

Tonbridge & Malling Borough Council
Gibson Building
Gibson Drive
Kings Hill
West Malling
Kent ME19 4LZ

GIBSON BUILDING WEST



Report & Recommendations
For Replacement & Improvements to
Heating Installation

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1.0 OBJECT OF REPORT

The report has been commissioned to identify the Capital Costs, Energy Savings and CO2 reductions for the following options:

- Installing new decentralised boiler plant
- Installing new central boiler plant and replacement heating mains in the undercroft
- Installing insulation into the pitched roofs (energy & CO2 savings only)

Note the report has also encompassed the recommendations from a previous Energy Survey report that recommended decentralizing the boiler plant.

2.0 CONCLUSIONS

The development of this report identified 4 options for consideration:

- Option 1 – Decentralised boiler plant
- Option 2 – Decentralised boiler plant plus replacement of the radiators and pipework in the Wings.
- Option 3 – Replacement of central boiler plant only
- Option 4 – Replacement of central boiler plant together with renewal of the original pipework through the undercroft to achieve Energy Savings and meet the Business Case.

The overall conclusion is Option 4 would provide the best option.

From the inspection of the installations and the design assessments detailed below the following conclusions are made:

- The boiler plant has reached the end of its useful life and should be replaced with a new high efficiency boiler plant.
- The pipework is in poor condition and has had to be repaired or replaced in some areas.
- The radiators may not be correctly sized and some are in poor condition.
- The boiler plant controls have reached the end of their useful life.
- In many rooms the existing pipework is exposed and provides useful heat thus reducing the control from the thermostatic radiator valves.
- Some improvements could be made to the building fabric but these may not be practical, cost effective or allowed under the List Buildings Consents.
- If the radiators and pipework are replaced in the East and West Wings this will cause disruption to the use of the buildings.
- The pipework through the undercroft is original (1945) and potentially in poor condition, it is insulated with asbestos materials and this is also potentially in poor condition. For Business Continuity reasons it is considered essential to remove the insulation and replace this pipework in the shorter term.

If the recommendations are carried out the complex will benefit as follows:

- The control of the environmental conditions in the building will be improved.
- Energy costs will be reduced.
- Carbon emissions will be reduced.
- Increased reliability and therefore reduced maintenance costs and risk of disruption to the operation of the offices and particularly the Council Chamber and Committee Rooms.
- Removal of the asbestos insulation on the pipework in the undercroft.

During the development of the report it became evident that further consideration should be given to not only the energy cost savings and the reduction in carbon emissions but also to the Business Case for ensuring the office heating could be maintained and the protection of the IT Department.

This was identified as follows:

- The heating mains in the undercroft were likely to present a greater risk to maintaining the heating installation because if there was a failure of the mains there would be a long down time while the asbestos content in the insulation was removed.
- The underground existing gas main is likely to be a steel pipe and will therefore have a shorter life than a plastic pipe.
- The gas safety controls require upgrading to current standards and these will provide additional safety to the IT Department situated above the boiler room.

Summary of Energy Use & CO2 Emissions

The tables in the report detail the energy use and CO2 emissions for the current installation and the proposed improvement and replacement works and are summarised as follows:

Gas Heating Energy:

Reduction in energy use with new boiler plant: 211,287 kWh/A = 32.3%

Reduction in CO2 emissions with new boiler plant: 38,257 kg/A (38.3 tonnes/A)

There will be a good reduction in the energy use and CO2 emissions.

3.0 RECOMMENDATIONS

The recommendation is for Option 4 as it is considered this will be the best option to achieve energy savings and CO2 reduction while at the same time minimizing the risk to the use of the building.

This option will also make it easier to carry out emergency repairs and replacements and to complete the recommendations for future improvements made below when monies become available.

Given the existing boiler plant has reached the end of its useful life and also the existing pipework is in poor condition the following recommendations are made based on the knowledge of the building and the calculation assessments made.

Primary Recommendations:

The following recommendations are considered to be essential if the buildings are to maintain good environmental conditions with minimal maintenance and disruption and to meet the Business Case.

- Replace existing boiler plant with new high efficiency boiler plant.
- Remove the asbestos on the undercroft pipework.
- Install new pipework distribution system in the undercroft to effectively decentralize the system to serve the respective 4 Zones.
- Replace existing pipework in the East and West Wings with a new pipework distribution system sized to suit installed loads and equipment.

- Complete the replacement of the existing pipework in the Centre Area.
- Replace the existing radiators in the East and West Wings with new radiators sized to suit the heating loads of the rooms.
- Encase exposed pipework in all areas to provide better control from the thermostatic radiator valves.
- Install new controls to serve the new boiler plant and 4 Zones.

Secondary Recommendations:

These recommendations would improve the performance of the building and reduce energy use and CO2 emissions but are considered impractical and not cost effective but could be considered when other works are carried out on the building as detailed in Section 9.0

- Insulate the pitched roofs over the West Wing, East Wing and the Centre Area Committee Rooms and Dining Hall Wing.
- Install secondary glazing to all windows

Phasing of the Recommendations:

Given the extent of the proposed works and the overall cost the following Phasing of the recommended works is proposed to utilize the available monies, to protect the Business Case and achieve the required energy efficiency, energy cost savings and reduction in carbon emissions.

Phase 1 – Essential works in 2012:

- Replace the existing boiler plant with new high efficiency gas fired boilers positioned in the existing boiler room
- Replace the existing pipework distribution in the undercroft with a new distribution system to suit the 4 Control Zones

Phase 2 – Future Replacement Works:

- Replace the pipework and radiators in the East and West wings
- Complete the replacement of the pipework in the Centre Area
- Replace radiators when required in the Centre Area

Phase 3 – Future Improvement Works to the Buildings:

- Install insulation in the pitched roofs to comply with the requirement of the Building Regulations – work to be carried out when repairs are carried out to roofs.
- Install cavity wall insulation if this can be assessed to be a cost effective and practical option.

Programme:

In order to carry out the above recommendations the heating system serving the buildings will need to be turned off and it is considered that a total period of four months will be required to complete all of the works.

The recommendation is to identify when the works can be carried out and to ensure the proposed works are fully designed and a detailed installation programme is prepared to ensure the down time on the services is kept to a minimum and carried out at a time to suit the use of the offices.

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4.0 COST PLAN

The following cost plan has been prepared using historical costs from other projects and budget quotations received from suppliers.

The costs are based on initial calculations and assessments of the loads of the building and equipment sized to suit the calculated loads.

OPTION 1 – REPLACEMENT BOILER PLANT (DECENTRALISED)

ITEM NO.	ITEM	BUDGET COST	TOTAL FOR WING
	WEST WING		
1	WEST WING – NEW BOILER PLANT	£ 23,600.00	
2	WEST WING ALTERATIONS AND CONNECTIONS TO EXISTING RADIATOR SYSTEM	£ 7,100.00	
3	BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 6,800.00	
4	GAS INSTALLATION	£ 3,600.00	
5	TOTAL FOR WEST WING	£ 41,100.00	£ 41,100.00
	EAST WING		
6	EAST WING NEW BOILER PLANT	£ 23,600.00	
7	EAST WING ALTERATIONS AND CONNECTIONS TO EXISTING RADIATOR SYSTEM	£ 7,100.00	
8	BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 6,800.00	
9	GAS INSTALLATION	£ 4,500.00	
10	TOTAL FOR EAST WING	£ 42,000.00	£ 42,000.00
	CENTRE AREA		
11	CENTRE AREA – NEW BOILER PLANT	£ 54,400.00	
12	CENTRE AREA BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 7,900.00	
13	GAS INSTALLATION	£ 1,700.00	
14	TOTAL FOR CENTRE AREA	£ 64,000.00	£ 64,000.00
15	OPTION 1 - TOTAL FOR NEW DECENTRALISED BOILER PLANT		£147,100.00

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OPTION 2 – REPLACEMENT BOILER PLANT (DECENTRALISED) PLUS NEW RADIATOR HEATING IN WEST & EAST WINGS

ITEM NO.	ITEM	BUDGET COST	TOTAL FOR WING
	WEST WING		
1	WEST WING – NEW BOILER PLANT	£ 22,200.00	
2	WEST WING NEW RADIATOR SYSTEM	£ 42,100.00	
3	BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 16,700.00	
4	GAS INSTALLATION	£ 3,600.00	
5	TOTAL FOR WEST WING	£ 84,600.00	£ 84,600.00
	EAST WING		
6	EAST WING NEW BOILER PLANT	£ 22,200.00	
7	EAST WING NEW RADIATOR SYSTEM	£ 42,100.00	
8	BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 16,700.00	
9	GAS INSTALLATION	£ 4,500.00	
10	TOTAL FOR EAST WING	£ 85,500.00	£ 85,500.00
	CENTRE AREA		
11	CENTRE AREA – NEW BOILER PLANT	£ 52,900.00	
12	CENTRE AREA BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 7,800.00	
13	GAS INSTALLATION	£ 1,700.00	
14	TOTAL FOR CENTRE AREA	£ 62,400.00	£ 62,400.00
15	OPTION 2 - TOTAL FOR NEW DECENTRALISED BOILER PLANT		£232,500.00

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OPTION 3 – REPLACEMENT BOILER PLANT – IN EXISTING BOILER ROOM

ITEM NO.	ITEM	BUDGET COST	
	WEST WING		
1	WEST WING – NEW CONTROLS	£ 1,800.00	
2	WEST WING ALTERATIONS AND CONNECTIONS TO EXISTING RADIATOR SYSTEM	£ 0.00	
3	BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 400.00	
	EAST WING		
4	EAST WING NEW CONTROLS	£ 1,800.00	
5	EAST WING ALTERATIONS AND CONNECTIONS TO EXISTING RADIATOR SYSTEM	£ 0.00	
6	BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 400.00	
	CENTRE AREA		
7	CENTRE AREA – NEW BOILER PLANT	£ 66,900.00	
8	CENTRE AREA BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 12,900.00	
9	GAS INSTALLATION	£ 6,100.00	
10	OPTION 3 - TOTAL FOR NEW CENTRALISED BOILER PLANT IN EXISTING PLANT ROOM		£90,300.00

OPTION 4 – REPLACEMENT BOILER PLANT – IN EXISTING BOILER ROOM PLUS NEW DISTRIBUTION MAINS IN UNDERCROFT

ITEM NO.	ITEM	BUDGET COST	
	WEST WING		
1	NEW BOILER PLANT, DISTRIBUTION MAINS AND CONNECTIONS TO EXISTING INSTALLATIONS	£ 122,600.00	
2	BUILDERS WORK ASSOCIATED WITH INSTALLATION	£ 16,800.00	
3	GAS INSTALLATION – REPLACEMENT UNDERGROUND GAS MAIN	£ 6,100.00	
4	REMOVAL OF ASBESTOS CONTENT MATERIALS IN UNDERCROFT	£ 13,000.00	
10	OPTION 4 - TOTAL FOR NEW CENTRALISED BOILER PLANT IN EXISTING PLANT ROOM AND NEW DISTRIBUTION MAINS		£158,500.00

PROFESSIONAL FEES & OTHER COSTS

There will be Professional Fees and other costs incurred in order to complete the project, these will be identified and agreed when a decision is made on the extent of the works to be carried out.

For purposes of the Budget costs the following percentages are recommended:

- Options 1, 3 & 4 = 12%
- Option 2 = 10%

Exclusions:

- Asbestos testing
- Value Added Tax

The Cost Plan is an assessment of the anticipated costs for the overall project and if some of the works are not carried out or other works are added to the project the cost plan will change but the changes will need to be reflected across all items, as some of the costs are spread over each section.

Payback Period:

A simple calculation of the payback period for the centralised boiler replacement and renewal of undercroft pipework (option 4) would be of the order of 22 years at today's energy prices and excluding the cost of the asbestos removal. The actual period will be reduced by the future increases in energy prices.

5.0 PROGRAMME

The period of the works will depend on the extent of the improvement recommendations that are carried out but a period of 4 months is considered to be a practical period to complete all of the works including commissioning testing and handover for each of the Options.

The actual period will have to be confirmed with the successful Contractor(s).

The selection of suitable contractors to tender the works should take into account their ability to carry out the project within the proposed period.

Option 1:

The proposed decentralized boiler plant installation would affect the following areas:

- Existing boiler room.
- Roof storage areas in the East & West Wings.
- The offices and rooms where it will be necessary to have access to modify the existing heating circuits to suit the decentralized boiler plant.
- Access to all areas will be needed for short periods when draining down refilling and testing the installations.
- Closure of the on site road while the new gas mains are installed.

Option 2:

The proposed replacement pipework and radiator works in the East & West Wings will affect all areas of the East & West Wings during the occupied periods.

The Centre Areas will be affected as noted for Option 1.

Option 3:

For the proposed replacement of the central plant the works will be mainly in the basement boiler room with disruption in the following areas for short periods:

- East and West Wings when the new controls are installed.
- All areas when draining, filling, testing and commissioning is carried out.
- Closure of the on site road when the gas main is replaced.

Option 4:

For the proposed replacement of the central plant and the undercroft pipework the works will be mainly in the basement boiler room and undercroft with disruption in the following areas:

- Main corridor when escape provision is made from the undercroft via the access hatches in the corridor.
- Central Area rooms when the connections are made to the new distribution mains.
- All areas when draining, filling, testing and commissioning is carried out.
- Closure of the on site road when the gas main is replaced.

Design & Procurement Period:

In addition to the Construction Programme the design and procurement of the works will also require a period between budget approval and start on site in June to complete the following stages:

- Discussion and agreement of extent of works and cost budget
- Procurement preparation
- Tender action
- Tender analysis
- Contract agreement

6.0 ENERGY USE & CARBON FOOTPRINT

The calculations have replicated the current energy use and carbon emissions.

The following schedule has been prepared to show the current energy use and the energy use for the following:

- Replacement with new central boiler plant with existing distribution mains.
- Replacement with new central boiler plant with new distribution mains.
- Decentralized boiler plant.
- Existing boiler plant and the Energy use if new roof insulation is installed in the Wings and in the pitched roof of the Central Area.
- Decentralised boiler plant and improved roof insulation.

The energy savings, carbon emissions and carbon savings are also shown.

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OPTION	ENERGY USE	ANNUAL ENERGY COST	CO2 EMISSIONS	ENERGY SAVING	COST SAVING	CO2 SAVING
	kWh/annum	£ per annum	Kg/annum	kWh/annum	£ per annum	Kg/annum
EXISTING (gas & pump energy)	653,478	£ 20,645.00	121,414			
NEW CENTRAL BOILER PLANT – using existing distribution mains (Option 3)	491,343	£ 15,616.77	91,581	162,135	£ 5,028.23	29,833
NEW CENTRAL BOILER PLANT – using new distribution mains (Option 4)	442,192	£ 14,173.41	83,157	211,287	£ 6,471.59	38,257
DECENTRALISED BOILER PLANT (Options 1&2)	436,446	£ 13,850.19	81,277	217,032	£ 6,794.81	40,137
EXISTING - PLUS IMPROVED ROOF	550,751	£ 17,390.16	102,299	102,727	£ 3,254.84	19,115
DECENTRALISED BOILER PLANT - PLUS IMPROVED ROOF	367,819	£ 11,664.70	68,474	285,659	£ 8,980.30	52,940

The greatest energy saving and thus fuel cost and CO2 savings would be achieved by Option 1 with decentralized boiler plant.

It is considered the best value for money and business case would be Option 4.

Carbon Reduction Commitment:

The CO2 savings shown above may have an added cost saving in future years should the Council become eligible under the Government's Carbon Reduction Commitment (CRC) whereby the Council would have to pay for every tonne of CO2 it produces in the consumption of energy. At present all companies/organisations which consumed more than 6,000 MWh of electricity through half hourly meters in 2008 have to buy carbon allowances from the Government.

In 2008 the Council consumed 4,325 MWh so are currently under the threshold, however it is widely expected that the Government will lower this threshold in the near future so that more organisations are forced to participate. Should the Council have to start buying carbon allowances then any reduction in the energy they use will result in fewer allowances having to be purchased.

7.0 COMPLIANCE WITH CURRENT REGULATIONS AND LEGISLATION

The proposed works will be required to comply with all current Regulations and Legislation, the ones that will particularly affect this project are:

Building Regulations: Compliance with Part L2B

To obtain compliance will require demonstration that the new installation will meet the energy efficiency standards set out in the Regulations.

Note: The specification will include for the following:

- New boilers, pumps, and equipment to comply with the efficiency requirements of Part L2B.
- Controls to meet the requirements of Part L2B.
- Additional Gas energy metering will be included.
- Commissioning to comply with CIBSE Code M.
- A Building Log Book will be provided.

Additional Requirements of Part L2B:

The Building Regulations require that where a scheme of this size is progressed improvements should be made to the energy efficiency of the building and the existing and proposed services, consequential to the main works. The value of the improvements must be not less than 10% of the cost of the principal works (in this case the boilers themselves) and the improvements should show a payback within 15 years. In relation to the services, we are confident that no matter which option is progressed there are enough consequential improvements above the basic boiler installation works that no additional works will be required.

In respect of the energy efficiency of the existing building the Regulations also state that improvements to the fabric of the building (such as roof and/or cavity wall insulation) are required where technically, functionally and economically feasible, but this is not subject to the 10% limit or a payback period. This aspect of improvement will be dependent on what works are allowed under the building's Listed Building status and will require further discussion with both Building Control and Planning Services. As a result it should be noted that the cost of improving the fabric of the building has not been included in the figures provided in this report however this will be addressed at a later date if cost effective.

Electricity Regulations: 17th edition of the electrical regulations, this will apply to the new wiring serving the new plant and controls.

Fire Regulations:

Gas safety Regulations

Water Regulations

Planning Regulations & Grade 2 Listed Building Consent:

Current advice indicates the proposals will not require Planning Permission as there will be no external alterations to the building structure.

Health & Safety: All works will be required to comply with the Health & Safety at Work Act and the Construction Design & Management Regulations.

Procurement Regulations: The procurement of the works will be required to comply with Tonbridge & Malling Borough Council procurement which will require a full tender action.

This list is not exhaustive and other Regulations will be covered during the design and construction process.

8.0 HEATING INSTALLATION

8.1 DESCRIPTION OF EXISTING PLANT AND INSTALLATIONS

Gibson Building West:

The building complex comprises the following:

- East Wing
- West Wing
- Centre Areas

The layout of the Building is shown on the drawings in Section 13.0

The Building is served by a central heating system with low pressure hot water boiler plant providing heating to radiators in all areas.

Boiler Plant & Heating Circuits:

The boiler plant comprises a 12 module gas fired boiler to provide heating in winter.

There are two pumped heating circuits, one serves the Central Area and the Wings and the other smaller circuit serves the Council Chamber, Committee Rooms and associated support rooms.

The existing boiler plant is situated in the basement plant room of the Centre Area and the heating distribution pipework runs through service ducts under the ground floor of the Centre Area.

The boiler is open vented to a feed tank at roof level.

Each boiler flue connects to a common horizontal flue header connected to a brick chimney with the flue discharge above first floor level.

The existing boilers were installed in the 1983 and have reached the end of their useful life and many key replacement parts are no longer available. At present only 8 out of the 12 modules are in operation. This has been achieved using parts from the broken modules.

The pipework is known to be in poor condition, the pipework in the undercroft is the original pipework installed in 1945.

Where pipework has failed it has been replaced in some areas of the Centre Area and in the Wings.

The pipework insulation in the service ducts contains asbestos in the sheeting covering the insulation material.

The pumps are all single head pipeline pumps, some have the original motor heads and some have been replaced.

Radiators:

The rooms are heated by radiators, most of the radiators have been replaced with steel panel convector radiators since the 1970's and many of the earlier radiators are now in poor condition and require replacement.

Domestic Hot Water Generation Plant & Installations:

Domestic hot water is generated by local electric water heaters.

Controls:

The existing controls and wiring are in poor condition and the controls are not able to operate the installation efficiently.

Gas Installation:

The gas installation serving the boilers is supplied from a gas meter positioned in the garages. A 3" gas main is run underground to the boiler room.

The gas supply is not fitted with an emergency shut off safety valve and therefore is not compliant with current regulations.

Flue/Chimney Installation:

The boiler modules are fitted with a common stainless steel flue system, this is installed into the original brick chimney and is fitted with a discharge cowl above the top of the brick chimney.

8.2 DESIGN ASSESSMENT

Design Standards:

Air Changes:

1.5 air changes per hour in occupied rooms and circulation areas

Temperatures:

Winter external design	-3°C
Offices & Meeting Rooms	21°C
Circulation spaces	19°C
Stores	12°C

Boiler Duty:

The existing heating boilers are rated at 50kW output per module.
Total heating output available 600kW.

A detailed heat loss calculation has been carried out using Bentley-Hevacomp design software and a summary of the results are listed below:

- West Wing 74,241 W
- East Wing 65,351 W
- Centre Area 195,591 W
- Total 325,183 W with roof insulation 276,314 W

Note: The above are the net heat losses and the boiler selection will include a pre-heat allowance.

Plant Design Parameters:

The recommendation for the new boilers would be high efficiency condensing boilers, to ensure the boilers operate at peak efficiency to heat emitters should be designed to operate with a maximum flow temperature of 80°C and a return of 60°C.

The use of weather compensation control equipment will further ensure the boilers operate at maximum efficiency during warmer weather by reducing the return temperature below the condensing temperature of the boilers.

The advantages are:

- Higher boiler efficiency.
- The pump duties will be smaller and more efficient.
- The existing pipework will have a greater capacity.
- New pipework will be smaller.

Pump Duties:

The recommendation is to install new low energy intelligent pumps correctly sized for the system duties.

8.3 PROPOSALS FOR REPLACEMENT INSTALLATIONS AND EQUIPMENT

As stated above the boiler plant and the ventilation plant have reached the end of their useful life and need urgent replacement.

Option 4 – Preferred Option:

New Boiler Plant:

The proposal is to install new boiler plant in the existing basement boiler room with a total output of 420kW.

The new boiler plant would supply LPHW water to serve the radiators in each area.

Plate Heat Exchanger:

The new boiler plant will be connected to the existing installation pipework and radiators which are known to be in poor condition, to ensure the new boiler plant is protected from poor quality water a plate heat exchanger would be installed in the pipework between the new boilers and the existing system.

Dirt separators would also be installed to protect the plate heat exchanger as far as is possible.

Controls:

The proposal is to install 4 separate circuits to serve the following Zones:

- Zone 1 – West Wing.
- Zone 2 - East Wing.
- Zone 3 – Council Chamber, Mayor’s Parlour, Committee rooms, main corridor and associated toilets.
- Zone 4 – Centre Area Offices, Dining Hall and IT rooms.

Each Zone will be fitted with weather compensator control to enable the controls to be set to the requirements of the particular zone.

In addition each Zone would be fitted with time controls and an override control to enable any of the Zones to be used independently of the others when out of hours use is required.

The buildings have a heavy weight construction and the recommendation is to maintain a background heat in the buildings during the unoccupied periods, this will reduce the preheat times particularly on a Monday morning and thus reduce energy use.

Replacement radiators and pipework:

This option does not include for the replacement of any radiators or pipework in the Wings.

The pipework in the undercroft would be replaced using plastic pipework but only up to a point where it can be connected to the mains serving the wings and the individual radiators serving the Centre Area.

The new installation with the Zoned pipework would enable each wing to have the pipework and radiators replaced in the future with minimum disruption to the other areas.

The new Zones would also enable pipework and radiators in the Centre area to also be replaced without affecting the other Zones, this will be particularly useful if emergency repairs are necessary as only that Zone will need to be shut down.

Flues & Chimney:

The new boilers would be connected to a common flue system with the discharge flue installed into the existing brick chimney with a suitable cowl mounted on the top.

Gas Installation:

Initial calculations indicate the existing 3” gas main to the central boiler room will not be suitable for use with the new boilers as it will not meet the gas regulations for high efficiency boilers.

A new 4” gas main would be installed to serve to new boiler plant.

Options 1 & 2:

Option 1 will provide the greatest energy saving – see notes in conclusions.

New Boiler Plant:

The proposal is to install new decentralized boiler plant as follows:

- West Wing – one 90 kW gas fired condensing boiler
- East Wing – one 90kW gas fired condensing boiler
- Centre Area – three 90kW gas fired condensing boilers

The new boiler plant would supply LPHW water to serve the radiators in each area.

The boilers serving the West and East Wings would be situated in the roof storage area and new distribution pipework would be installed to connect to the existing pipework distribution system in Option 1 or new pipework distribution in Option 2.

The boilers serving the Centre Area would be situated in the existing basement boiler room and would be connected to the existing pipework distribution system

Option one would reuse the existing radiators and pipework in the West & East Wings, the existing distribution mains would be capped off at a suitable point and the new distribution mains from the new boiler would be connected to the existing system.

The Centre Area distribution mains would remain as existing up to the capped off points.

Option 2 this would have new boiler plant as for Option 1.

The existing heating circuits in the West & East Wings to be made redundant and removed and new heating circuits to be installed to meet the requirements of the new heat emitters.

The Centre Area heating system to remain as existing.

Radiators:

The existing radiators are a mixture of original cast iron radiators, and steel panel radiators from each decade since the 1970's, some of the radiators are in poor condition.

The proposal is to replace all of the radiators in the West & East Wings with new steel panel convector type radiators sized to suit the heat loss of each room.

Each radiator would be fitted with a new thermostatic radiator valve and lockshield valve.

Pipework and Plate Heat Exchangers:

Option 1 would reuse the existing pipework which is known to be in poor condition and the proposal is to separate the new boilers from the existing installation pipework using plate heat exchangers.

Option 2 would use new pipework without the need for plate heat exchangers in the wings. A Plate heat exchanger would be used in the Centre area. The new pipework would be either copper with crimped joints or plastic pipework with mechanical joints.

Where pipework is exposed in the rooms it is proposed to insulated and encase the pipework to eliminate the residual heat from the pipework and thus improve the control from the thermostatic radiator valves.

Boiler Flues:

The new boilers in the Centre Area basement plant room would be connected to a common flue system utilizing the existing boiler chimney.

The new boilers in the West & East Wings would each be fitted with a concentric flue system installed into one of the existing chimney's with a concentric flue outlet above the top of the chimney. This will meet the requirements of the Planning Officer and avoid making holes in the existing roof and the asbestos sheeting.

Gas Installation:

The existing gas meter is positioning in one of the garages and an underground main serves the existing boiler plant in the basement boiler room.

The existing main is run in steel pipework in the garages, it is not known if MDPE pipe is used underground, where the steel pipe enters the ground it is wrapped in protective Denso tape and therefore it is possible the underground main is also in steel pipe.

For purposes of the design and budget costs it is assumed the existing gas main is reusable to serve the new boilers in the Centre Area.

To serve the proposed new boilers in the roof voids of the Wings a new 50mm gas main will be run through the back of the garages in each direction to exit into the ground and then run in MDPE gas pipe underground to each Wing.

The gas mains will exit the ground and enter the buildings above the DPC level and rise through an office to the roof void and then to the respective boiler.

Option 3:

Option 3 is the lowest cost option but is not recommended as it will not eliminate the risk from failure of the mains in the undercroft.

This option is as Option 4 but without the replacement of the mains in the undercroft or the installation of the 4 zones to allow improved control of the building.

Removal of existing plant and equipment:

Allowance has been made in the budget cost for all options to remove all redundant plant and equipment and for it to be disposed of in accordance with the Waste Disposal Regulations.

9.0 PROPOSALS FOR IMPROVEMENTS TO THE BUILDING FABRIC

The Buildings have Grade 2 Listed Building Status and therefore any alterations will have to ensure there is no infringement of the status.

The pitched roofs in the Wings, over the Council Chamber, Committee Rooms and the Existing Dining Room are lined with asbestos sheeting.

The wall construction is unknown but it is thought there is a large cavity in the external walls.

It is therefore considered it will be extremely difficult and costly to make improvements to the building fabric however the following options have been considered:

Roof Insulation:

The heat loss calculation summary details the saving that could be achieved in both energy use and CO2 emissions if roof insulation is installed in all pitched roofs except the two small roof areas over the Emergency Planning Area and IT Training.

The energy costs savings are indicated in the schedules but no attempt has been made to cost the proposal, this can only be done when a method of installing the insulation has been made. The most cost effective time to install the insulation would be when the roof requires major repair or replacement.

Improved Windows:

Replacement of the existing windows with new double glazing units is unlikely to be approved under the Listed Building Status and would also have a very high cost and be disruptive to the offices.

Secondary glazing has been fitted in some rooms and this could be installed in all areas. The use of secondary glazing will help to improve energy use and will have the most effect in high winds by reducing infiltration.

Cavity Wall Insulation:

Cavity wall insulation would help to reduce energy use but could be difficult to install for the following reasons:

- Forming holes in the external facade may not receive Listed Building Consent
- If there is a large cavity in the walls the quantity and cost of the insulation will increase.
- It may not be possible to ensure insulation in a large cavity will not settle over a short period thereby negating the effect of the insulation.
- Cavity wall insulation can create moisture paths across the cavity resulting in condensation problems on the inner surfaces.

10.0 BUILDERS WORK IN CONNECTION WITH THE HEATING INSTALLATION

The proposals for the replacement boiler plant and heating installation will also involve a large amount of builders work and the main items are listed below:

Removal of Redundant Plant:

- Opening up service ducts.
- Scaffolding for flue.
- Making good walls and floors.
- Disposal of redundant materials.

Pipe Casings:

- Construction of pipe casings.
- Painting & decoration of new casings.

Suspended Ceilings:

- Taking down and replacing suspended ceilings to enable installation of new pipework.
- Supply and installation of new ceiling tiles where required.

Roof Voids:

- Protection of asbestos sheeting in working areas.
- Opening up chimney's in Wings for installation of new flue systems.

Gas main:

- Forming and making good trenches for new gas mains to Wings.
- Forming and making good holes in walls, floors, and ceilings for new gas pipework.
- Construction of casing over exposed pipework in rooms.

General Items:

- Scaffolding, hoists and safe access provision – roof access.
- Forming and making good holes in walls, floors, ceilings.
- Provision of protection to finishes during construction works.
- Redecoration of damaged areas.
- Disposal of redundant materials.
- Contractors compound with mess room, toilets and storage facilities.
- Safety fencing where required.
- Craneage if required.
- Health & safety & welfare.

11.0 INSTALLATION OF SUSTAINABLE AND LOW CARBON EQUIPMENT

There are many options for sustainable and low carbon equipment but most are unsuitable for the Gibson Building West, the following options could be used and are listed with comments regarding suitability:

Thermal solar panels to provide heating to the domestic hot water – not suitable as the hot water is generated at point of use. A central system would be inefficient due to the extensive distribution mains required.

Photovoltaic solar panels to provide a proportion of the electrical energy, this could be a viable option but would require approval Listed Buildings Consent. Note the recent reduction in the Feed In Tariff has made PV Panels less viable.

PV-T combination Hybrid photovoltaic and solar panels to provide a proportion of the electrical energy and heating to the domestic hot water, these panels improve the performance of the photovoltaic panels by using the thermal solar panels to cool the PV panels – this is not a viable option because the thermal panels would provide very large quantities of hot water for which there is no practical use. The quantities would be far in excess of that provided for the domestic hot water load, see also comments above regarding thermal solar panels.

Air to water heat pump to provide thermal energy for the heating system. This could be a viable option but would require the heat pumps to be mounted reasonably close to the connection to the heating system.

This would probably be impractical given the need to meet Listed Building Requirements, also capital costs would be increased and additional costs would be incurred to eliminate the noise generated by the units.

The thermal energy would be low grade energy and therefore changes to the existing heating system would be required, i.e. larger radiators, possible increased size of the incoming electrical supply and also a back up heat source would be required when the outside temperature drops below 1°C.

Ground source heat pump to provide thermal energy for the heating system, this could be a practical option subject to the local Geological conditions. The capital costs would be very much greater and larger radiators would be required.

Biomass Boiler plant could be an option but would require space for the fuel store and possibly a larger chimney which would require approval from the Listed Building approval.

Also there would be additional capital costs, maintenance and attention required to ensure the boiler operates reliably and efficiently.

Summary Comments:

All of the above practical options would have a high capital cost and although they would reduce the bought energy and carbon emissions the recommendations in this report could achieve similar energy and carbon savings.

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The main plant item that produces carbon emissions is the gas fired boiler plant, the installation of new higher efficiency boilers and improved controls will result in a reduction of carbon emissions.

Future increased energy costs and legislation to reduce Carbon Emissions will make sustainable and low carbon equipment more viable and alternative options should be regularly considered.

It is however important therefore to design the replacement systems to achieve low energy use and wherever possible for a low grade heat energy source in the future and this has achieved when sizing the new radiators and the replacement pipework systems for the Wings,

12.0 PHOTOGRAPHS



WEST WING



CENTRE AREA – COUNCIL CHAMBER & ENTRANCE



EAST WING



DINING HALL & IT OFFICES

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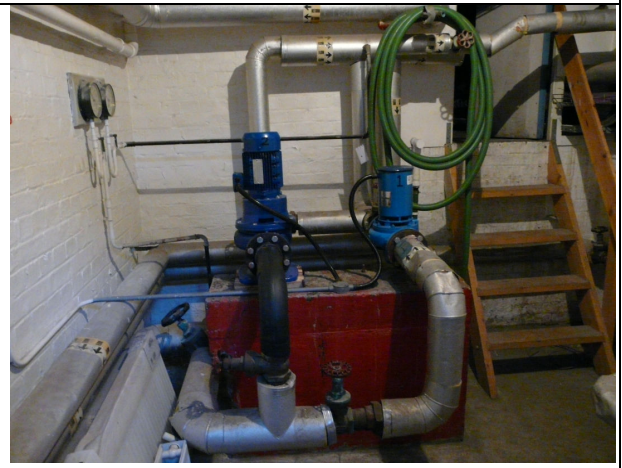
CENTRE AREA FROM NORTH



**POST ROOM & STAFF RECREATION
BUILDING**



**EXISTING BOILER PLANT SHOWING
REDUNDANT MODULES AT THE
BOTTOM**



**EXISTING MAIN PUMPS SHOWING ONE
ORIGINAL AND ONE REPLACEMENT
PUMP (on left)**



**PIPEWORK IN UNDERCROFT (under main
corridor)**

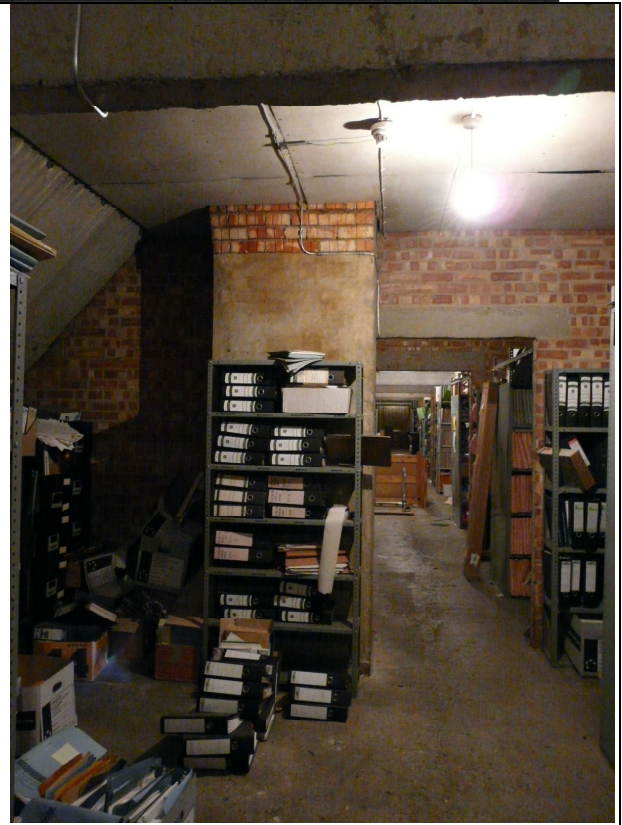


**PIPEWORK IN UNDERCROFT (From
pump room)**

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ROOF OVER DINING ROOM – SECTION WITH NO ASBESTOS SHEETING



WEST WING CHIMNEY IN ROOF VOID – PROPOSED POSITION FOR NEW BOILER (OPTIONS 1 &2)



WEST WING ROOF WITH ASBESTOS SHEETING



ROOF OVER DINING ROOM SHOWING SECTION OF ABESTOS SHEETING

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REPLACEMENT PIPEWORK



SERVICE DUCT COVER IN FLOOR



**EXISTING PIPEWORK AT LOW LEVEL -
UNCASD**



**VIEW LOOKING INTO EXISTING ENTRY
SERVICE DUCT WITH REDUNDANT
CONTROL EQUIPMENT**



**EXISTING PIPEWORK AT LOW LEVEL IN
PIPE CASING**



**COVER OVER EXISTING HEATING
MAIN ENTRY POINT AND CONTROLS
ARRANGEMENT**

**TONBRIDGE & MALLING BOROUGH COUNCIL
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**GARAGE WITH GAS METER AND
 SHOWING GAS MAIN INTO GROUND
 WITH DENSO PROTECTIVE TAPE**



**WEST WING – PROPOSED ROUTE
 ACROSS ROADWAY FOR NEW GAS
 PIPE (OPTIONS 1 & 2)**



**EAST WING – PROPOSED ROUTE
 ACROSS ROADWAY FOR NEW GAS
 MAIN (OPTIONS 1 & 2)**



**END OF GARAGE BLOCK – NEW GAS
 MAIN TO EXIT ON END AND RUN IN
 GROUND AROUND ELECTRICITY SUB-
 STATION (OPTIONS 1 & 2)**

13.0 DRAWINGS

Ground Floor Plan Service Ducts

Ground Floor Plan

First Floor Plan

Elevations

GF Zones

FF Zones