CORPORATION OF LONDON

Feasibility Study and Report on The Heating And Hot Water Services

At

Middlesex Street Estate

REPORT REVISIONS RECORD

Version No.	Rev. No.	Date	Purpose / Revision Detail
001		October 2017	Draft For Comment/Discussion
002		January 2018	Incorporating client comments
003			
004			

1. INTRODUCTION

1.1 PURPOSE OF REPORT

Due to the numerous failures and age of the existing plant and equipment at the Middlesex Street Estate, London, we were asked to visit site to review the plant equipment condition and provide a feasibility report with recommendations on replacement or upgrading of the existing equipment and services.

The purpose of this report is to provide an overview of the existing heating and domestic services systems and its condition, then to detail the possible replacement/upgrade requirements to the system.

1.2 LIMITATIONS OF THE SURVEY AND REPORT

The system was reviewed and visually surveyed on 12th, 16th and 17th October 2017; this included the main plant room, the gas meter room, cold water booster plant, the communal extraction plant, the communal heating and hot water distribution pipe work, various shops, commercial properties and indwelling systems.

In general only a visual inspection was completed during the surveys and no attempt was made to dismantle any plant, pipework, valves, distribution boards or control systems etc., also no testing of the installations was carried out.

The report is intended to:

a. Identify the condition of the heating system serving lower and tower blocks, shops, commercial properties and the remaining life of plant/equipment where possible.

b. Identify a menu of fully costed options available to the client to consider when determining the remedial strategy.

c. Identify budget costs to appropriate resources during 2017-2018 to support the project.

d. Develop a narrative for tenant and leaseholder engagement for inclusion within S20 leaseholder consultation.

E. Create robust knowledge and understanding from which to draft a briefing document to fee tender the selection/appointment of Building Services Consultants for a design and Contract Administration rose for the completion of the desired works.

1.3 AVAILABLE INFORMATION

Apart from the details obtained during the surveys no other information was available from the Client Corporation of London at this initial stage.

1.4 GENERAL DESCRIPTION OF EXISTING SYSTEMS

1.4.1 Overview

The Middlesex Street Estate is circa 1970 and is generally split into four lower housing blocks which cover Harrow Place, Middlesex Street, Gravel Lane and a central tower block Petticoat Square. The communal boiler house is situated directly below the main tower block at basement level and the distribution pipework is networked around the surrounding blocks in five separate heating zones via the central underground car parking area which has two levels. The pipework then rises up in several places through the garages and shop/commercial property areas into the residential dwellings above.

No information has been provided to ascertain whether the building is listed but we would assume not as modifications have been carried out; such as installation of gas pipe work and shop conversions etc. However this will need to be clarified if the recommendations later on in this report are opted for.

The tower block provides Low Temperature Heating and Hot Water (LTHW) services via the communal plant room. There are two main risers within the service ducts running through the bathroom areas either side of the central lift shafts. These terminate on the roof of the tower block where manual air vents are fitted.

In the four lower blocks the LTHW service ducts rise directly through the bathrooms of each dwelling and tee off accordingly to supply the flats on each level apart from the converted dwellings on the podium level which in the main have domestic system boilers installed providing both heating and hot water. However this is not the case in every dwelling on this level as some have been connected to the communal network. There are also other units which are vacant and may not be connected at all (access to these areas not available).

The four lower blocks also incorporate shops and commercial properties on the outer facing perimeter at ground level of which the majority are being supplied heating and hot water from the communal plant. It is noted that no heat meters have been installed and the occupiers of the shops are charged via an annual service rate according to occupiers who were spoken to.

The domestic boilers were not viewed in depth, but are approximately aged as 15+ years and above and are unlikely to conform to current regulations or be condensing type units. These units are also likely to be reaching the end of their economic maintainable lifespan.

The communal mechanical extract units are located on the flat roofs of both the lower blocks and the central tower block.

The cold water services are provided by a central booster plant room also located in the basement area.

The underground car park areas have a sprinkler distribution network provided by four separate sprinkler plant rooms and a mechanical ventilation unit as well as permanent air ducts.

There is also a backup generator in this area for the firefighting lifts in the blocks and fire and smoke alarm systems.

Dry riser systems are installed throughout the estate in all blocks.

1.4.2 Main Plant Room

The boiler plant room is in the basement area below the central tower block. There are Six gas fired Hoval 500Kw sectional boilers incorporating Nuway forced draft ranged burners. The Hoval boilers and burners were installed in 1989 and one of the Nuway burners was renewed in 2014 according to the data badge information on the appliances. The existing system was originally a duel fuel set up i.e. natural gas and oil.

There are two flues, Boilers 5&6 share a flue. Boiler No.'s 1 - 4 share the other flue. Both flues run through the central tower block and terminate on the roof above the lift motor room.

Each boiler is fitted with an individual Smedgard shunt pump (6 in total).

The oil supply has since been disconnected and made redundant and the fuel used is now solely natural gas.

The redundant oil pipe work, storage tanks and pumps have been left in situ adjacent to the boiler plant room in the oil tank room.

The oil storage tanks we are informed are empty although the existing gauges state otherwise. This should be investigated further to ensure that the oil tanks have been degassed and made safe.

The LTHW supply to the system is very basic and simplistic in design. The primary Variable Temperature (VT) heating water circuit to the blocks is fed via five separate zones incorporating their own pumps for each zone and controlled via separate three port motorised valves.

There is also a primary Constant Temperature (CT) heating pump circuit feeding these zones with its own pumping circuit and a central circuit proving the HWS primary to the HWS Cylinders in each dwelling for the estate along with shops and commercial building units.

The pumps are generally Holden and Brooke pumps of various sizes for details refer to condition survey below aged between 10-25 years.

Some of the heating and primary pipe work within the boiler room and elsewhere on the distribution network is still wrapped with its original insulation which is suspected to contain asbestos and is damaged in several places. This is a cause for major concern; if the material does contain a hazardous substance it will require immediate attention as it poses a health risk to anyone entering this area.

The plant room still incorporates the original sump pumps used for the old oil fire safety circuit.

The system is pressurised via a Pillinger pressurisation unit, Cold Water Storage (CWS) is 1000 litre break tank and a 100 litre expansion vessel.

There is a Spirovent dirt air separator installed on the primary circuit.

There is a dosing unit present but is not connected to the system

1.4.3 Within Dwellings

Within each dwelling supplied from the communal heating boilers the heat emitters are not standardised i.e. some have thermal panel radiators which are no longer made and steel panel radiators of different manufacturers. The radiator valves are of various types also and are a mix of thermostatic type and normal wheel heads. There is no form of temperature control within the dwellings apart from the thermostatic radiator valves (TRV's) where fitted.

The majority of the pipe work is run in the floor screed which splits into the dwellings via a riser from the garages below into each bathroom area.

Major concerns are raised that there appears to be no fire proofing within any of the shared service ducts and should be risk assessed urgently.

The hot water cylinders provide hot water at 60ºC and is supplied via a cold water cistern directly above the cylinder in each property. There are no localised temperature controls on the cylinders and therefore the temperature is reliant on the temperature regulators within the main plant room, apart from four dwellings in the main tower block (flats 2a-d) which have been installed with unvented cylinders, a plate heat exchanger, two heating zones and individual controls and programmer.

Dwellings which are not served from the communal heating scheme have been fitted with domestic system boilers. The boilers are approx. 15+ years and non-condensing type. These dwellings are located on the podium level only.

1.4.4 Main Plant Room Gas Systems

The current gas is provided to the main plant room from the separate gas meter room below the dental health care building basement. The gas supply inlet is 150mm which runs from the gas meter room directly through the oil tank room into the main plant room. The 150mm Safety shut off valve is located within the oil tank room above the redundant oil storage tanks.

1.4.5 Main Plant Room Electrical System

The electrical system within main plant room is via an existing 400v/3ph intake supply adjacent to the entrance door which serves all the equipment, supplies of lighting within the main plant room.

The main control panel is free standing at the far end of the plant room. The control system has been fully integrated with the heating and hot water system. Generally, only temperature and pressure sensor have been fitted which can be visually seen on the wall adjacent to the heating pumps. The existing plant has not been upgraded in line with the controls, limiting the ability to use a Building Energy Management System (BEMS) for little to no more than what was previously installed.

The main control panel is approximately 5 - 10 years of age and in fairly good condition.

Access to main plant room is good via double opening doors to a stairwell next to the Artizan Library which has enough flexibility to lower major plant in and out of the basement area via suitable craneage. There is also lifting beams with the plant room.

Access is also available via the underground car park.

1.5 CONDITION RATING

Part of the report uses the following methodology to outline the condition rating of Mechanical and Electrical Services within the limitations of the survey.

Code	Condition Report	Definition & Reason for Expenditure	Probable Outcome if Determined
1	Hazardous	In hazardous condition. Works needed to comply with Health & Safety or other statutory obligations.	Failure to meet legal responsibilities. Possible closure of section of property. Danger to property users and to public
2	Poor	In poor condition or reaching the end of its useful life. Comprehensive repair or replacement needed.	Property or element will become unfit for its purpose. Maintenance and running costs will escalate. Inconvenience to property users.
3	Fair	In fair or serviceable condition with evidence of wear and deterioration. Repair or partial replacement needed.	Further deterioration and damage. Repair costs and running costs will increase with period of deferment.
4	Good	In good condition. No immediate significant repair or replacement necessary.	Deferment of repair or replacement over lifespan of property or element could result in lower standards and decrease of asset value.

2. EXISTING SYSTEM CONDITION & RATING

2.1 PLANT ROOM

The plant rooms are located within the basement area of the tower block and generally in a fair tidy state.

The plant room in general looks to have been reasonably maintained over the years.

There is no asbestos documentation/info on site. However there appears to be several possible asbestos issues that need urgent attention. Refer to pipe work section.

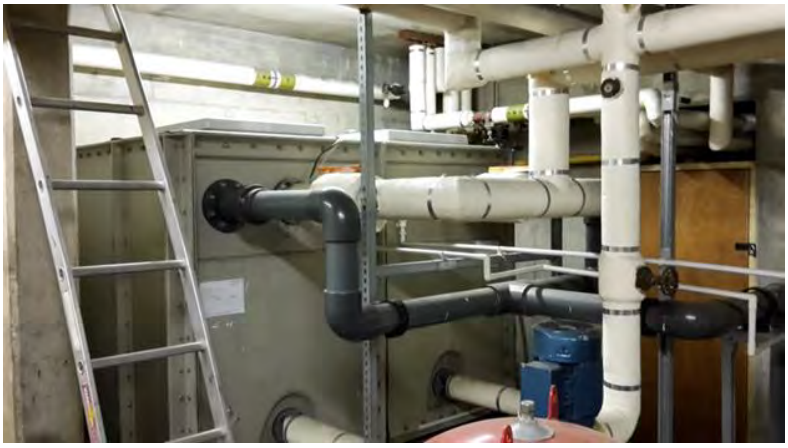
Lighting is inadequate with poor lighting levels and there are units which are non-functioning.

Generally all plant rooms require a general tidy up and removal of debris.

There are signs of leakage within the plant room mainly around valve glands.

Signage's within the plant rooms are poor and mostly outdated.

Condition Rating: Code 3



2.2 BOILERS

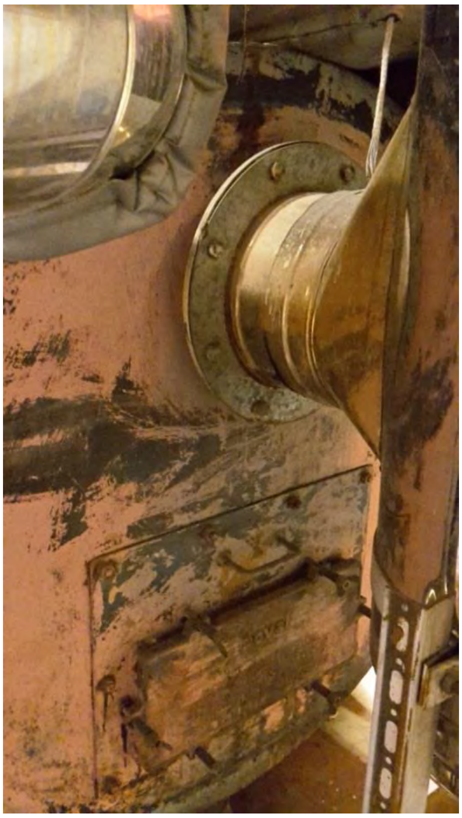
The communal heating and hot water services are supplied via 6 x Hoval SRH Plus 500Kw boilers employing forced draught 5 x Nuway NDFL 1989 burners and a 1 x New Nuway MGN860 burner installed in 2014. The boilers are approx. 30 years old as are the original Nuway Duel Fuel burners. The boilers are stacked in twos. Each boiler employs a shunt pump on the return pipe work. Some of the pumps have been recent replacements.

All look in fair visual condition. The heating system was originally designed for dual fuel. However the oil supply has been disconnected and made redundant.

The boilers share two separate flue systems, No.s 1 - 4 boilers are on one flue and No's. 5 & 6 share the far flue. These flues rise through the far end of the tower block and terminate at roof level.

The boilers have reached their economic maintainable life span and should be replaced with a more modern and energy efficient type. Preferably a condensing model in accordance with current regulations and industry standards.

Condition Rating: Code 3



The domestic boilers surveyed were mainly 15 years+ of age and in fair to poor condition.

These should be renewed and the systems brought into line with current regulations.

It is noted that the gas run supplying the domestic boilers externally has been run in copper pipe which has no identification label or colour coded. This requires rectifying ASAP as it does not conform to GSUIR 1998

Condition Rating: Code 3

2.3 GAS SUPPLY

The gas meter room is located within the basement area below the nearby dental surgery. The access door is next the Artizan Library entrance.

The meter is a Rotary/Pulse meter 150mm with a 150mm gas regulator set at 21mb.

The gas supply runs for approx. 40 metres directly through the redundant oil storage tank room before entering the main plant room.

The gas pipe work has not been sealed correctly as wiring has been routed through the pipe work sleeve and its integrity has been compromised.

There is 1 x 150mm electronic gas safety valve in the oil tank room. This is a major cause for concern and will need to be assessed under the DSEAR 2002 regulations to clarify level of risk and remedial actions required.

It is not known whether the redundant oil storage tanks plant and associated pipe work have been degassed and rendered safe in accordance with the HSE guidelines.

Condition Rating: Code 2

2.4 VENTILATION

The plant room is ventilated via combined high and low level grilles direct to outside. These are located above the windows and on the fire escape double louvred door.

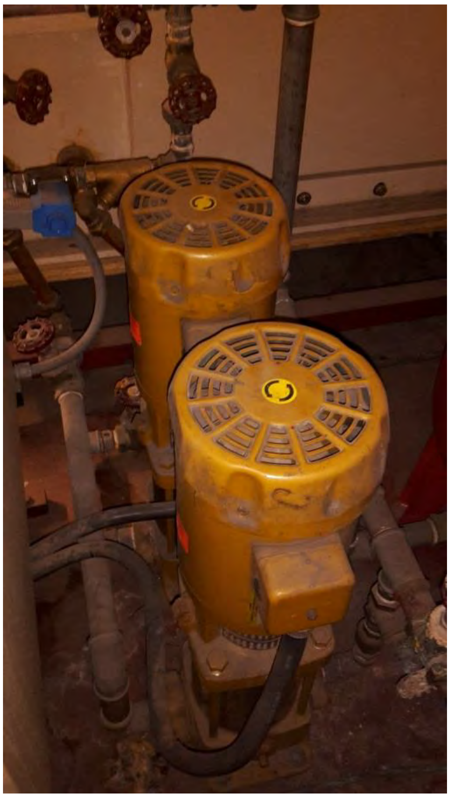
There is also a Vent Axia inlet fan in one of the adjoining heating zone pump areas at high level above the pipe work at the back of the boiler plant room.

Condition Rating: Code 3

2.5 PRESSURISATION UNIT

The system is pressurised via a Pillenger Unit incorporating 2 x multi-stage pumps, 1000 litre break tank and a 100 litre expansion vessel. Approx.15 years old and in poor condition.

Condition Rating: Code 2




2.6 <u>HEAT EMITTERS</u>

In dwelling pipe work installation is fair. It is run mainly within the screed floor or through ceilings.

No standardisation on valves or emitters.

Does not conform to current Building Regulations L1 of the approved document, with missing radiator thermostatic controls valves, room thermostats or programmers.

Condition Rating: Code 3

2.7 HOT WATER CYLINDERS (WITHIN DWELLINGS)

Of the 10% dwellings surveyed the pipe work installation is original and past its economic life expectancy, with missing insulation or inadequate sleeving, The pipe work rises through a central service duct then is run mainly within screed floor or through ceilings within the dwellings.

There appears to be no fire proofing in service ducts

No standardisation on valves or cylinders.

No localised temperature controls.

Hot water cylinders do not conform to current Building Regulations L1 of the approved document, with missing basic controls such as cylinder stats, regulating valves, insulation jacket and either damaged, missing or beyond economic life expectancy.

Condition Rating: Code 2




2.8 PUMPS

2 x Holden and Brooke direct drive primary pumps.

2 x Holden and Brooke belt driven Tarflex HWS primary pumps.

10 x Heating zone belt driven pumps (duty and standby).

6 x Boiler shunt pumps

2 x Sump pumps

Condition Rating: Code 3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2.9 CONTROL PANEL AND CONTROLS

The controls panel and existing controls visibly are in fair condition.

The main control panel appears to have been recently rewired.

There is no rubber safety mat below the control panel.

The Landis Gyr three port motorised valves are showing signs of slight leakage

Generally all controls require renewal, as they are iinefficient for today's standards and will not meet current Building Regulations of the approved documents.

Condition Rating: Code 2

2.10 VALVES GENERALLY

The valves generally are in fair/poor condition. There appears to be a lack of maintenance and signs of leakage. Some valves have been left open ended.

Condition Rating: Code 2

2.11 PIPEWORK AND INSULATION

Pipework generally is in fair/poor condition, with signs of leakage. Valve wraps are either missing or not refitted.

Several sections of insulation is missing/damaged on main distribution pipe work externally

Pipe work within various areas is insulated in suspected asbestos material. No information available on site.

Condition Rating: Code 1


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2.12 FIRE SAFETY DEVICES

Thermal links on boilers.

<u>No Gas leak detector in boiler room and gas meter room</u>.

Emergency shut off buttons at exit/access.

Redundant foam pipe work still in situ (for oil).

Fire extinguishers mounted on wall are within service date.

Sprinkler system in car park areas.

<u>No fire proofing in shared riser ducts in all blocks</u>

Condition Rating: Code 3

2.13 GENERAL WIRING AND CONTAINMENT

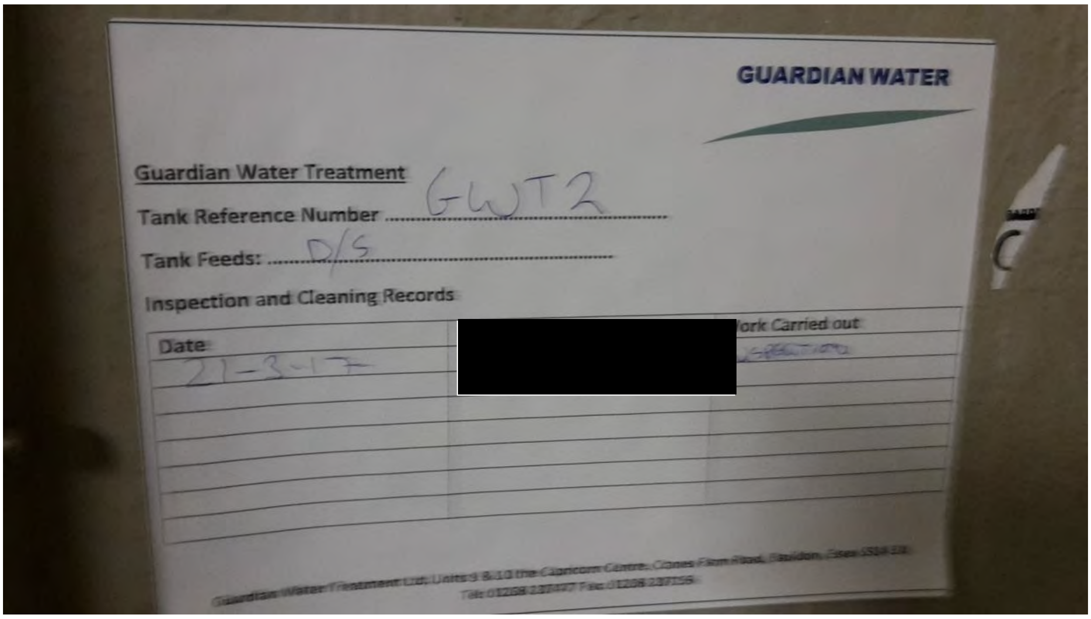
Wiring is visually mostly in a fair/poor condition, and original 30 years of age.

Condition Rating: Code 2

2.14 WATER TREATMENT/DOSING

Dosing pot in fair condition but not connected to the system.

Condition Rating: Code 3



2.15 ASBESTOS

No asbestos information was available on site. However asbestos suspected material is likely to be in all areas. An assessment should take place. Insulation on pipe work should take priority as this is damaged and if asbestos content is confirmed then area is highly hazardous and requires urgent attention.

Condition Rating: Code 1

2.16 <u>COLD WATER BOOSTER SETS</u>

There is a central plant room in the basement area containing a cold water storage tank and duty and standby booster pumps set. Approx. 15 years old.

Plant rooms require a general tidy up and there is suspected asbestos material on pipework and fire proofing is required to some areas.

Condition Rating: Code 1

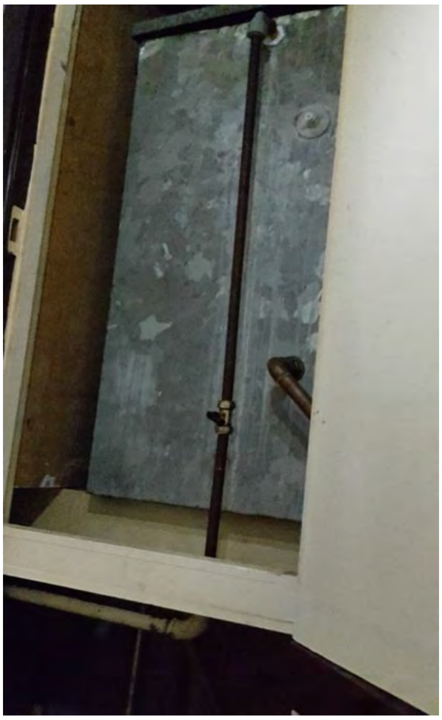
2.17 COLD WATER STORAGE TANKS

These are mainly GRP cisterns but galvanised also present in some locations, are located within each dwelling and are supplied via mains water or the booster plant.

Particular concern was the galvanised tank located within the "Tifin Box" Restaurant which was badly leaking into the electrical fuse board. The Owner stated that this had already been reported to the Corporation of London. This requires urgent attention.

Condition Rating: Code 1 (Tifin Box)

Condition Rating: Code 3 (generally)



2.18 COMMUNAL FANS

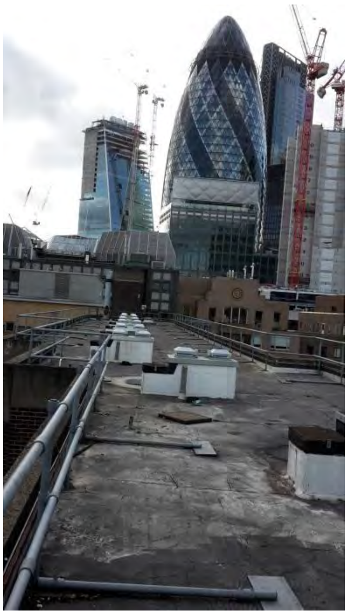
There are Helios RDW 225/2 communal fans on the flat roofs of each block. The ductwork drops down each column of two flats in the service riser duct providing extraction for bathrooms.

The communal fans are in fair condition,

The transfer grilles within dwellings require cleaning, rebalancing, fitted with fire dampers where not installed.

Where individual fans have been installed in kitchen areas these can either remain, be cleaned or replaced, depending on condition. Where none have been installed, new fans will be installed to comply with Part F of the approved document Building Regulations.

Condition Rating: Code 2



3. NEW SYSTEM OPTION A & B

3.1 OPTION A – COMMUNAL HEATING + MINIMAL DOMESTIC SYSTEMS

The existing boilers, pipework, valves, hws cylinders, radiators, control panel and controls plus the majority of associated equipment are beyond their economic life; the plant is also beginning to fail on a regular basis and needs to be replaced with a new more efficient system to serve the estate as a whole now and into the future, especially with the continued outage of hot water and heating to the residents.

The final arrangement would be similar to existing with new modern equipment, energy efficient and highly insulated distribution pipework run within the underground car park area and redesigning of the distribution network within the blocks.

Renewing all radiators and cylinders with dwellings and installing new controls in accordance with Building Regulation L1.

Renewing all hot water cylinders to high recovery, pre-insulation type.

It is also recommended to consider installing a separate primary circuit for the surrounding shop/commercial properties connected to the communal system. The units would each be fitted with heat meters and units would be charged on energy usage. The connection to these commercial units could be offered as an optional connection as and when.

The distribution network would be run externally when it exits the car parking area on the lower blocks and split along the balcony areas at high level and enter the dwellings accordingly, incorporating a suitable heat interface unit. (HIU).

The central tower block pipework will be split into two separate risers as existing but will be run externally either side of the block and enter into the lobby area for each floor before splitting and entering the dwellings.

Note the four dwellings which have had unvented cylinders installed on level 2 can remain as is. However for conformity purposes we would recommend that these units be changed to the new design opted for; to ensure standardisation of the system.

This option will heavily rely on the existing asbestos issues being taken into account and dealt with accordingly prior to works commencing.

The properties on the podium level which have had domestic systems installed should remain as the same. However all heating system should be updated to current regulations. This will require all boilers, controls and associated fittings to be renewed.

It is also advisable to convert the remaining units on this level to domestic boiler systems apart from 230 – 239 which are already connected to the communal network as a whole block.

Each property connected to the new communal system shall have installed an individual heat meter on the heating and hot water primary circuit to enable accurate energy usage per property in accordance with the current regulations and guidelines.

Individual mechanical extract ventilation fans shall be fitted in the kitchen where required, with minor upgrades where fans are not operational or are in poor condition.

The communal fans are likely to have a small overhaul in places, with the main part of the works in ductwork cleaning, replacing grilles with fire rated grilles and/or volume control dampers, with a re-balancing and commissioning of the system

3.2 LIKELY PROCEDURE FOR REPLACING THE EXISTING SYSTEM WITH NEW

Works will need be carried out in a specific order to ensure that the heating & domestic services to individual dwellings is kept to a minimum. All of which will be subject to full invasive survey, that would need to be carried out by the contractor before works commence.

Phase 1

Would be to remove all asbestos under fully controlled conditions within the boiler plant room and any associated areas where works are intended.

This is more likely to be a separate project but can be combined into an overall scheme. However which ever option is adopted must be treated as priority.

Once the asbestos issue has been dealt with and area is deemed safe the refurbishment works can commence.

At this stage the existing main plant room shall be connected to a standalone temporary boiler and pumping system supplied by the existing gas supply. This can be connected onto the existing pipe work via the access into the plant room provided by the ventilation openings and utilise the existing pipe work the blocks and isolating the existing pipe work to the boiler plant room.

This will allow the existing boilers and pipe work to be removed and replaced without major disruption to the heating and hot water services. Ideally Phase 1 will be carried out during the summer period reducing the size of the temporary boiler plant set up to provide hot water primary only and can be factored into the tender costs. However at this stage of the report it is considering the heating services also.

On completion of replacement boilers, control panel and associated equipment. The new appliances can be connected to the existing distribution pipe work and temporary boilers plant removed.

The new system within the plant room will incorporate pressure unit and plate heat exchangers on the primary circuit to protect the new equipment whilst connected to the existing distribution circuit.

Phase 2

The new pre insulated distribution network will be pre-fabricated and installed alongside the existing network up to each block and terminating outside each property as stated previously above. It would be virtually impossible to use the same routes as the existing distribution network and running the pipe work externally will enable the replacement of the system to be done with less disruption to the occupiers and keep the services going at the same time.

Planned shutdown periods will enable stage change over periods where the disruption to the service will be minimal. This will include mechanical flushing of each section during planned shutdown period and pressure test prior to connection.

Once complete the redundant pipe work can be removed where possible and capped off as necessary.

The new external pipe work will be insulated, boxing in or cladded for protection. All efforts will be made to ensure aesthetics are not compromised.

Phase 3

Each dwelling would have its existing heating & domestic services systems removed & replaced with new. Note dwelling heating & hot water may be off for a few days, but cold water will only be off for a short period of hours. The new systems shall be linked to new distribution pipework as they are finalised.

Each dwelling will be designed to incorporate more economic system i.e. new radiators, TRV's, TPV, room thermostat all in accordance with Building Regulation L1.

The pipe work in dwelling will be installed on the surface at either high or low level depending on the dwelling layouts. Pipe work will be boxed in where possible or unsightly.

Again all efforts will be made to ensure aesthetics are not compromised. The contractor will ensure that this is fully priced for and included in there tender submission

Asbestos information is vital for these works to commence safety and must be taken into account at tender stage.

The hot water cylinders will be sized according to need and dwelling layout with a high recovery pre-insulated type fitted with immersion back up and thermostatic controls.

It is recommended that these works are resourced sufficiently to enable 4 dwellings be completed per week.

The programme is to be administrated by the incumbent installer with assistance from the client in arranging access.

Temporary heaters are also to be made available to the residents if the need arises in particular for vulnerable occupants.

Once all replacement and installation works are completed the system as a whole will be commissioned, balanced and fully tested.

The installer will take full possession of the site and maintain the heating and hot water services both in the plant rooms and dwellings for the duration of the defects liability period (12 months) which then can be handed over to the term maintenance contractor employed by the client.

The dwellings incorporating the domestic boilers can be done at any time during the programme.

3.3 OPTION B - INSTALLATION OF NEW INDIVIDUAL 'NATURAL GAS' INSTALLATIONS TO WHOLE ESTATE

As the title suggests, this would be a complete departure from the Communal Heating system with the installation of individual systems. Assuming that all the communal systems are to become defunct i.e. heating and hot water, then the proposed system would need to provide heating and hot water. This would mean the installation of a condensing boiler with hot water cylinder or combination boiler; both have distinct benefits and both distinct problems.

The use of combination boilers could mean a reduction in the availability of hot water if a boiler were selected to meet the heating demand only. Acceptable hot water flow rates can be achieved by combination boilers if they have a high output i.e. 35Kw boilers generally provide 15.1 l/min which complies with NHBC requirements. Boilers less than 28Kw in general do not provide more than 9 l/min which would not meet the demands currently being provided by the central system.

Another consideration with an individual boiler; be that combination type or not, is the location of the boiler. The external façade of the building is mainly glazing/infill curtain wall panels with only a dividing wall between properties. To comply with Part J of the Building Regulations the fan flued boiler flue needs to be sited at least 300mm from a boundary and a similar distance away from any opening. It is also recommended for Health and Safety purposes that the boiler flue does not discharge at low level in areas likely to be occupied due to the pluming of the water vapour such as onto balconies or walkways.

The installation of a regular condensing boiler with associated cylinder will require not only a position for a boiler in a suitable location but also a cylinder position.

With modern boilers it is also necessary to consider the condensate discharge and in this case it could be a problem as the existing drains are a combination of copper and cast iron which are both very susceptible to corrosion from the condensate. Equipment has been manufactured to overcome this problem but it adds to the yearly maintenance costs.

As the existing gas and water main is undersized and original this would have to be replaced adding to the capital costs.

This option is not resident friendly in logistics as space within the properties is limited and residents would lose storage space.

There are costs associated with windows amendments to be included.

A further consideration, as noted in a previous section, is details of the existing gas network within the building. That this will not sustain the required increase in load required to serve both gas for cooking and gas for the boiler plant. Full checks with the Gas Supply Authority will be necessary prior to commencement.

Due to the existing window configuration, balcony and walkways any individual system will require windows to be replaced by non-openable windows and residents loss of associated kitchen space for new boilers. There will be similar pipe routes within the dwellings to that of the communal system, with additional pipework for pressure discharge, condense pipe and cold water services.

Due allowance for this would need to be accommodated in the design proposals.

Asbestos information is vital for these works to commence safely and must be taken into account at tender stage.

4. ENVIRONMENTAL ASPECTS

When considering option appraisals for refurbishment, it is now a requirement that renewable technologies are considered as part of the overall project.

Various types of technology could be incorporated namely (i) Biomass boiler; (ii) Solar thermal panels (iii) combined heat and power. Other technologies such as wind power and solar PV are available but in general do not contribute to the provision of heating and hot water services.

Biomass boilers are very popular because of the relatively low carbon emission and with a reconfiguration of the current plant room and potential storage space around if new storage facility was constructed it is quite possible that one boiler could be converted to biomass firing with the other remaining gas fired. Problems with delivery of fuel and storage are likely to however out way the benefits achieved by its installation, it should also be noted that biomass installation requires a relatively high level of maintenance to ensure correct operation and security of fuel supply ie: careful monitoring of fuel moisture content to ensure it does not deteriorate into compost and regular removal of any clinker/waste product. It would also require a complete review of the flue system to ensure it rises above roof level adjacent building to comply with the clean air act requirements of the Borough and GLA make this option less viable.

Solar thermal panels could be located on the block roofs to provide pre-heat to the domestic hot water calorifiers. The roof aspect makes it ideal for this type of technology, and although planning permission would be required it is the least troublesome option when providing renewable technology to this type of system. The distance from the plantroom to the panels would however be a problem in making the system effective but it would make some savings. Again higher levels of maintenance are required to maintain the system at peak performance, and this would need to be included in the site planned maintenance schedules plus additional access to the roofs. However the additional costs required to install such a system along with the additional Health & Safety requirements for the 7th storey rooms & additional weight would far outweigh any benefits for such a system.

Another alternative is to install a gas fired combined heat and power unit with the electricity produced being used to feed landlord supplies and any excess transported to the local grid. This would provide sufficient heat to provide hot water in summer and be part of the load to meet the heating requirement in winter. These systems are generally vastly more expensive than other renewable technologies and have higher maintenance requirements the size of vent would also need to be renewed if it is to be installed without modifications to existing plant room.

Technologies such as heat pumps have not been considered due to the nature of the building and associated costs of drilling bore holes etc. (Underground slinkies are not possible on this site).

Whilst Solar PV panels do not contribute to the provision of heating and hot water, their installation would be beneficial. The benefit would be achieved at two levels, if a large proportion of the roof could be used to generate electricity, it could be used to off-set the electricity consumed in the landlord and plant room areas with similar requirements to solar as above for Health & Safety issues.

Overall, a replacement system on a like for like basis without the usage of renewables would be the best solution for this project.

5. HEAT METERING

5.1 GENERAL

Heat metering whilst not a new technology has recently become a popular method, due to changes in legislation, of providing building occupants the means to measure heat usage and thus encourage energy savings. Advances in technology have allowed the miniaturisation and contact ability of meters, and computerisation has allowed the use of ‘Heat Cost Allocation’ where difficult to meter locations are found.

Heat meters generally use the flow and temperature difference between flow and return of the heating medium to measure the energy consumed by the user only. The more robust system and therefore reliable is where the meters are hard wired back to a central location for either onsite reading or off site via an internet of GSM connection. An alternative system is to use mobile phone network such that each heat meter has a SIM card that can be contacted, these systems suffer in heavyweight buildings due to poor signal strengths.

In this type of building, metering systems which utilise mobile telephone networks to transmit data have been found to be unreliable. This is due to interference caused by the structural elements, and the location of pipework entry to the properties having not been designed with metering in mind.

A shielded “hard wired” system does not suffer from this problem and is therefore more suited to this type of building.

Heat metering equipment installed in the heating flow and return branches to each flat can be wired back to a central monitoring station, which can be monitored either physically or remotely by land telephone line.

5.2 METERING WITHIN THE ESTATE

The current pipe configuration within both the circuits that serve the flats does not favour heat metering. The flats are served by four heating risers and four hot water risers which pass through other flats; the heating circuit operates on a ladder type system with the main heating flow running through the roof void with drops to low level and a return. However with the external pipe option this would now be achievable.

5.3 HEAT METERING IN RELATION TO VARIOUS OPTIONS

5.3.1 Option 1 Main Plant Replacement

A heat meter would be required to be installed within the main plantroom to measure the heat being distributed around the buildings, ideally one for each circuit, i.e. tower block (flats). Each flat would be provided with heat metering, if a central hot water system is selected then a meter would be required for both heating and hot water to each flat. If a decentralised option is selected then a single meter would be required.

5.3.2 Option 2 Individual Boilers

No heat metering would be required for this option as all properties would have a gas meter which would be the users responsibility.

5.3.3 Option 3 Mixed Install

The heat metering requirement for this option would be for only those properties served from the central plant as described in Option 1 above.

6. FINANCIAL IMPLICATIONS

The following 35 year life cycle cost analysis has been completed to reflect both option a – communal heating and option b – individual heating, the basis of the installation costs are taken directly from Spon’s 2017 Building services cost book, quotations and previous project costs. An assumption has been made on 2.7% inflation cost per annum retrospectively. Gas consumption for the existing communal heating has been based on last year’s fuel bills, it is likely that as the existing system is no more than 50% efficient, with the new heating system on communal would be in the order of 94% efficient, the energy bills would further reduce to reflect the new installation. For the purpose of this report it has been decided that this costs saving will not be included within the detailed analysis, but is suggested here that assuming 35 years running cost in its current configuration is £4,200,000.00, allowing for plant to be less energy efficient over the 35 years, at 85% as an average over the 35 years, then 35% saving would be circa £1,600,000.00, this has been considered in the final conclusion as a financial saving to the client and residents fuel costs. Individual gas consumption is taken from Ofgem national statistics for average energy consumption and average fuel bill cost.

35 YEAR TOTAL SPEND		
MECHANICALINSTALLATION / COMMUNAL HEATING		
GAS CONSUMPTION COMMUNAL (HTG AND HWS)		£ 4,200,000.00
MECHANICAL INSTALLATION / COMMUNAL HEATING		£ 2,800,000.00
BOILER HOUSE PPM MAINTENANCE		£ 450,000.00
COMMERCIAL / 35 YEAR COST ANAYLSIS		**£ 7,450,000.00**
DOMESTIC HEATING		
ALL DWELLINGS INDIVIDUAL GAS CONSUMPTION		£ 16,000,000.00
FULL INSTALLATION INCLUDING;		£ 2,300,000.00
Prelims & General Contingency Sum		
Condensing Boiler		
Hot Water Cylinders		
New Gas & Water Services		
Replacement Radiators And Pipework		
3* SERVICE (CP12) INCLUDING 2.7% UPLIFT YEARLY		£ 650,000.00
DOMESTIC / 35 YEAR COST ANALYSIS		**£ 18,950,00.00**
INSTALLATION/CAPITAL COST		
COMMUNAL HEATING		£ 2,800,000.00
INDIVIDUAL HEATING		£ 2,300,000.00

The above indicates that over 35 years significant savings would be made on a life cycle costing. The installation/capital cost indicated individual heating installation cost is less than communal, but the savings over 35 years clearly outweighs that of the capital cost.

7. OUTLINE SCOPE OF DESIGN REQUIREMENTS

The following provides an outline for a scope of work for the proposed boiler replacement and associated works:

a. All mechanical, electrical, plumbing, safety systems, BMS and controls and associated work and installations required to provide complete and fully operational building services systems. This includes the heating, hot and cold water, sanitary, plumbing, gas and systems as would be expected. The Consultant is to allow in his tender to include in the design for the preferred option.

b. Asbestos removal in the plant room will be carried out under a separate project unless agreed otherwise with the client.

c. Asbestos removal within dwelling TBA.

d. Amend existing incoming gas supply to serve the boiler room.

e. Liaise with Water Utility Companies to confirm that there will be adequate flow and pressure for a full mains water and gas system, if not;

f. Calculate the new boiler loadings and select boiler plant sizes accordingly taking into account all recommended margins and loading diversities.

g. Design system and plant in accordance with relevant Building Regulations.

h. Liaise with Clients representatives, manufacturers etc., in respect to design requirements, programming of works, access to properties for the entire project.

i. Produce drawings and specification outlining agreed design proposals.

8. PROGRAMME AND DURATION OF WORKS

The renewal/replacement of the existing systems cannot be completed without some disruption to the building occupiers. The amount of disruption will depend entirely upon the competence and skill of the contractor to programme and complete effectively any change overs from one system to another. The following information can only be a guide to the duration of the works, it can also only be an indication as to the work elements as no full design has been completed. Programming and progress of the works will also be affected by access issues which are a consequence of this type of project.

Programme of Works assuming most works carried out in more than one area at a time

Site set up and preliminary works:	30 days
Works within flats (allowing 3/5 days per flat)(working in 4 flats at time):	120 days
Asbestos removal form plant room and associated areas (not including dwellings)	120 days
Commissioning and Testing:	60 days
Works to plant room:	120 days
Works to distribution mains:	120 days

Estimated days:	560 days

The estimated 560 days can be reduced if more gangs utilised at same time.

An alternative would be a phased replacement project, over a period of 3 years, where staged replacement works would take place during the summer months.

The first year would be the main plant room and distribution pipework, connection via a hydraulic heat interface to the existing so that the new system in not in direct contact with the old would alleviate any poor water quality effecting the new. These works could then be carried out during the summer heating shutdown months.

The second year the distribution network be replaced.

The third year would consist of the blocks internals being replaced.

All being completed during the summer heating shutdown months.

This option is likely to increase costs circa 15 – 20% due to additional material & installation works along with general inflation over the period of construction.

9. CONCLUSIONS

The general condition of the majority of the current installation is such that it is reaching the end of its economic life and beyond economical repair and that the Client wishes to replace the existing with a new more reliable and efficient system to serve the blocks now and into the future.

Having visited site and surveyed the mechanical services it is clear that most of the plant is between 25-30 years old. However there are signs of some equipment having been replaced.

The Charted Institute of Building Services Engineering (CIBSE) publishes a guide “Maintenance Engineering and Management Guide ‘M’ “ which provides a method for predicting future life of existing plant and also tables expected life based on standard of maintenance of plant.

The following information is an extract from Guide ‘M’ and provides details on the indicative life expectancy of well-maintained plant (see below).

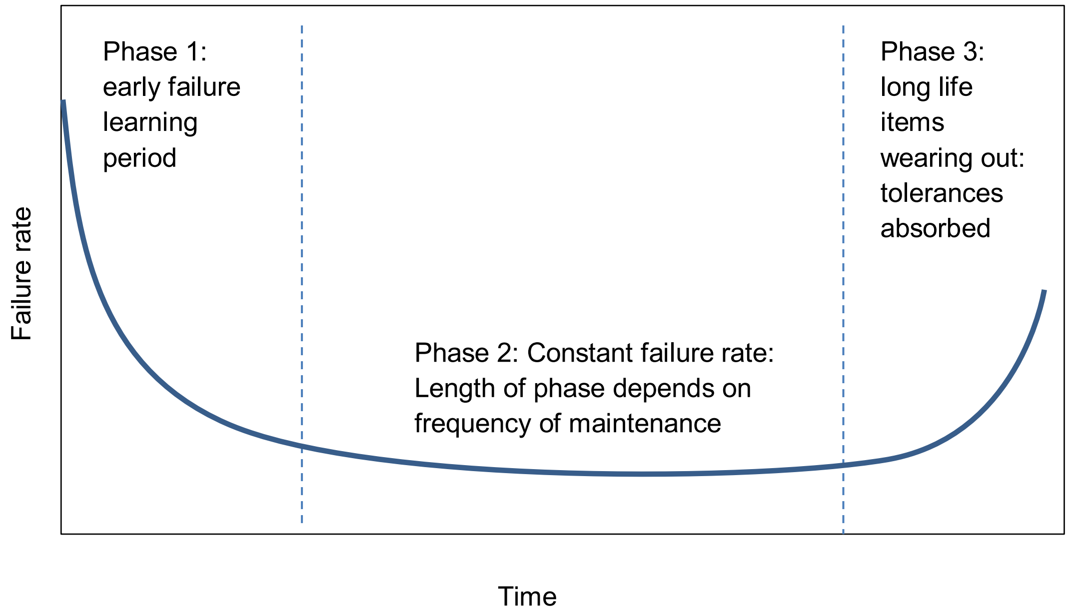
Boilers and flues	20 years
External Louvres	25 years
Pumps (base mounted)	20 years
Circulating pumps (commercial)	20 years
Pipework systems (closed galv)	30 years
Pipework system (open steel & galv)	25 years
Motorised control valves	15 years
Motorised control valve actuator	10 years
Valves (general isolation)	15-20 years
Control systems	5-15 years
Electrical services associated with plant	30 years
Plant room lighting system	25 years
Lamps	3 years
Pressurisation unit	20 years
Distribution boards	20 years
Sub-main distribution:	
- Consumer units	20 years
- Distribution boards	20 years
- Final circuits and outlets	20 years
- Lighting installations (luminaires) (external)	15 years
- Lighting installations (luminaires) (internal)	20 years
- Miniature circuit breaker (MCB)	20 years
- Switched socket outlet (SSO)	15 years
Lighting	
Lamps:	
- Compact fluorescent lamps	3 years
- Florescent tubes	2 years
- SON lamps	4 years
Lighting systems:	
- Emergency lighting minimal	25 years
- Lighting and luminaires (external)	15 years
- Lighting and luminaires (internal)	20 years
- Switches	10 years

Most of the plant installed within the building is now approximately 25 - 30 years old with much of system having been installed when the building was originally commissioned where the pipework continues to fail.

It can therefore be confirmed that most of the mechanical installation is beyond its indicative and economic life expectancy. The guide also takes this into account and describes the process as a bath graph (see below) where the plant operates in its early phase of life needing care and attention (phase 1). Then as time progresses failures and maintenance drop down level out for a period of years (phase 2), then as it ages the plant wears out, tolerances increase and plant failures increase (phase 3) to an extent where it should be replaced.

Therefore it should be noted that the age and condition of equipment within the building is in phase 3 part of our description, with the exception of the replacement primary pumps which are Phase 1, but could be considered Phase 2, as they are connected to existing poor water quality system.

BATH GRAPH OF INDICATIVE MAINTENANCE REQUIREMENTS



Phase 1: Decreasing Failure Rate: This occurs when the system is new and is a consequence of teething problems such as design and installation errors, faulty components and manufacturing faults among other matters.

Phase 2: Constant Failure Rate: In maintained systems, after the early failure period, the system will be in settled state, random isolated faults and failures will occur, and parts that wear will need repair and/or replacement from time to time as part of preventative maintenance. Such parts typically include bearings, seals, printed circuit boards, control components, motors, heat exchanger components and compressors on packaged heat pumps/air conditioners or multiple compressor chillers.

Phase 3: Increasing Failure Rate: This is the point where major components begin to fail and random failures increase with time. At this stage the cost of repair of plant and equipment begins to exceed the cost of replacement.

10. FINAL CONCLUSION TO THE REPORT

The feasibility report provides the reader with the current condition of existing services, with conclusion based on CIBSE data and current system failures and expenditures. The conclusion is to replace the entire system in one shape or another. Due to the age of the whole installation if would not be cost effective to continue to spend money on short-term fixes that replacing on an ad hoc basis as this will be much more expensive in the long term and cause more disruption with resident having to suffer from continued outages of heating and hot water.

Option 1 of the report evaluates the replacement system on a communal heating basis and partial domestic boilers. The report concludes this is most economical choice based on 35 year life cycle cost of £7.8M the report also concludes this is less intrusive to the residents as the pipe service routes would be less disruptive and take up less resident space.

Option 2 of the report evaluates the replacement system on an individual heating basis. The report concludes this is the most expensive choice based on 35 year life cycle cost. The report also concludes this is the most intrusive to residents due to the additional works for boiler location and window/flue and several logistics within the dwellings. This is considered a more invasive option to the residents, be that less capital cost to the client.

Finally it is our conclusion that the communal heating option is preferred option as it offers more advantages for both the Client and residents based primarily on practical constraints, and significant financial savings over the duration of its life cycle.

10.1 RECOMMENDATIONS

The following recommendations are proposed on the basis that the relevant service or equipment item detailed cannot be brought back to a level of life expectancy mainly due to the fact that most of the equipment and plant may no longer be manufactured and that current legislation precludes the replacement on a like for like basis.

1) Replace all equipment plant, etc., within boiler room with modern energy efficient gas fired boilers, inverter driven pumps, plate heat exchanger and new pipework. The works would include updating all the associated electrical services and controls elements.

2) Replace the primary heating mains distribution network with energy efficient pre-insulated pipe work

3) Replace and update hot water services within dwellings with energy efficient appliances enabling the system to be heat metered in future.

4) Replace heating systems within tower block to provide energy efficient heating systems in compliance with current building regulations.

5) Renew all existing domestic boilers and upgrade to current regulations

The above costs are estimates only based on the initial feasibility detailed and do not take into account for concept design and do not include any costs should asbestos be found within boilers, pipework insulation and under floor ducts; associated builders work necessary to access pipework, ducts and equipment; consultant/professional fees, tender costs, associated design fees and any VAT payable. They are also subject to actual design works agreed and included in scope of works.