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BSc Quantity Surveying

Built Environment Services

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Design Criteria – Water Supply and Waste Drainage

Introduction

For our first assignment, in the built environment services portfolio, we have been asked to give our answers on two separate questions/reports.

The first question, references to the new super sewer that is set to be installed/built in London. Within our report, we have been asked to include the following:

- The founding work of civil engineer, Sir Joseph Bazalgette.
- The problems currently experienced by the limited capacity of the old system.
- The reasons for these problems.
- A description of the 'Super Sewer' project.
- Attitudes to the project, both positive and negative, from the Media and Environmental groups, utilising suitable quotes.

The second question, we have been asked to describe and illustrate 'direct' and 'indirect' supply, for both cold and hot water provision within a building and on the likely frequency of encountering this system variety in different property ages and types.

I hope to give clear and accurate answers to both these questions below.

Question 1

1.1: The founding work of civil engineer, Sir Joseph Bazalgette.

Joseph Bazalgette was a chief engineer to London's metropolitan board of works in the mid-19th century, Bazalgette had a significant impact both on London's appearance and, through his design of an efficient sewage system, on the health of its inhabitants. At that time, the River Thames was little more than an open sewer, empty of any fish or other wildlife, and an obvious health hazard to the poor Londoners.

Bazalgette's solution (similar to a proposal made by painter John Martin 25 years earlier) was to construct a network of 82 miles (132 km) of enclosed underground brick main sewers to intercept sewage outflows, and 1,100 miles (1,800 km) of street sewers, to intercept the raw sewage which up until then flowed freely through the streets and thoroughfares of London.

The plan included major pumping stations at Deptford (1864) and at Crossness (1865) on the Erith marshes, both on the south side of the Thames, and at Abbey Mills (in the River Lea valley, 1868) and on the Chelsea Embankment (close to Grosvenor Bridge; 1875), north of the river. The outflows were diverted downstream where they were collected in two large sewage outfall systems on the north and south sides of the Thames called the Northern and Southern Outfall sewers. The sewage from the Northern Outfall sewer and that from the Southern Outfall were originally collected in balancing tanks in Beckton and Crossness respectively before being dumped, untreated, into the Thames at high tide.

The system was opened by Edward, Prince of Wales in 1865, although the whole project was not actually completed for another ten years.

Partly as a result of the Princess Alice disaster, extensive sewage treatment facilities were built to replace the balancing tanks in Beckton and Crossness in 1900.

Bazalgette's foresight may be seen in the diameter of the sewers. When planning the network he took the densest population, gave every person the most generous allowance of sewage production and came up with a diameter of pipe needed. He then said 'Well, we're only going to do this once and there's always the unforeseen' and doubled the diameter to be used. His foresight allowed for the unforeseen increase in population density with the introduction of the tower block; with the original, smaller pipe diameter the sewer would have overflowed in the 1960s, rather than coping until the present day as it has.

The unintended consequence of the new sewer system was to eliminate cholera everywhere in the water system, whether or not it stank. The basic premise of this expensive project, that miasma spread cholera infection, was wrong. However, instead of causing the project to fail, the new sewers succeeded in virtually eliminating the disease by

removing the contamination. Bazalgette's sewers also decreased the incidence of typhus and typhoid epidemics.

1.2: The problems currently experienced by the limited capacity of the old system.

When the sewers designed by Sir Joseph Bazalgette were built, they were built to accommodate a population of between 4 and 6.5 million people. The population of London currently stands at just over 8.1 million people. This means simply, there are too many people for the sewage system to be able to cope with. This does not factor in the amount of additional houses, apartments etc built to cope with the rise in population, therefore more rainwater from buildings etc. This wouldn't usually affect the sewage system, but there are some combined pumping stations taking both sewage and rainwater, meaning the excess is being washed into the surrounding rivers.

1.3: A description of the 'Super Sewer' project.

The Thames Tideway Tunnel is an under-construction 25 km (16 mi) tunnel running mostly under the tidal section of the River Thames through central London, which will provide capture, storage and conveyance of almost all the combined raw sewage and rainwater discharges that currently overflow into the river. Bazalgette Tunnel Limited (BTL) is the licensed 'Infrastructure Provider' set up to finance, build, maintain and operate the Thames Tideway Tunnel. BTL is a consortium of investors that comprises Allianz, Amber Infrastructure, Dalmore Capital and DIF. From the licence award, BTL trades and is known to the public as 'Tideway'. On 3 November 2015, BTL received its operating licence from Ofwat, ensuring the start of the project.^[1]

Starting in 2016, construction of the Thames Tideway Tunnel will take seven to eight years, giving a target completion date of 2023.^[2] Once constructed, the main tunnel will have an internal diameter of 7.2 m (24 ft) and will run from -30 m (-98 ft) at Acton in the west of London for over 25 km (16 mi) under central London down to -70 m (-230 ft) at Abbey Mills in the east.

It will connect 34 of the most polluting combined sewer overflows (CSOs), via transfer tunnels, and is expected to reduce the number of overflow events to a maximum of four per CSO per year at time of commissioning, increasing gradually due to effects of climate change and population growth.^[3] The tunnel will transfer the captured sewage to the Stratford to East Ham part for onward delivery to Beckton Sewage Treatment Works for treatment. The recycled clean water is then released into the River Thames.

1.4: Attitudes to the project, both positive and negative, from the Media and Environmental groups

Question 2

Direct water supply

A direct water supply system is one where the raising main feeds directly the cold water taps and a multi point water heater.

The mains water comes in via a rising main and directly feeds all the cold taps and a multi point water heater - so all the taps and other water feeds are at mains water pressure. Note that in this article, we are dealing with just the hot and cold water supplies to the taps etc, we are not dealing with the central heating system.

1. Water company stopcock - this is used to cut off all the water to the property and is the point at which the responsibility for the water pipe changes; up to, and including, this stopcock the water supply company is the responsible for it; from this point to the house, the house owner is responsible even if the stopcock is not on their land (it's often in the pavement).

Make sure that you know the location of this stopcock and, periodically, make sure that it's working - if you have a disaster with water in the property, you may need to turn the water off at this stopcock quickly.

2. Householders stopcock - normally just one stopcock within the property will cut off all the water into it and the householder is responsible for it. This stopcock is normally located where the rising mains enters the house, often under the kitchen sink.
3. Draincock - this allows all the pipework within the house to be drained down at the lowest point.
4. Stopcock - this stopcock can be used to isolate the rising main from the cold water taps and WC cistern etc to allow maintenance in those areas without having to shut off all the water in the property.

5. Gate valve which can isolate the cold water feed to the multi point water heater.
6. Gate valve which can isolate the hot water from the multi point water heater to the taps etc.

NOTE: Valves 5 and 6 allow for the water heater to be isolated for maintenance, repair or replacement.

7. Multi water heater - specifically designed to work at mains water pressure.

8. Inline valves to isolate water feeds to washing machine or dishwasher etc.
9. WC overflow pipe - this takes any overflow from the WC cistern out of harms way and deposits it outside of the building. It needs to be positioned so that any water flow is immediately noticed as it would indicate a problem.

Please see Appendix 1 below for illustration.

Indirect water Supply

An indirect water supply system is the most common type found in modern houses.

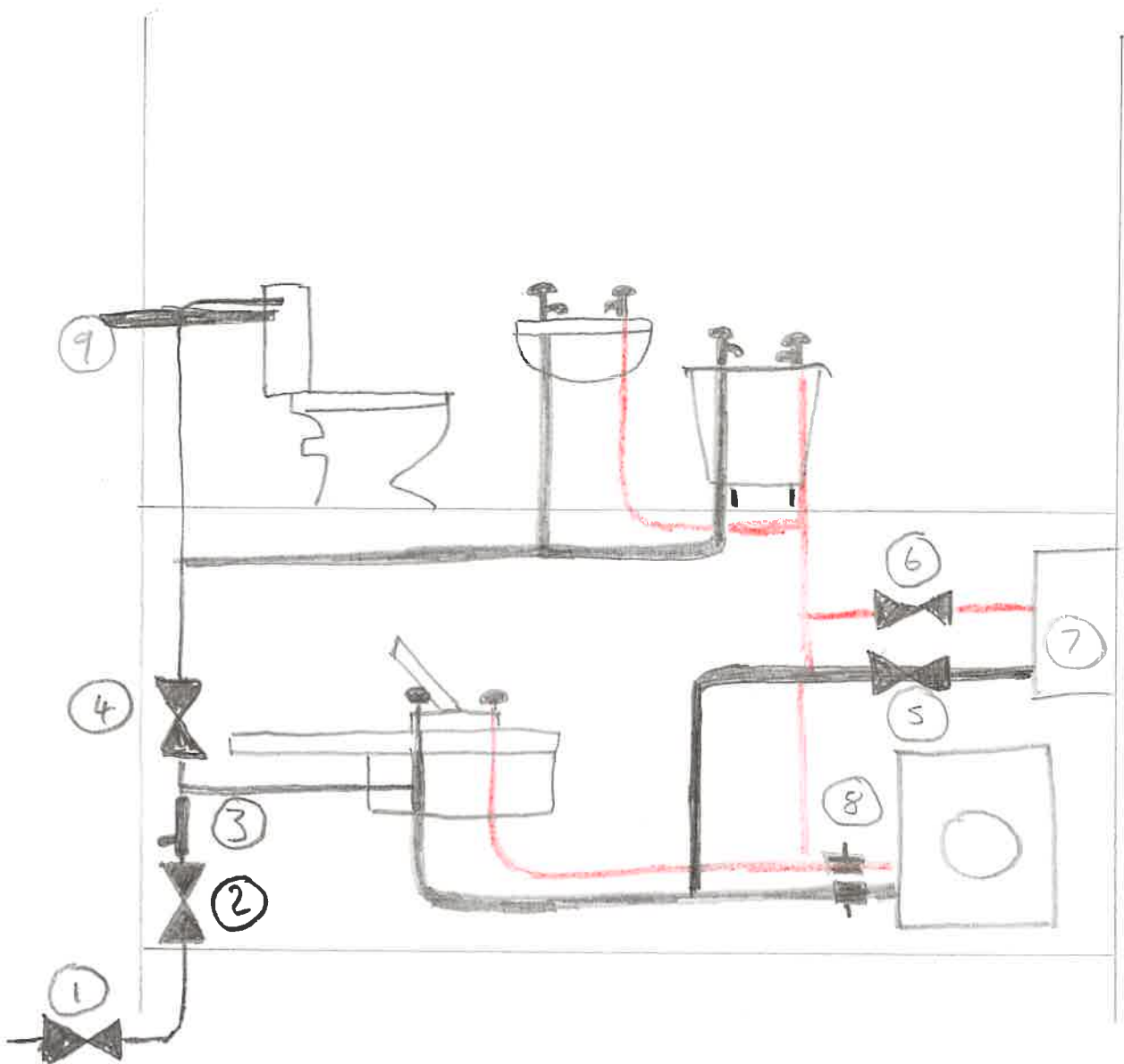
The mains water comes in via a rising main and directly feeds at least one cold tap at the kitchen sink with 'potable' water (i.e. water which is fit for drinking, cooking etc) and may also feed a washing machine, a shower and an outside tap etc. The rising main also feeds a storage tank at a high point in the building from where the water is fed to all the other taps etc using gravity.

1. Water company stopcock - this can cut off all the water to the premises and is the point where the responsibility for the water pipe changes; up to, and including, this stopcock is the responsibility of the water supply company (even if the stopcock is on your land); from here to the house, is the house owners responsibility.
Make sure you know where this stopcock is located and, periodically, check that it's working - if you have a disaster in the house, you may want to turn the water off at this stopcock quickly.
2. Householders stopcock - this normally can cut off all the water within the house but the householder is responsible for it. It's usually located where the rising mains enters the house, often under the kitchen sink.
3. Draincock - this allows the rising main within the house to be drained down at the lowest point.
4. Stopcock - this stopcock can be used to isolate the rising main from the storage tank to allow maintenance without having to cut off all the water from the property.
5. Storage tank with a ballcock float valve to control the water stored. The tank will typically hold from 230 to 360 litres (50 to 80 gallons) of water at the highest part of the building - the higher it is, the better the gravity feed pressure at the taps etc. From 1991, the tank should be fitted with a close fitting lid; the expansion pipe from the hot water tank should pass through a grommet in the lid to keep out contaminations.
6. Gate valve which can isolate the cold water feed to the hot water tank.
7. Gate valve which can isolate the cold water to the WC and taps etc.
8. Hot water cylinder.
9. Gate valve which can isolate the hot water to the taps.
NOTE: Without the valves 6, 7 and 9, any maintenance on the taps or hot water cylinder etc would require the storage tanks to be drained down - by using the appropriate valve to isolate the part being worked on, the amount of water wasted is minimised.

10. Storage tank overflow pipe - this takes any overflow of water from the storage tank out of harms way and deposits it outside of the building. It needs to be positioned so that any water flow is immediately noticed as it would indicate a problem.
Since 1991, the entry to the overflow inside the tank should include a filter to prevent even a small insect from entering the tank.
11. WC overflow pipe - this takes any overflow from the WC cistern out of harms way and deposits it outside of the building. It needs to be positioned so that any water flow is immediately noticed as it would indicate a problem.
12. Inline valves to isolate water feeds to washing machine or dishwasher etc.

Please see Appendix 2 below for illustration.

APPENDIX 1 - Direct.



APPENDIX 2 - Indirect

