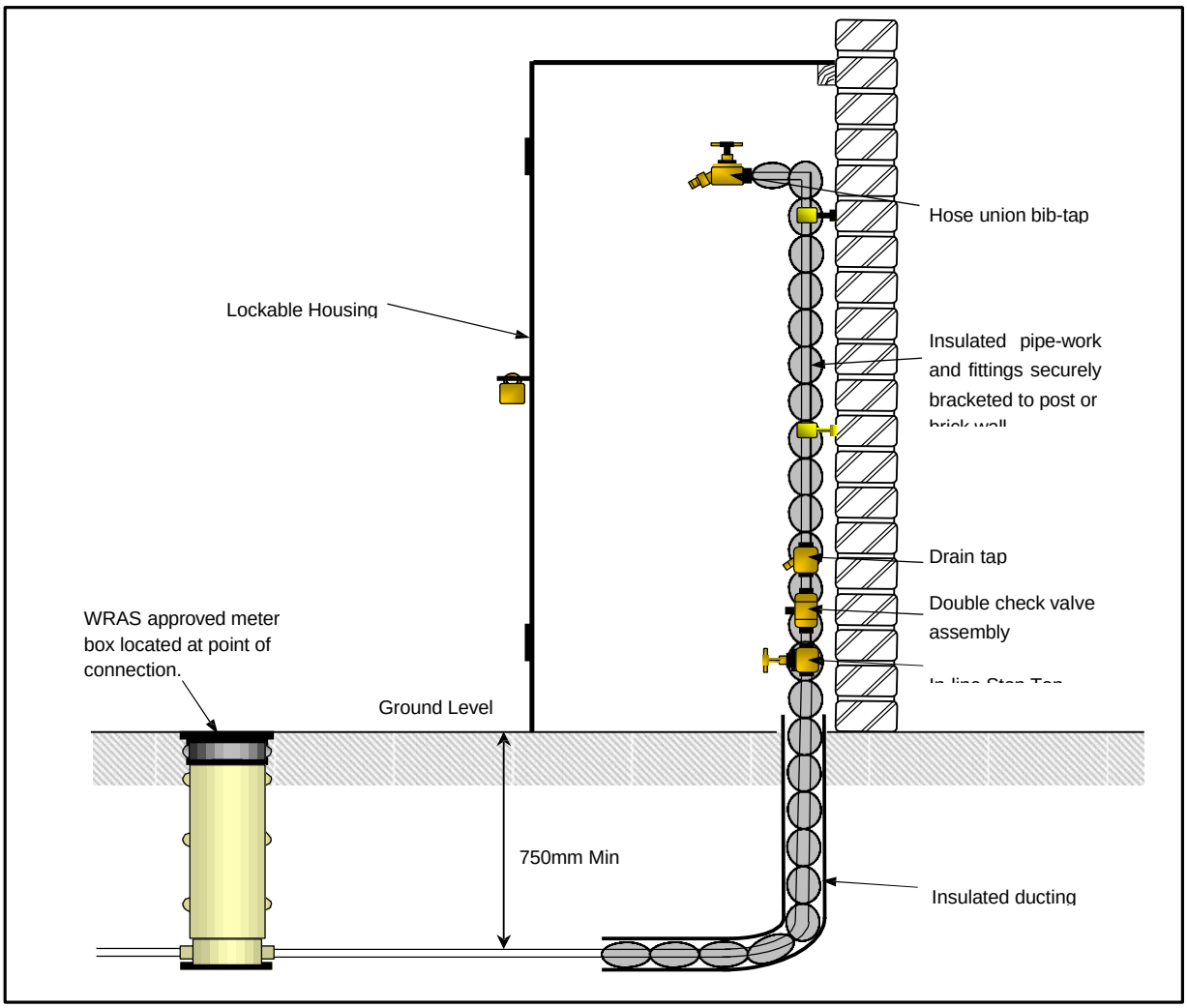
9.5.2 **Wall mounted box installation**



9.5.3 In wall box arrangement



9.5.4 **Temporary supply installation**

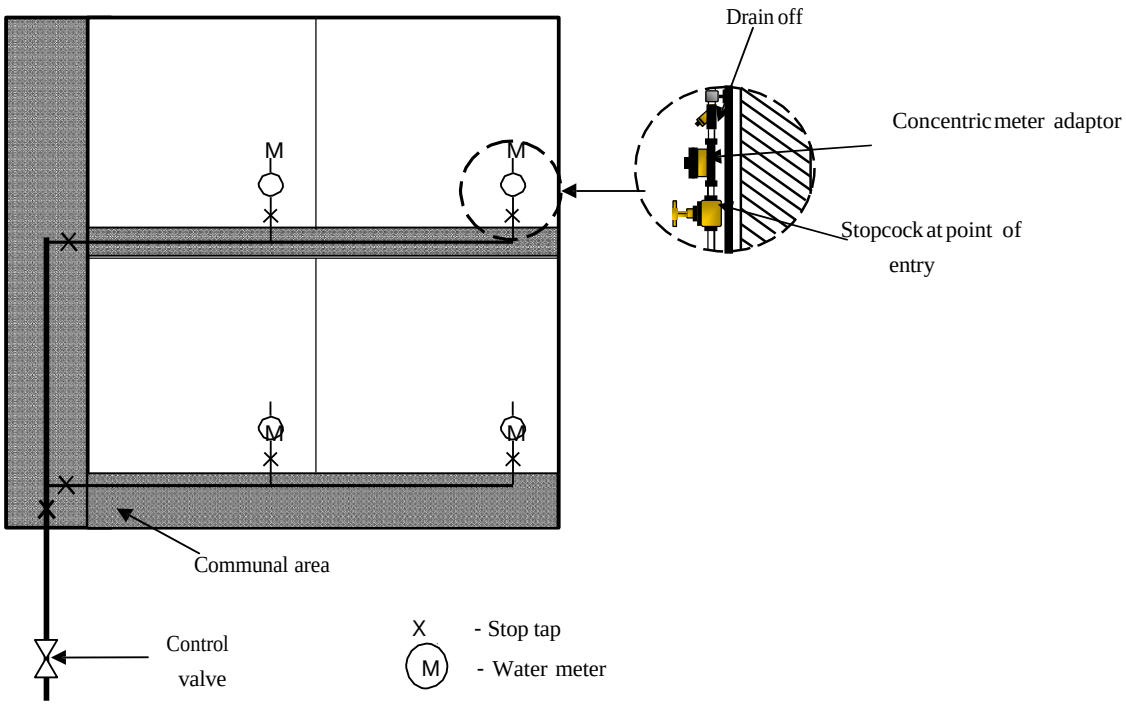


9.6 Services to multi occupancy premises

Premises that consist of a number of separate occupancy units, which may be domestic, commercial or industrial, can be metered using a common billing arrangement or individually with meters being provided for each occupancy unit. Additionally, there may be a need to fit separate meters to record water consumption for communal facilities such as communal hot water or laundry facilities. Where meters are installed in a communal area, each meter should be clearly identified using a tag with permanent lettering, so that customers may easily identify which meter serves their property. Where meters are located in a secure area, customers should be provided with access both for meter reading and to enable the water to their premises to be individually controlled. Meters should not be located in any area such as a plant room or similar that could present access difficulties or other safety related issues.

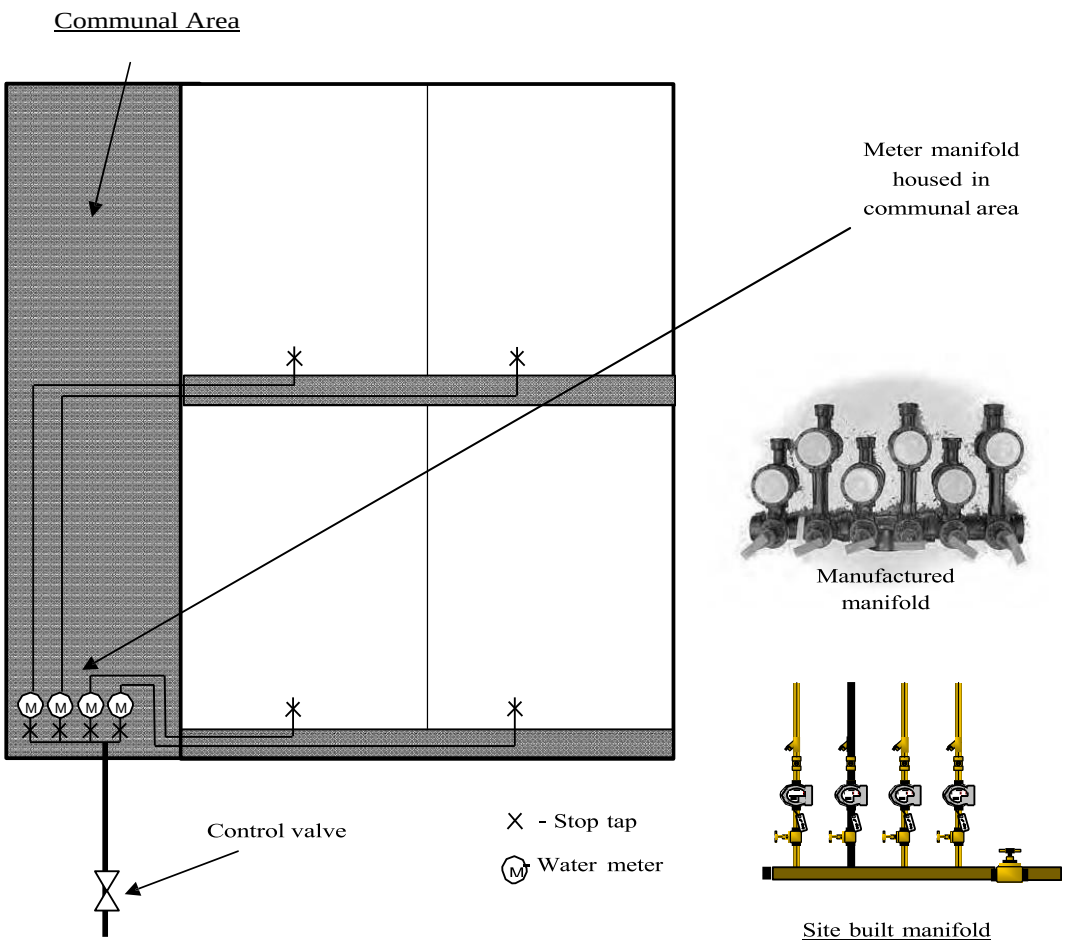
It is usually acceptable for domestic and commercial units to be served via a single shared supply within a multi occupancy premise.

9.6.1 Individual internal metering using a large diameter riser

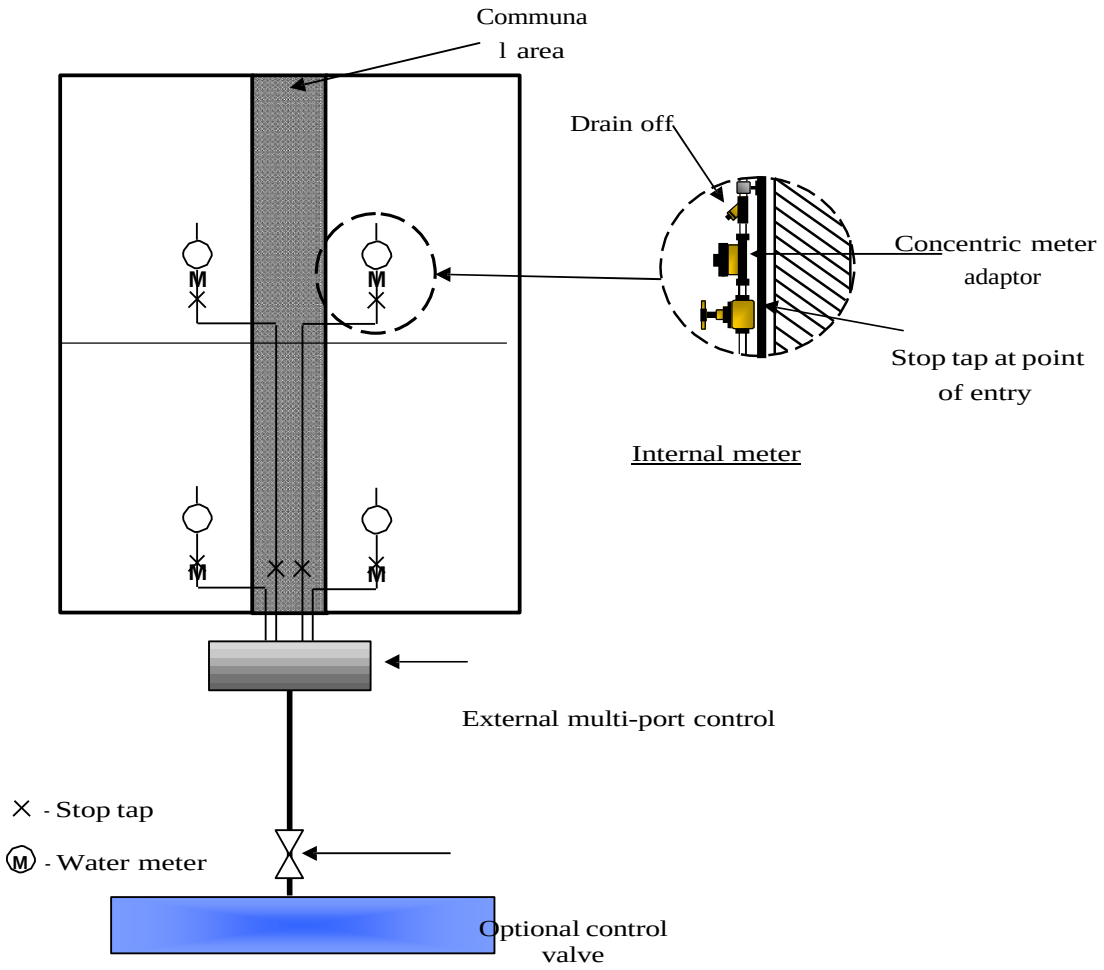


Meters located in each individual unit with large diameter connections to a rising main

9.6.2 Individual meters using a manifold meter arrangement



9.6.3 Individual internal meters and services with external multiport control



Communal premises with internal meter arrangement

9.7 Communal billing agreement

A communal billing agreement, or Bulk metering arrangement as it often referred to, uses a meter that measures the whole consumption of multi-occupancy premises, is available under certain circumstances. It is a requirement that a legal agreement between UUW and the developer is in place during construction, which is subsequently transferred on building completion to the premise owner. The owner of the premise will then be liable to UUW for all water consumed together and other service related charges. To cater for the bulk metering arrangement being discontinued, consideration should be given to ensuring that service pipe work is constructed so that billing to individual units is possible.

It is recognised good practice to install a separate service pipe from a manifold arrangement to each occupancy unit. This provides benefits in controllability of leakage, management of water quality, metering of individual units if the bulk agreement is cancelled and control of water supplies to empty occupancy units.

Designs using other distribution designs are not precluded, however, any alternative arrangements must be subject to a risk assessment as part of UUW's obligation under the Water Supply (Water Fittings) Regulations, to ensure that water quality and leakage control will be maintained under all possible operating circumstances.

A bulk metering arrangement will not be made available where occupancy units within the premises are being offered for sale at the time that the first connection is made.

10 Metering

10.1 Metering standard service connections

UUW policy is to install a remote reading facility, known as Automated Meter Reading (AMR) to all new 15mm or 20mm meters fitted to standard service connections. The various locations and individual requirements for standard service arrangements are set out in Section 9 (Requirements for service pipes) of this document.

10.1.1 Meter carrier arrangements

It is the customer's responsibility to install a meter carrier fully in accordance with UUW's specification for all new standard service connections. During the design process, the location and accessibility of the meter must be clearly defined such that the meter remains accessible for operational and maintenance purposes.

10.1.2 Internally located meters.

Where a meter is to be installed inside the premises the meter carrier should be located immediately after the controlling stop tap and immediately before the drain valve. The meter may be oriented in any direction, but should be positioned such that the recording dial can be read directly and with sufficient space to permit a meter change. Consideration should also be given to how possible changes to the immediate surroundings of the meter will impact on future maintainability. A stop tap located within an underground meter chamber should be positioned externally close to where the service pipe enters the building.

10.1.3 Externally located meters for standard connections.

Meters may be located within an "in wall box" or a "wall mounted box", as set out in Section 9 of this document. When either of these options is chosen, a risk assessment should be carried out with regard to any external influences that may impact on the meter enclosure. Frost protection is an integral feature of any externally located meter box, and where there is any possibility of the enclosure being damaged by external influences then relocation or additional mechanical protection should be considered.

It is essential that the meter box is installed fully in accordance with the manufacturer's requirements and that the installation is fully re-validated at the time the service connection is made. This re validation is particularly important as there can often be a considerable period of time between installation of the meter box and its connection to the water supply during which the integrity of the box and insulation may have been affected. Under no circumstances should any box, wall-mounted or in-wall be connected to the water network unless it has been installed fully in accordance with the manufacturer's requirements.

10.2 Metering non-standard connections.

Service connections greater than 25mm are classed as non-standard connections, these connections may be used to provide supply to a number of individually metered premises or may be used to supply single premises and fitted with a bulk meter. The arrangements for metering and their locations are likely to be design specific and dependant on the construction of the building, the layout of the pipe work and the availability of sufficient space to facilitate the meter installation.

11 Fire Fighting

Section 57 of the Water Industry Act 1991 provides that undertakers have a duty to provide water free of charge for fire fighting, including water used for testing and training purposes.

UUW has no duty to provide infrastructure specific to fire fighting, i.e. hydrants or additional mains capacity, which would be rechargeable to the requisitioner. Hydrants are ordinarily requisitioned by the Fire Service, but not mains capacity.

The mains network is designed by UUW to meet the normal [non-fire] requirements of our customers.

11.1 Fire Hydrants

For more information see National Guidance Document on the Provision of Water for Fire Fighting, Third edition January 2007. This third edition of the National document has been produced jointly by representatives of the Water Industry, the Fire and Rescue Service with the encouragement of the Department for Environment, Food and Rural Affairs, The Welsh Assembly Government and the Department for Communities and Local Government. It demonstrates commitment by all Water Companies and the Fire and Rescue Service to improve working relationships and secure co-operation in meeting the challenges facing both parties UK.

11.2 Statutory Duty

The ideal flows, which the Fire Service would like from hydrants, are given in the "National Guidance Document on the Provision of Water for Fire Fighting" - Water UK, January 2007. The actual flow available from hydrants will be less than this in many cases.
The Water Industry Act does not provide for Fire Services to requisition hydrants on Trunk Mains, but UUW has a policy to cover such requests. Typically the Fire Service will identify a particular fire risk adjacent a trunk main and a valve-controlled hydrant will be agreed where possible.
Water Undertakers are required to allow any person to take water for fire fighting, from any pipe to which a hydrant is fixed.

Hydrants are fitted to water mains at the request of the Fire Brigades. They are installed, maintained, and replaced at the Fire and Rescue Services expense.

Legislation does not specify the pressure and flow which must be made available at a hydrant..

11.3 Hydrants on large diameter mains

S58(2)(b) of the Water Industry Act 1991 says that we need not fix fire hydrants on trunk mains. This proviso to our legal responsibilities is long-standing. However, we have been asked by the Fire Services to allow, in certain circumstances, hydrants to be fixed to large diameter mains.
There are advantages to both parties in allowing this, providing certain criteria are met. The Fire Service may enjoy a better supply to fight certain fires – e.g. in industrial estates, and we may suffer less discolouration problems if a large volume of firefighting water is drawn from a trunk main rather than from the local distribution network.
The following criteria should form part of any decision relating to the installation of a fire hydrant on a trunk main.

1. Any request to install a fire hydrant on a large diameter main will be treated on its own merits.
2. Fire hydrants will not be allowed on strategic supply mains which are, or can be, used to transfer bulk water supplies between areas.
3. Fire hydrants will not be allowed on large diameter mains where it is anticipated that loss of supply and/or pressure or discolouration will occur if used. As a guide, assuming a flow rate of 1250 litres per minute, the operation of the hydrant should not cause the flow in the main to exceed 1metre per second, or drop the pressure by greater than 10m.
4. Fire hydrants may be allowed on large diameter mains, which are a deemed to be a normal distribution main within a district meter area. UUW local operations staff will determine whether or not a main can be used for fire fighting purposes, in liaison with the Asset Performance Manager, as required. Operations staff will consider the practicality of installing a hydrant on such a main i.e. whether or not the installation can take place under pressure or without a shut off affecting large numbers of properties.
5. The hydrant will be installed with a controlling gate valve on the hydrant tee in every case.
6. Where a request is granted then the installation will be re-charged at actual cost.
7. UUW reserves the right to remove a fire hydrant from a trunk main after installation if problems are subsequently caused on the network.

11.4 Requests for water for fire fighting

Any requirement for a fire hydrant is a Fire and Rescue Service decision; all new developments should be notified to the relevant Fire and Rescue Service during the design stage, such that any fire hydrants can be in place prior to new mains being connected and premises being occupied. The Fire and Rescue Service should respond to any enquiry from a water company or other water infrastructure designer within 42 calendar days of the enquiry being made.
Where new mains are being installed as part of a requisition, the general process for applications will be as follows;

11.4.1 The finalised water mains design should be forwarded to the FRS office within the area that the new development is sited.

11.4.2 The Fire and Rescue Service has 42 calendar days in which to respond and to provide details of any hydrants that may be required.

11.4.3 Fire and Rescue Service will raise an order to UUW for each fire hydrant to be requested.

Where new mains on a new development site are being self laid, the Fire and Rescue Service will deal directly with the self lay organisation (SLO). The process is the same as that which applies to a requisitioned main:

11.4.4 The SLO will provide a copy of the approved design to the Fire and Rescue Service.

11.4.5 The Fire and Rescue Service will then have 42 days to respond directly to the SLO, who will then amend the approved design accordingly, and provide a copy to UUW

11.4.6 All financial transactions relating to the provision and installation of the hydrant will be between the SLO and the Fire and Rescue Service.

11.5 Fire sprinkler systems

Fire sprinkler systems should be designed, installed, maintained and used in accordance with all current regulatory and nationally recognised standards or guidelines BS9251.

Where properties have a fire sprinkler system installed, United Utilities Water cannot guarantee pressures and flows for the operation of the fire sprinkler system. All sprinkler system designers and installers must contact United Utilities Water prior to installation, in line with the Regulations, to confirm the distribution main from which the fire sprinkler system is to be connected to is able to provide the necessary volume of water and flows. A designer may choose a direct mains fed system which includes a priority demand valve and should consider that United Utilities does not provide a guaranteed volume of for water for fire-fighting purposes.In some circumstances It may be more appropriate to install a boosted system which relies on a stored volume of water in order to protect against flow and pressure changes in the local water network. All storage systems must comply with water supply regulations 1999 and have an appropriate backflow prevention device at the inlet.

Although water for firefighting is provided free of charge, in many circumstances the capital cost of the installation will be less if the fire and domestic supplies are provided from the same mains connection. It should be so arranged that the normal supply can be isolated from outside the premises, whilst leaving the firefighting supply intact.

11.6.1 Commercial Sprinklers

Although water for fire fighting is provided free of charge, in many circumstances the capital cost of the installation will be less if the fire and domestic supplies are provided from the same mains connection. It should be so arranged that the normal supply can be isolated from outside the premises, whilst leaving the fire fighting supply intact.
Depending on the size of supply pipe, and the number of sprinklers, it may be acceptable to supply the sprinklers (or hose reels) directly i.e. without a tank. The developer should satisfy himself of the adequacy of the pipe work, and consider not least the hydraulic restriction of the incoming water meter.

11.6.2 Fire Mains

In the event that the developer requires underground hydrants within the site, these will normally require a dedicated “fire main” (an additional service pipe exclusively for firefighting) from a separate mains connection, with backflow protection. This is also the case for commercial sites where multiple customers are fed through a bulk-metered private network.
The flows required from hydrants will usually be very restricted by any meter, and the meter would be liable to damage, possibly causing further blockage. Fire Valves on meter by-passes are not acceptable.

11.6.3 High Rise Residential

For high rise buildings UUW has no specific requirement for a separate fire main riser. Water meters will normally tolerate flows through sprinklers in individual flats, and this arrangement is acceptable.
Designers should satisfy themselves that there is sufficient water available at the Point of Delivery (usually the highway boundary) and that the pipe work is hydraulically adequate for the required flow.

Where residential premises are fitted with sprinklers supplied from a dedicated tank, it is acceptable for that tank to be replenished from the domestic supply. There are particular Fittings Regulations applicable where fire fighting water is drawn from the domestic supply.
Pipe work sized for an exceptional fire flow is likely to be oversized for normal use, leading to stagnation. Designers should bear in mind that UUW does not normally know if premises are fitted with fire protection systems, and, except where there is dedicated storage, any interruption to the supply could leave the premises unprotected. This could be due to UUW planned or unplanned work, or if the supply to the premises is shut-off longer term for any reason e.g. when vacant. In the case of flats, whether high or low rise, regulations require an external stop tap is available so that the individual unit can be isolated from a common access area in an emergency, typically for frost damage when occupancy units are empty.

12 Self lay of mains and services.

S51A of the Water Industry Act 1991 permits an undertaker to make an agreement with a person wishing to lay a water main or to connect service pipes and to subsequently adopt the main and service pipes. The requirements in terms of design and specification for self laid mains and service connections in UUW's licensed area are the same as those set out for requisitioned mains and services, and this document applies equally to both requisitioned and self laid mains and services.

The processes that apply to self lay are set out in the Self Lay Code of Practice and in UUW's addendum to that code.

When a quotation is provided, UUW will also give an indication of the self lay asset value payable, based upon the requisition design. This value is subject to confirmation when a self lay agreement is completed.

In self lay the asset payment, is what the water company must pay to the person constructing the water main, public sewer or other related infrastructure. In calculating the charges for requisitions or a payment for a self lay scheme, the water company will calculate these as if it had borrowed the money (a hypothetical loan) to enable it to carry out the work. This means that the charge or payment includes both the capital costs of the work, and interest.

For self lay, the water company may sometimes be required to provide certain infrastructure as part of the new water supply, which the person constructing the water main, public sewer or infrastructure cannot provide. Where the water company incurs a cost as a result of carrying out this work, it can ask for an amount to be deposited with it as security before starting the work. The company cannot ask for an amount greater than the estimated total cost of the works.

It is also possible for services to be self laid and connected to a requisitioned main. In such a case the developer will pay the self lay company directly for the service connection work, other connection related charges, such as infrastructure charges will be paid to the water company either directly, or indirectly through the self lay company.

Further information regarding self lay is available on United Utilities website.

13 Abandonment and diversion of existing mains.

S185 of the Water Industry Act 1991 provides for a water company to alter or remove any pipe or other apparatus if requested to do so, by any person who has an interest in land that is being improved, on the basis that the land cannot be improved without the required alteration or removal. This requirement does not apply to any pipe or equipment that is located in a street.

The following provision and examples can be used to ascertain how the various combinations of new requisitioned mains, diverted mains and abandoned mains would be treated.

UUW will require advance payment of the estimated reasonable cost of diverting or abandoning any existing mains or other associated equipment. This applies to both self lay and requisition schemes

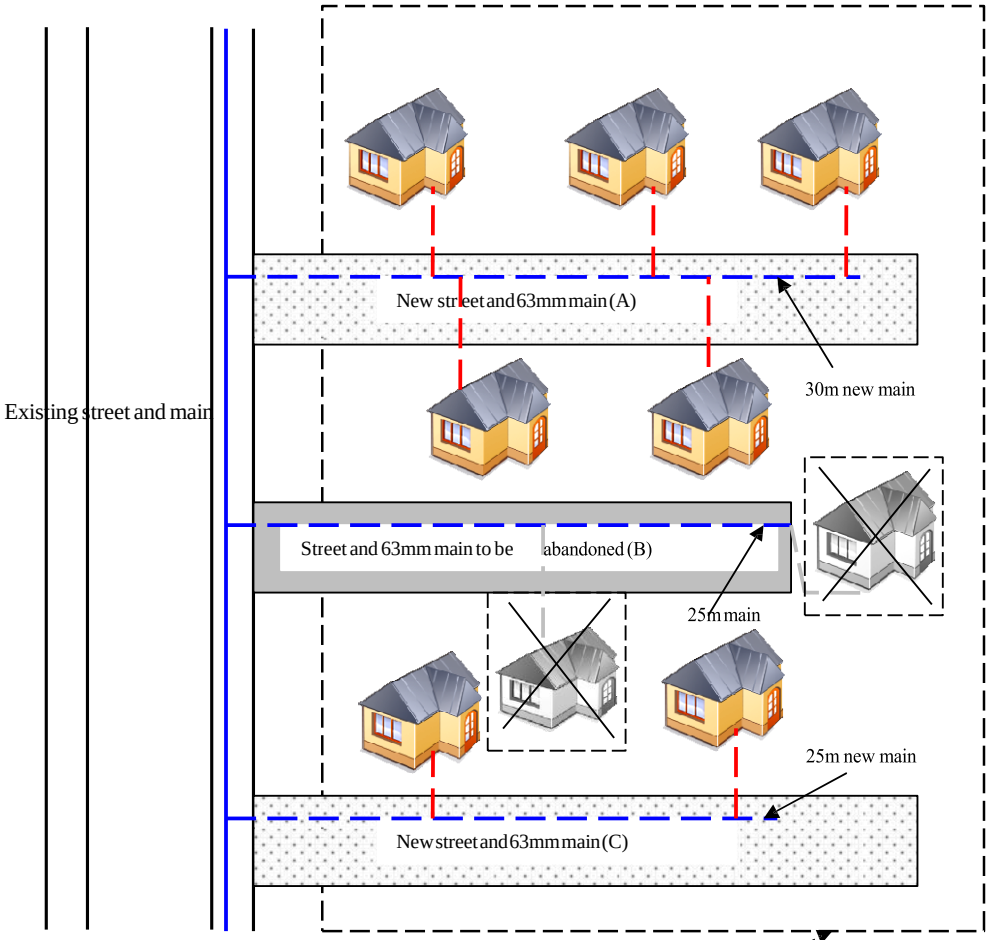
Important note:

If a new development is to take place on land where existing equipment is to be altered, it is important that this information is passed to UUW as early as possible. This will assist in avoiding the possibility of equipment being altered during a site clearance exercise and then being replaced in the same location when the site is subsequently redeveloped.

UUW will be pleased to assist in forward planning when a site is being redeveloped. This is particularly relevant in city centre re-developments where the capacity of existing mains may be reduced due to encrustation or by activities such as slip lining.

The following pages provide examples of how abandonment and diversions associated with redeveloped sites will be dealt with.

13.1 A development with both a new main and an abandoned main



Example 1 - Development with both a new main and an abandoned main

Requisitionable: In this situation **ALL** of the new mains i.e. 55m (A+C) can be requisitioned.

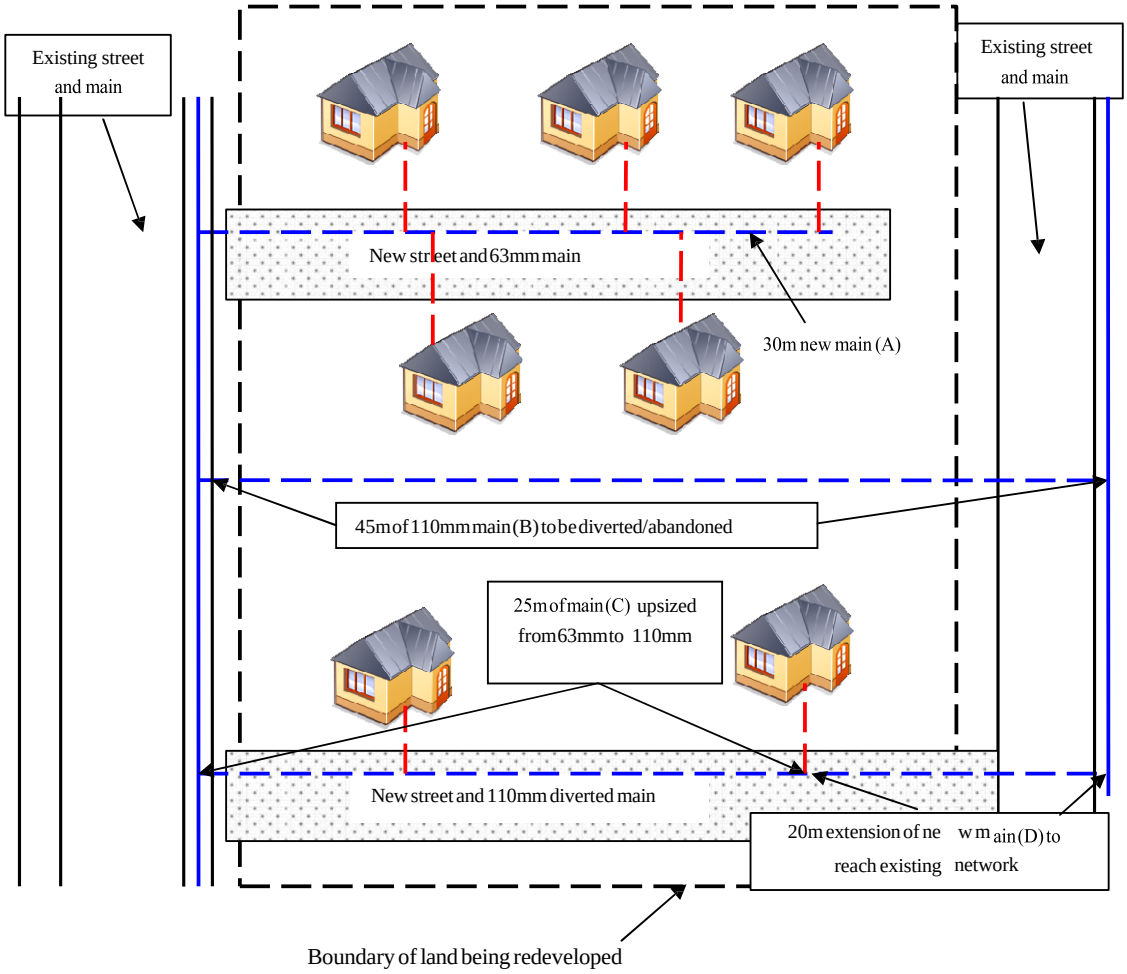
Abandoned Main: The developer would pay the reasonable cost of abandoning the existing 25m of 63mm main (B).

Allowable Income: The income from **ALL** 7 new premises is allowable against the cost of providing the requisitioned main.

Infrastructure charges: Provided that the new main is requisitioned no later than 5 years after any charges for domestic water in respect of the disconnected premises have been made, then 2 infrastructure credits would be allowable.

13.2 Example of a redeveloped site with a diverted/abandoned main

In this example, an existing 110mm main feeding an adjacent street is currently in place across the land being redeveloped. Two new streets are being created and new mains are to be installed in those streets to serve a total of 7 new premises. The diverted main is to be laid in one of the new streets and re-used to supply some of the new premises on the redeveloped site.



Diversion: The reasonable cost of diverting a main is usually borne by the developer. In this case, there is an overlap between the requisitioned main and the diverted main.

Requisitioned main: The two sections of requisitioned main, A and B, would normally be sized at 63mm. However, as section C (25m) is "shared" with the diverted main it is required to be upsized to 110mm.

Allowable Income: The income from all 7 new premises can be set against the cost of providing the requisitioned mains.

Calculation:

Requisitioned main	55m of 63mm main (A+C)
Main requiring diversion/abandonment	45m of 110mm main (B)
Upsized requisitioned main	25m of 63mm upsized to 110mm (C)
Extension of main to reach existing network	20m of 110mm main (D)

Requisition calculation is based on 55m (A+C) of 63mm main, allowable income is based on 7 new premises to be connected.

Diversion cost is based on abandoning 45m (B) of 110mm main, plus the cost of 25m (C) of upsize from 63mm to 110mm, plus the cost of 20m (D) of 110mm main.

14 Example layouts for new mains and services

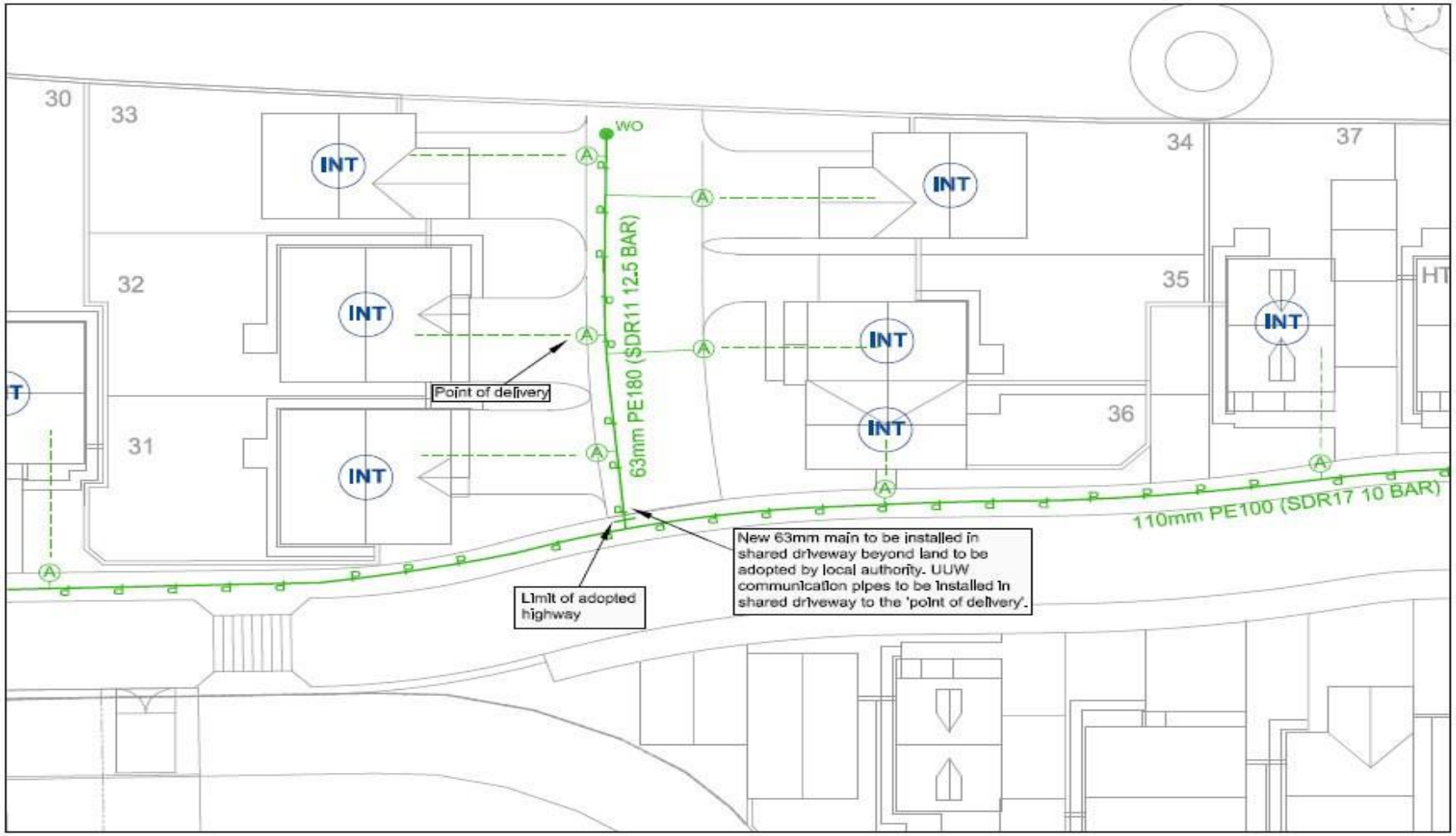
This section provides examples that demonstrate how this guidance would be applied to a design for a new development.

The general principles are,

- New mains should be laid in a street,
- New mains should be on the side of the street with the greatest number of service connections,
- Routes for new mains should be planned in conjunction with other utilities and laid in accordance with NJUG guidance,
- Service connections should be arranged so that they run perpendicular to the main that they are connected to,
- The total length of pipe installed (both mains and services) is minimised, this is particularly relevant in areas such as shared drives and courtyards.
- All equipment such as valves and stop taps should be installed so that access is generally available without any requirement for special arrangements such as traffic management notices etc.

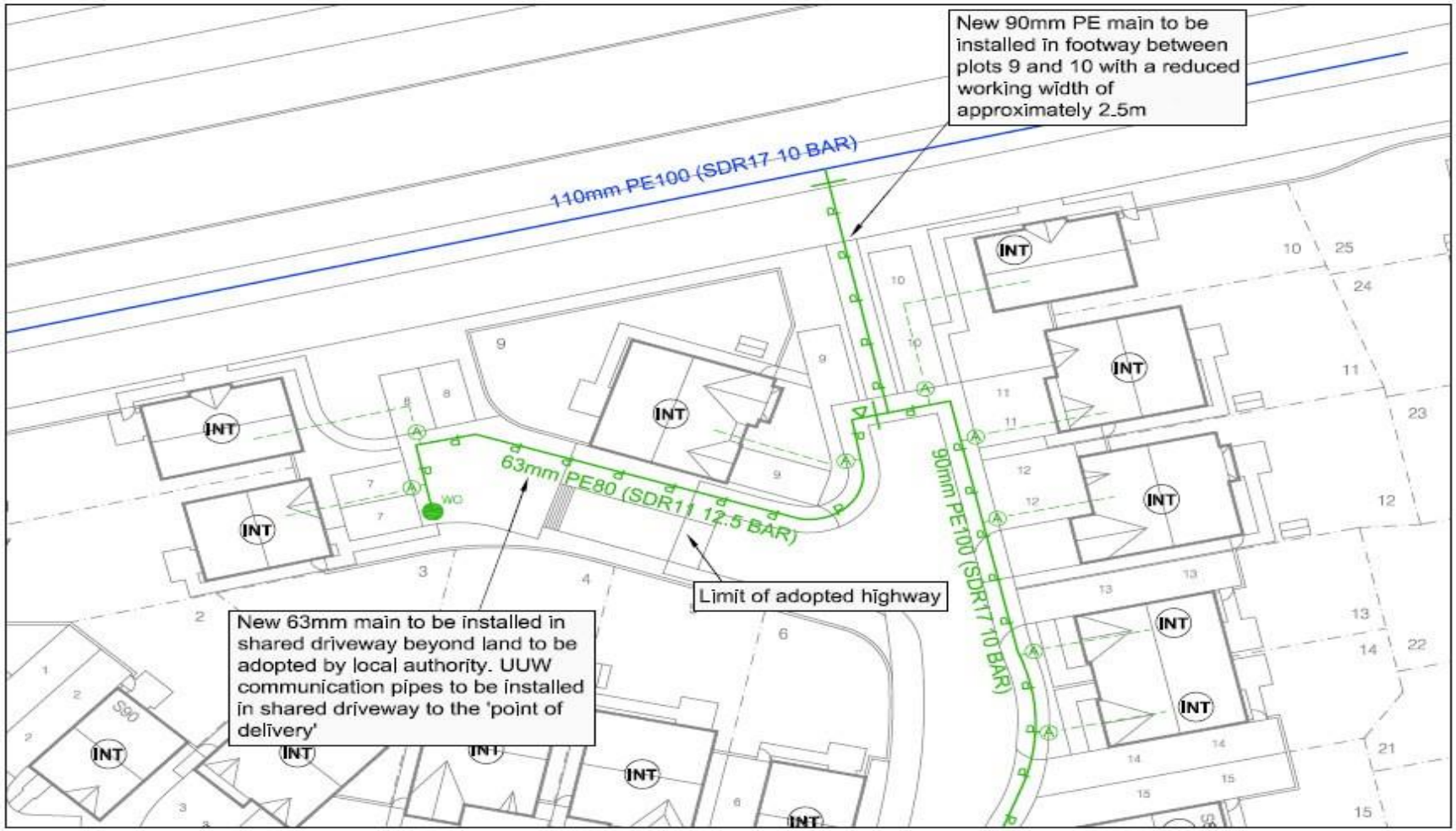
These examples are provided to assist in planning new developments; it should not be assumed that any final design will always be fully in accordance with these examples.

14.1 Example of new mains in a shared driveway



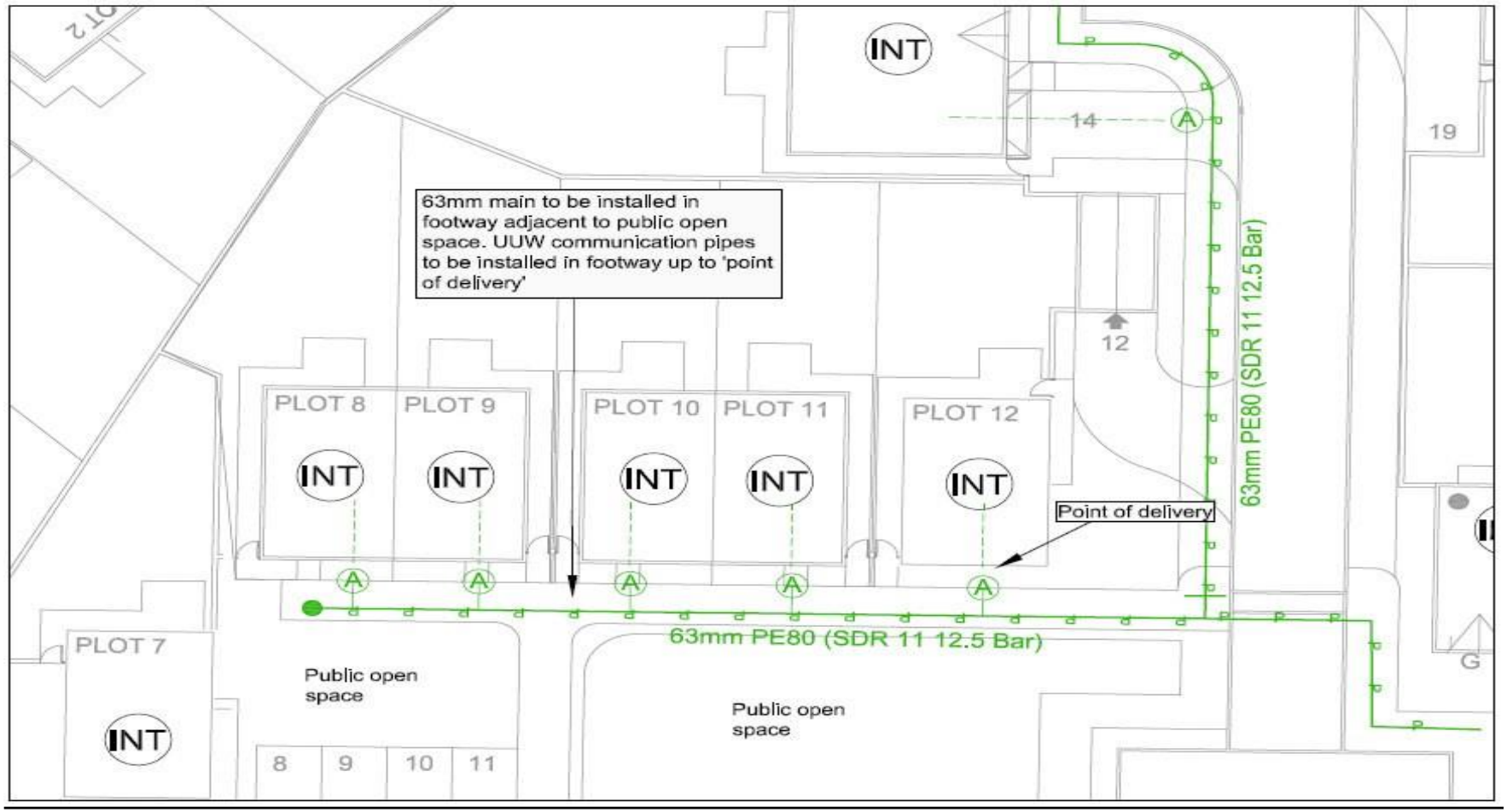
In the above example the new mains and communication pipes will be installed within the shared driveway. There is no requirement for an easement as the new main is installed in a street.

14.2 Example of new mains with reduced working area and a shared driveway



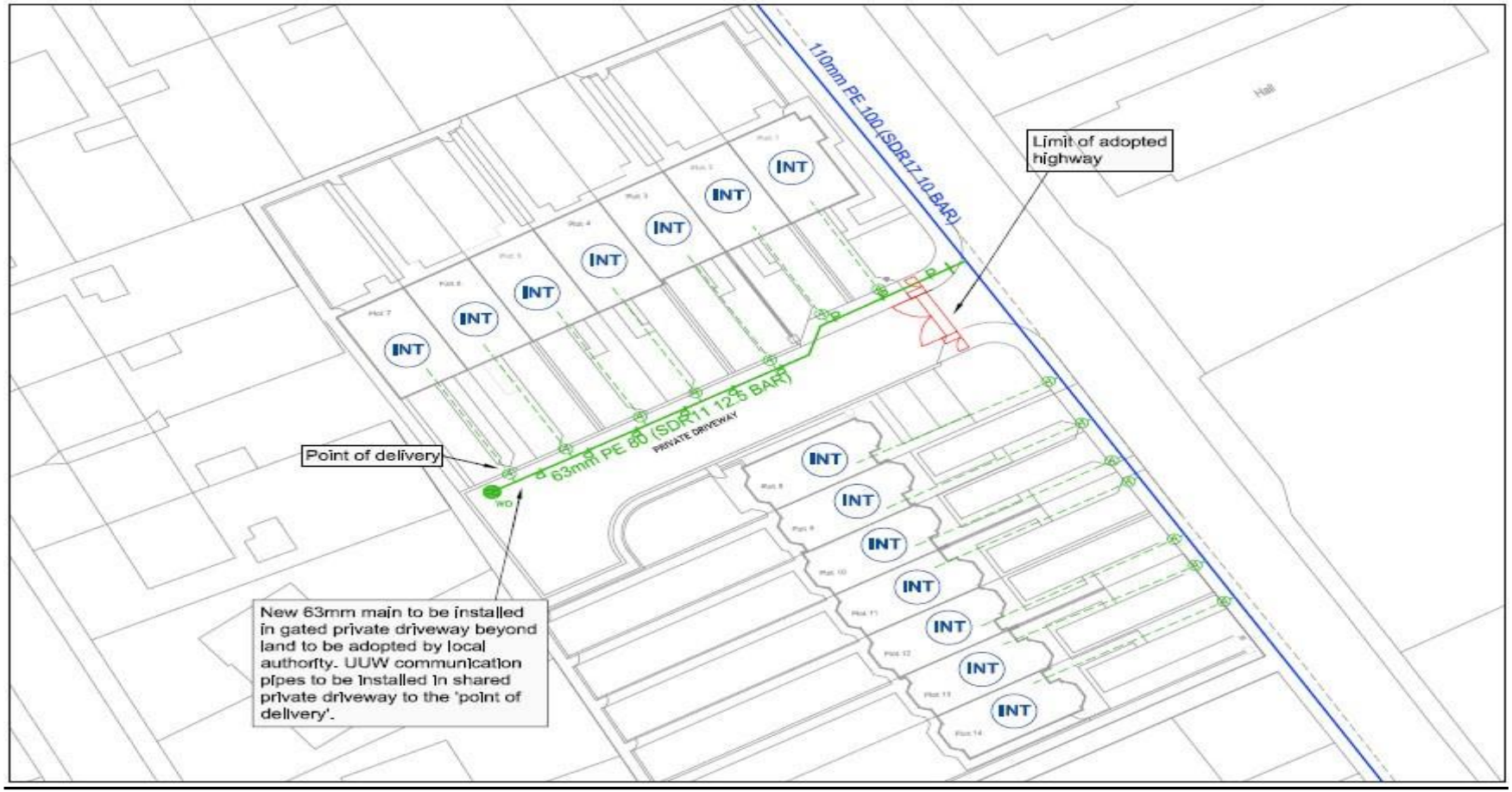
In the above example the new mains and communication pipes will be installed within the shared driveway to serve plots 7 and 8. There is no requirement for an easement as the new main is installed in a street. The new 90mm main is to be installed with a reduced work width of approximately 2.5m between plots 9 and 10; this is acceptable as there are no service connections or joints in the main.

14.3 Example of new mains installed in a footway adjacent to public open space



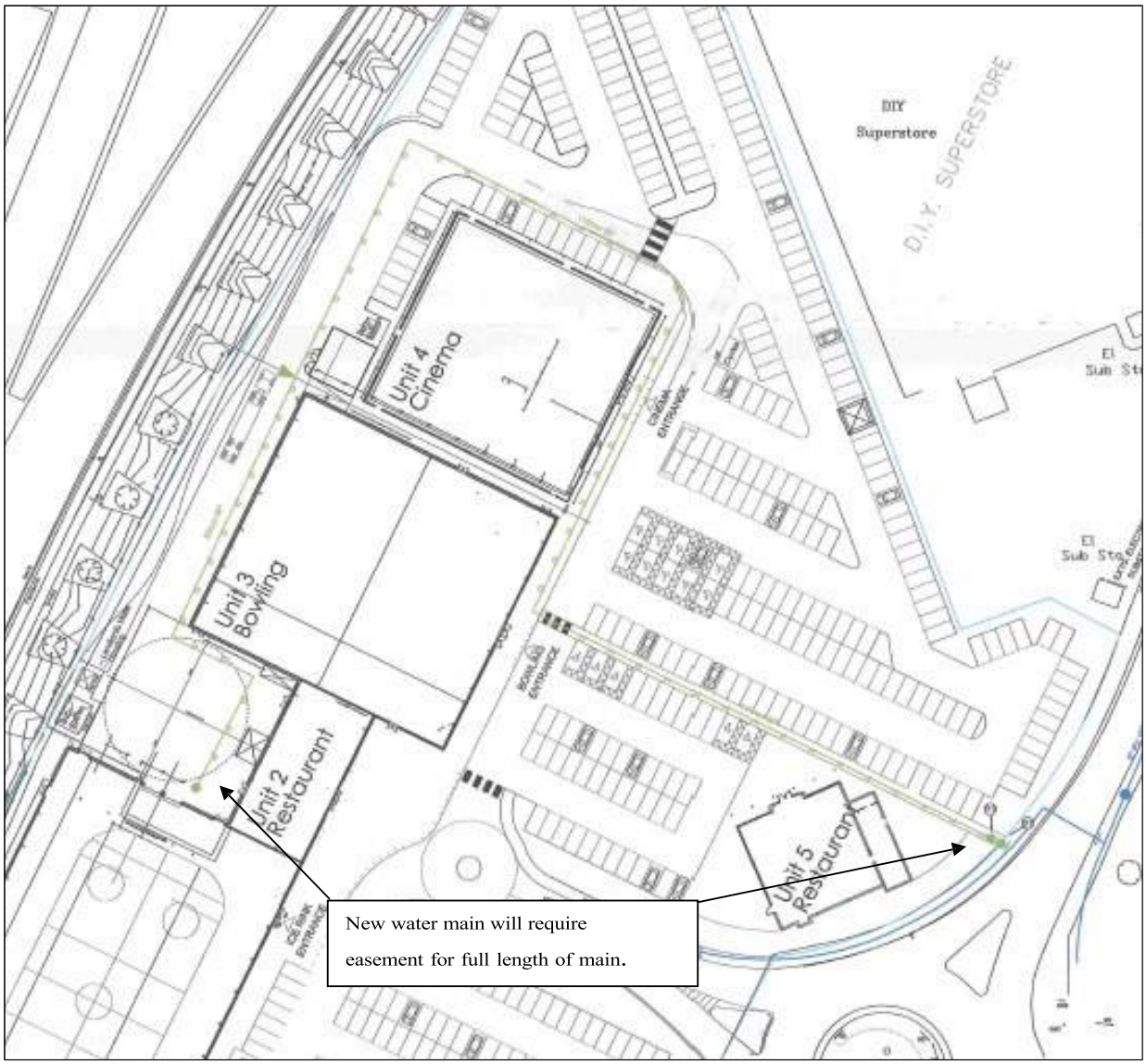
In the above example the new mains and communication pipes will be installed within the footway adjacent to the public open space. It does not matter whether the footway is adopted or a shared footway as the new main is installed in a street and there is no requirement for an easement.

14.4 Example of new mains to be installed in shared private driveway within a gated development



In the above example the new mains and communication pipes will be installed within the private driveway of a gated development. There is no requirement for an easement as the new main is installed in a street. A controlling valve is sited outside the gated area so the main/services can be isolated without delay if needed.

14.5 Example of new mains on a commercial development requiring an easement



In the above example the new main would require an easement to protect UUW's asset from any future changes to the site layout. The communication pipes would be installed up to the edge of the defined easement area to the point of delivery.

15 DEFINITIONS

Aqueduct
A potable pipe upstream of the O.M.S. meter, separately shown and individually named on the Regional Connectivity Diagram.
(For the purpose of DWI reporting these are called Large Diameter Trunk Mains LDTMs)
(OMS meters are the operational bulk-supply points, treatment works, aqueducts off-takes, transfers)

Trunk Mains
" A Water Main from a source of supply to a filter (WTW) or reservoir, or from one filter or reservoir to another, or for conveying water in bulk, whether wholly within UUW's area or not"
[compressed from WIA s.219(1)]
This definition includes what we call Aqueducts or what OFWAT refers to as Large Diameter Trunk Mains. For UU purposes: a Trunk Main is a potable pipe between the last OMS meter or DMZ boundary – typically a WTW or aqueduct off-take – and a District Meter.
The Water Industry Act does not entitle the Fire Brigades to requisition fire-hydrants on trunk mains, but it is UU policy that valve-controlled fire-hydrants may be installed in certain risk areas at the request of the Fire Service, and following consultation with the Network Services team. Service connections will not normally be provided from a trunk main.

Distribution Main
Any potable main within a District Meter Area.
These will normally have both fire hydrants and service connections.

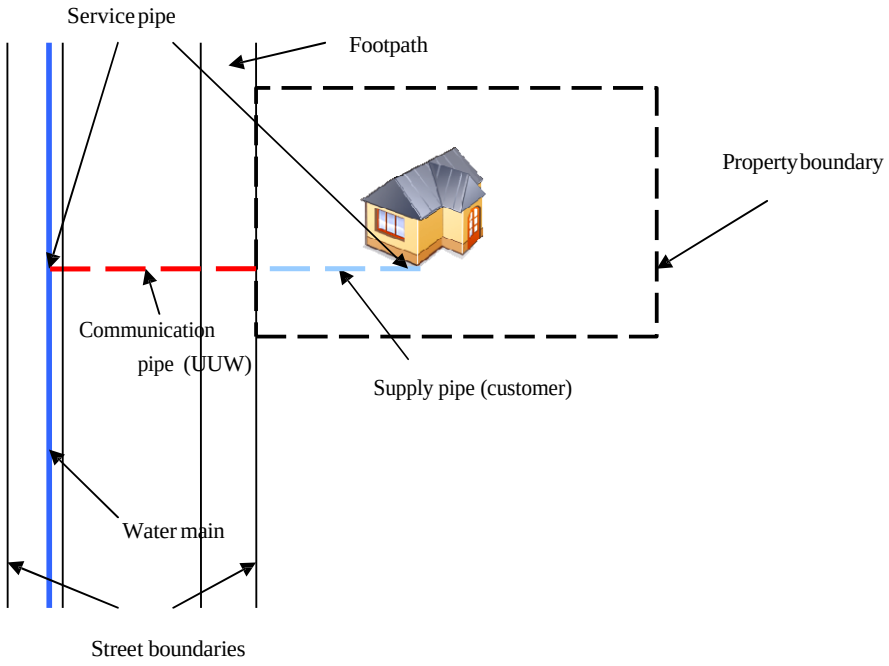
Non-potable mains
Any main of any size, which conveys raw or partially treated water, either between sources, or from source to treatment.

Strategic Main
This definition is required only for the purposes of DG3 (interruptions) reporting. A strategic main may be any of the above.
Strictly, a strategic main conveys water in bulk to a centre of population which has no other supply which can fully meet normal demand.
For simplicity and consistency, UU considers strategic mains to be those shown on the DMZ connectivity diagrams.

Service Pipes
The Service Pipe is that part of the water supply system which conveys water from the distribution main to the customer's property, and is normally at mains pressure.
It consists of 2 elements*:*

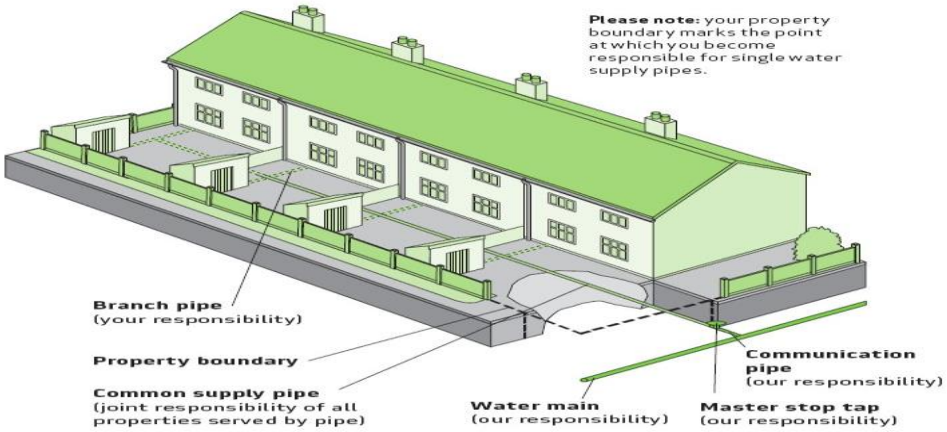
- **Communication Pipe**
- **Supply pipe**

The **Communication Pipe** extends from the water main to the property boundary (the boundary of the premises with the part of the street where the main is laid), and includes the ferrule connection,
The **Supply Pipe is** from the boundary (i.e. the "point of delivery") to the mandatory internal stop tap, and normally from there to the sink tap and to the valve at the inlet to the cold water storage cistern. Only so much of the internal plumbing as is at mains pressure is part of the service pipe. (Note that the Water Quality Regulations apply at the first drinking water tap). Other internal plumbing, if not part of the supply pipe will normally comprise distributing pipes and parts of water or space heating systems.



Service pipe, communication pipe and supply pipe

A Common Supply Pipe (CSP) serves more than one property, generally terraced houses, through a small diameter pipe, usually of lead. A CSP characteristically runs through the back-yards, or under floors, with uncontrolled branches to each house.
Properties served by CSPs often suffer poor pressure/flow. Repair & maintenance of the CSP is the joint responsibility of the householders*. The individual property is responsible for the branch pipe.
(*Current UU policy is to repair a CSP once in 12 months, and to provide up to 50m of new distribution main to facilitate CSP replacement).



Shared Service Pipe
A single pipe supplying a building in multiple occupancy is not a Common Supply Pipe in the traditional sense and does not qualify for free repair or replacement schemes.

Meter Boxes
Underground meter box -commonly knows as “boundary boxes”, but not necessarily located at the boundary.

In Wall meter box built into the wall of the building.
Wall mounted meter box attached to the wall externally.
Note: The position of the meter does not represent the change of ownership in the service pipe. That point is normally at the street boundary.

Potable Water
The Water Supply (Water Quality) Regulations 2000 refer to **Wholesomeness**, which is described as…
(1) Water supplied
(a) for such domestic purposes as consist in or include, cooking, drinking, food preparation or washing, or
(b) to premises in which food is produced.
(2) The requirements of this are met if the water does not contain – (a) any micro-organism or parasite, or
(b) any substance (other than a parameter listed in Schedule 1- named microbiological and chemical parameters)
at a concentration which would constitute a potential danger to human health. The point at which the requirements are to be met is:
(a) in the case of water supplied from a tanker, the point at which the water emerges from the tanker, or
(b) in any other case, the consumers first tap.

Highway
Generally, a carriageway or other way includes any footway or verge, over which there is a public right of way (i.e. thoroughfare). The term highway is of no practical significance for the provision of water supplies.

Street
The whole or part of any highway, road, lane, footway, alley or passage, square or courtyard, whether or not a thoroughfare. Where a street passes over a bridge or through a tunnel, these are included as part of the street.
Note:
* Water mains may be laid in any street,
* It is not necessary for the street to be (1) publicly maintainable, (2) constructed to any particular standard e.g. including footways, or (3) a right of way.
* A Street is a “length” of land, as distinct from an “area” of land. Thus in a retail park for example, the mains would normally be placed *in the road part, and we would not consider the parking areas as part of the Street.*
* The transition from communication pipe to supply pipe at the edge of the street is derived from the definitions in the Act.

16 COMMON ABBREVIATIONS

PVCu.
Unplasticised pvc, developed in the mid '50's but not extensively used until late '60's, it is no longer used by UU following failures of pipelines installed in 1970's and 80's. Generally, until approx 1992, it was imperial sized, grey coloured, and called uPVC. Then UU changed to blue PVCu which is a much tougher material, and metric sized.

PVCa
PVC alloy or modified PVC. Previously called mPVC. Much improved fracture toughness over PVCu. Early problems with joints now overcome by new Forsheda seals. PVCa is manufactured only by Hepworth, (marketed as Hep30) and Wavin (Aquaforce)

PVCo
Molecularly Oriented PVC. Previously called moPVC. Thin walled & very tough. Made small and then stretched to a larger dia. Only from Wavin ("Apollo") & Uponor ("Mondial"). Only in 12.5 bar, and only as straight pipes.

NGS
Next Generation Stabiliser. From 25 Dec 2003 Lead-based stabilisers are prohibited for all types of PVC for potable use. Non-Pb pipes are marked NGS.

PE80 Medium density polyethylene (MDPE) which has a minimum 50 year strength of 8Mpa (80kgf/cm^2). Enables operation at 12.5 bar @ SDR11 or 8bar @ SDR17

PE100
High Performance Polyethylene (HPPE) which has a minimum 50 year strength of 10Mpa (100kgf/cm^2). Enables operation at 16 bar @ SDR11 or 10 bar @ SDR 17

SDR
Standard Dimension Ratio. (PE pipes only) Nominal OD / minimum wall thickness
Preferred SDRs 11, 17, 26 (SDR 17.6 is a gas spec) Add NH comments here

LDPE & HDPE
Low density (BS 1972) and high density (BS3284) Polyethylenes. A.k.a black poly or trade name "Alkathene". Popular 1950 – 1970 but no longer used.

CI
Cast Iron
1860-1930 vertically cast Grey Iron
1930-1950 centrifugally sand-spun Grey Iron
1930-1971 centrifugally metal-spun Grey Iron
1963>centrifugally metal-spun Ductile Iron

DI
Ductile Iron

SI
Spun iron. Pipe made in a horizontally spinning mould. Applies to both Cast & Ductile Iron.

GI
Galvanised Iron (strictly galvanised steel – used for service pipes, mainly in Cumbria)

AC
Asbestos Cement (manufacture ceased 1986)

GRP
Glass Reinforced Plastic

UTI
Up to and including [diameter] e.g. all pipes up to and including 300mm

NB
nominal bore

ID
internal diameter

OD
external or outside diameter

DN
An alpha-numeric designation of size for components of a pipework system.
Comprises the letters DN followed by a dimensionless whole number indirectly related to the size , in mm, of the bore or o.d. The DN series is DN 10, 15, 20, 25, 32, 40, 50, 60, 65, 80, 100, 125, 150, 200, …….4000

Pb
Lead. Mostly service pipes 3/8", ½", 3.4" internal diameter. Not used since early 1970's

Cu
Copper

17 Other guidance documents

UUW Documents referenced in this guidance document:
UUW Distribution Manual – Definitions (20268)
UUW Distribution Manual – Statutory Requirements (20278) UUW
Distribution Manual – Design Principles General (20288) UUW
Distribution Manual – Design Principles Mains (20298)
UUW Distribution Manual – Design Principles Service Pipes (20308) UUW
Distribution Manual – Design Principles Pressure (20318)
UUW Distribution Manual – Design Principles Provision for Fire Fighting (20328) UUW
Distribution Manual – Testing & Commissioning (20338)
UUW Distribution Manual – Pipe Materials (20348)
UUW Distribution Manual – Service Connections to Mains (20268) UUW
Procedure for entering onto private land (Ref: 50385)
UUW Pipeline Materials Selection Policy (Ref: 20971)
UUW Mains Hygiene Practices (Ref: WD/D/001/44)
UUW Addendum to: Code of Practice for Self-Laying of Water Mains and Services – England & Wales (2nd Edition May 2009)
UUW Civil Engineering Specification for the Water Industry (UU CESWI 6 Issue 2, March 2008)
UUW Network Modelling of Water Mains (Ref: 60114, Issue 1)

Other referenced documents:
Water Industry Act 1991

Water Act 2003
Water Supply (Water Fittings) Regulations 1999 Water Supply (Water Quality) Regulations 2000 Competition & Services (Utilities) Act 1992 Competition Act 1998 (applicable from 1 March 2000) New Roads and Streetworks Act 1991
Traffic Management Act 2004
Code of Practice for Self-Laying of Water Mains and Services – England & Wales (2nd Edition May 2009) Volume 1 - NJUG Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus Volume 2 - NJUG Guidelines on the Positioning of Underground Utilities Apparatus for New Development Sites
Volume 4 - NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees
Volume 5 - NJUG Guidelines on Environmental Good Practice
National Guidance Document on the Provision of Water for Fire Fighting (3rd Edition January 2007) Fire Sprinkler Association Guidance on BS9251:2005 Revision 2 (June 2006)

UUW Metering and Connections Policies:
Common Metering Arrangements (Bulk Metering) – New Multi Occupancy Premises Policy (Ref: C.05.02.12)
Compulsory Metering of Non-Household Premises Policy (Ref: C.05.02.13) Free Meter Option Policy (Ref: C.05.02.01)
High Level Water Metering Policy (Ref: C.05.02.02) Meter Location Policy (Ref: C.05.02.06)
Meter Maintenance Policy (Ref: C.05.02.03)
Resizing of water meters (Ref: C.05.02.10)
Meter Reading Policy (Ref: C.05.02.05)
Meter Relocation Policy - Household Meters (Ref: C.05.02.08)
Meter Sizing Policy (Ref: C.05.02.07)
Testing of Household and Non-Household Water Meters (Ref: C.05.02.11)
Notional downsizing of water meters (Ref: C.05.02.09) Metering of Split / Merged Premises Policy (Ref: C.05.02.16)

