OXFORD HEET CASE STUDY 2: OXFORD TOWN HALL

BUILDING DESCRIPTION

Late Victorian, Grade II* listed civic centre on three floors with basement, built 1893-7. There is a later Art Deco extension on four floors with basement at the northernmost end of the building. Mixed use including shop, City Council headquarters - offices, council chamber, meeting and function rooms, performance space (the main hall), museum and community resource and heritage centre. Also incorporates a residential flat.

Much of the building perimeter opens to sheltered courtyards and where exposed, the predominant elevations are west and south facing. The footprint perimeter to area ration is a compact 0.17.

Walls are fair faced or ashlar dressed solid brick with no insulation, over a pre-existing cellar. Roofs are of lightweight timber structure with slate tile covering. With the exception of the top floor of the Art Deco extension, these are not habitable. Whilst insulation has been applied horizontally above ceilings in the panel room and flat, the roof space over the vaulted ceiling of the main hall is uninsulated.

Windows are predominantly single glazed, steel framed fixed light, casements or top-hung projecting in configuration, with stained glass panels to principal rooms. Some windows have been sensitively upgraded with secondary glazing.

Feature skylights punctuate vaulted ceilings over the main staircase landing and the IT office in the Art Deco wing, and though these have an adverse effect on heat loss, they offer heritage value and psychological benefit to occupants.

Fireplaces in principal reception areas have been sealed, but there are some smaller rooms where they remain open.

Although the historic ventilation system is used as a fresh air intake in summer, it is not fully understood and is a potential resource for improving natural ventilation in the building.

Central heating is via radiators with TRVs or fan coil units with integral controls, connected to a LPHW system served by eight modular boilers. LPHW pipes are lagged in basement areas, whilst connections to radiators are not.

Hot water is supplied either centrally via two direct gas fired water heaters in the basement, or locally via point of use boilers, some of which are very old and due for replacement.

Voltage optimization has been fitted to reduce energy consumption. Lighting is via manually switched low energy lamps throughout, with PIR control to the basement area only

The building achieves a 'C' rating on its current DEC, demonstrating that old does not necessarily mean inefficient.

HERITAGE VALUE

Designed in exuberant Jacobean style, the impressive principal front to St. Aldates is virtually symmetrical, with large projecting mullioned windows, semi-octagonal turrets, ornate finials and gables, topped by a decorative timber lantern. The corner to Bear Lane has an ornate domed octagonal projection. 'Large and unashamedly 'showy' exterior with a 'sumptuous interior' (Sherwood and Pevsner [1974], built to celebrate the city becoming a county Borough

Aesthetic Value: '*Value deriving from the ways in which people draw sensory and intellectual stimulation from a place'*

Building	Setting
Stone frontage makes a remarkable contribution to the appearance and the quality of the top end of St Aldates. Impressive entrance, main circulation areas and public spaces derive their effect from design and choice of facing materials. Committee rooms and function rooms impress with their design, decoration and fittings and ample proportions reflecting the enhanced status of the headquarters of the new County Borough*.	Important element in the character of the City close to Carfax, the busy centre of the City and of the Central (University and City) Conservation Area.

Communal Value: *'Value deriving from meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory'*

Operates as the formal civic focus for the City and as an important entertainment venue and museum facility playing an important and more informal role in the cultural life of the City.	This end of St Aldates is less of a commercial area but is important in daily city life as a major location for accessing public transport.

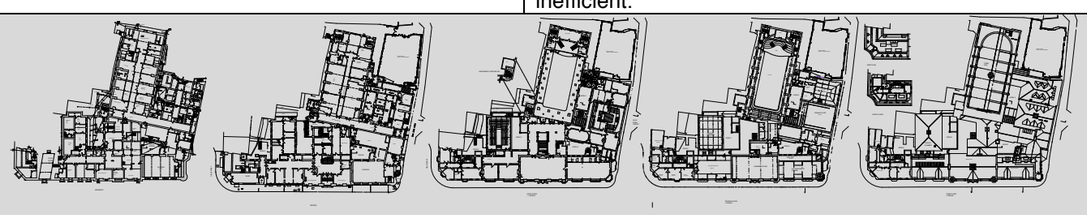
Evidential Value: *'Value deriving from the potential of a place to yield evidence about past human activity'*

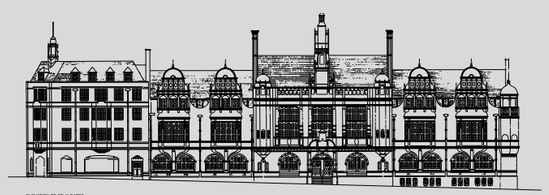
Built on site of previous new Town Hall (1751-2) itself on top of a C14/15 cellar, evidence of continuity in the city centre. Hierarchy of spaces (evidence in location, scale and décor) alludes to past historical requirements and values.	Carfax as a crossroads represents the survival of the original Saxon city layout.

Historical Value: *'Value derived from the ways in which past people, events and aspects of life can be connected through a place to the present'*

Showy and sumptuous building embodies new City status when built, an now combines the governance of the City with modern cultural activity. Hierarchy of spaces (evidence in location, scale and décor) illustrates civic pride, past historical requirements and the relative importance placed on activities, and the relationship sought in past times between the design and function of civic spaces.	The Town Hall forms a significant part of the historic backdrop to City Centre commercial and social activity.

*County borough' was a term introduced in 1889 in the United Kingdom of Great Britain and Ireland (excluding Scotland), to refer to a borough or a city independent of county council control. They were abolished by the Local Government Act 1972 in England and Wales (Wikipedia).





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Element	Assessment	Maintenance Issues	Retrofit Options	Heritage Impact		Planning Permission/LBC required	Advice Required	Recommendations/Comments
FABRIC								
Pitched Roofs	Slate coverings on timber boarded sarking, with insulation on flat ceilings over the flat adjoining the old library. Over the Main Hall, the ceiling is vaulted, and the interface between rafters and the convex surfaces of the ceiling vault would be difficult.	Check integrity of flashings, keep gutters and downpipes free from debris, as blocked pipes can lead to dampness in walls and thermal discomfort via evaporative cooling of fabric	Apply additional insulation at ceiling level, up to a max of 300mm.	Low	☺		Architect, Conservation specialist	Applying additional insulation at ceiling level is a quick and cost effective measure with low heritage impact.
			Apply insulated roofing membrane below rafters to minimise ventilation heat loss to 'room-in-the roof' spaces	Low	☺		Architect, Conservation specialist	Applying multi-foil insulation below rafters will improve air-tightness and reduce heat loss. A moderately expensive but quick measure with no impact
			Apply insulated roofing membrane above rafters to minimise ventilation heat loss to 'room-in-the roof' spaces	Low	☺	Listed Building Consent	Architect, Conservation specialist	Applying multi foil insulation above rafters is most cost effective when carried out in conjunction with replacement of roof covering. A moderately expensive but quick measure with no impact
			Apply insulation between rafters, combined with vermiculite or other loose fill insulation to hard to reach crevices	Low	☺		Architect, Conservation specialist	Applying additional insulation between rafters is a quick and cost effective measure with no impact. Ideally vermiculite insulation should be overlaid with boards or boxed-in so that it is not disturbed.
Flat Roofs	Isolated flat roofed areas recently re-covered in single ply membrane	Check integrity of membrane periodically, particularly joints. Ensure outlets are free of debris. Provide designated walkways in reinforced membrane to avoid damage by maintenance traffic. Insulate internal downpipes as condensation on pipe walls can cause dampness in adjoining building fabric.	Insulation applied above the roof deck as part of re-covering work has enhanced energy performance	Low	☺	Listed Building Consent	Architect, Conservation specialist	No further work recommended at present. Regular inspection required to ensure integrity of membrane.
Walls	Traditional construction of fair faced or ashlar dressed brickwork		Insulate walls	High - External insulation would hide historic stone/brick detailing	☹	Listed building consent, planning permission	Architect, Conservation specialist	Applying wall insulation offers a high potential energy saving, but would be extremely damaging to internal and external decorative features given the building's significance. There is also an increased condensation risk. Not recommended in this instance.
				High - Internal insulation would reduce floor space and hide internal historic detailing	☹			
Ground Floor	Suspended timber floor over unheated/ partially heated basement with solid floor. No evidence of floor insulation.		Apply draught sealing to floorboard joints or impervious floor covering	Low	☺	Listed Building Consent	Architect, Conservation specialist	Take care to ensure that basement ventilation is not compromised.

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Windows	Single glazed steel casements, fixed directly to stone surrounds or within timber sub-frames.	Regular maintenance to prevent corrosion of steel frames.	Draught stripping	Low	☺	None	Architect, Conservation specialist	Steel framed windows require particularly sensitive approach. In this instance an appropriate proprietary system has been applied successfully, for example in the St Aldates room.
		Replace broken panes to reduce draughts and water ingress	Secondary glazing	Medium	☺	Listed Building Consent	Architect, Conservation Specialist	Consider ease of operation and impact on internal features. Applied successfully in limited locations for example in the St. Aldates Room, where ehnhanced acoustic performance
		Clean regularly, particularly in a city centre location like this as dirty windows reduce benefits of daylighting	Heavyweight/ thermally lined curtains	Low	☺	None	None	Relatively quick and easy solution. Carefully consider impact on feature windows and sensitive internal features. Applied successfully to clerestory windows in the Main Hall.
Main Entrance Doors	Partially glazed timber panel doors to main entrance, with ornate pediment incorporating stained glass windows internally.		Draught stripping	Low	☺	None	Architect, Conservation Specialist	Draught stripping is a relatively simple and cost effective measure. On the principal entrance doors which are subject to heavy traffic, seals would be vulnerable to damage, hence detail needs careful consideration
			Draught lobby	Medium	☹	Listed Building Consent		Installing a draught lobby would be more appropriate to high traffic areas where space permits. This not practical in this instance due to the limited depth of the entrance porch and proximity of steps down to street level.
			Air curtain	High	☹	Listed Building Consent		Air curtain would be inappropriate as it would adversely affect important internal features (ornate door pediment with stained glass window inserts).
Skylights	Both the main stair landing and the IT office in the Art Deco extension benefit from skylights – the former more for decorative effect with a stained glass occulus set in the decorative ceiling vault, whilst the functional benefit of the latter is obviated by uniform illumination from suspended fluorescent fittings.	Clean regularly, particularly in a city centre location like this as dirty glazing would reduce benefits of daylighting	Consider photoelectric sensors in conjunction with overall lighting strategy.	Low	☺		Lighting Engineer	Local task lighting combined with a lower level of general illumination in the IT office would improve ambience, however, given that low energy fittings have been installed in most areas, energy saving is unlikely to be significant.
			Install double/secondary glazing	High	☹		Architect, Conservation Specialist	Installing double or secondary glazing in this instance is not advisable due to detrimental effect on historically important features – the skylight over the IT office is glazed in curved glass, which is expensive to replicate properly. The decorative features in the vaulted ceiling into which the oculus over the stairs is set would be adversely affected

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SERVICES								
Boilers	Low-pressure hot water (LPHW) system is served by 8 no. Potterton Derwent HE gas fired boilers located within the basement boiler room. The boilers are circa 20 years old and have an efficiency of around 80%.	Although the boilers are old, they appear to be in good working order and have been regularly maintained.	Replace with new, higher efficiency boilers	Low	☺	None	HVAC Engineer	The existing plant appears to be functioning well and could have up to 5 years service life. Though there would be an improvement with newer boilers, replacement is a major project that would involve significant cost. Continued regular maintenance is recommended with programmed replacement in 5 years.
Heating Controls	There is a very simple, central Trend control system to the main boiler plant. The building is not separated into different control zones.		Introduce heating zones to align with use patterns.	Medium-High	😐	Listed Building Consent	Architect, Conservation Specialist HVAC Engineer	Disparate space uses and usage patterns across the building suggest that this could be beneficial. Likely to be an expensive process involving extensive re-routing of LPHW pipework that could impact on internal features, so careful pre-planning would be needed. Alternatively consider the use of wireless TRVs and room thermostats linked to existing zone control valves.
Distribution Pipework	LPHW distribution pipework, insulated at basement level, but with long uninsulated runs on upper floors and final radiator connections.	Build-up of sludge and lime scale within pipework can cause corrosion of pipework and other components, whilst reducing efficiency over time.	Periodic power flushing of the system	Low	☺	None	HVAC Engineer	This should be carried out as part of the regular maintenance cycle.
		Unlagged pipework leads to heat loss and undermines local control via TRVs	Apply lagging to uninsulated pipe runs	Medium	😐	Listed Building Consent only if likely to affect historic features.	HVAC Engineer Conservation Specialist.	This needs to sensitively done to avoid compromising key internal features.
Heat Emitters	A mixture of cast iron and pressed steel LPHW radiators with thermostatic radiator valves (TRVs), connected to the main boilers serve most rooms.	Build-up of sludge and lime scale in radiators can cause corrosion whilst reducing efficiency over time.	Periodic power flushing of the system.	Low	☺	None	HVAC Engineer	This should be carried out as part of the regular maintenance cycle.
	Radiator reflector panels have been introduced behind some radiators on heat loss walls.		Apply radiator reflector panels to all radiators on heat loss walls	Medium – conservation had previously objected to adhesive mounting of reflector panels on tiled wall.	😐	Listed Building Consent only if likely to affect historic features.	HVAC Engineer Conservation Specialist	Review currently available mounting adhesives to determine most suitable for application on historic finishes.
	Larger rooms such as the Main Hall and the Assembly room are served by LPHW fan coil units with integral thermostats, connected to the main boilers							None
	Local electric heaters, some fixed (St Aldates Room), some portable (Main Hall Green Room), are also in use alongside the main LPHW system. These are all manually switched with no automatic controls.		Where possible, replace electric heaters with heat emitters/fan coil units served off LPHW system.	Medium	😐	Listed Building Consent	HVAC Engineer Conservation Specialist.	Pipework routes need to be carefully pre-planned to limit impact on key internal features.
			Also, consider self contained, local combination boiler to serve the Green Room; this has the added benefit of improved local hot water supply.	Medium	😐	Listed Building Consent	HVAC Engineer Conservation Specialist.	Recommended. Pipework routing would be easier to manage and more cost effective. Heat loss from long runs would also be eliminated.

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	A gas fire with back boiler serving a local LPHW system serves a separate small flat above the old library. This system is connected to pressed steel radiators without TRVs in individual rooms.		Replace back boiler with more efficient modern combination boiler. Install TRVs to all radiators.	Low	☺	None	HVAC Engineer	As above. Additionally, carefully consider location of boiler flue.
Domestic Hot Water	Central system served by 2 no. Andrews direct gas fired heaters, efficiency 76%, within basement boiler room serving main toilet block and kitchen		Install more efficient modern heaters	Low	☺	None	HVAC Engineer	Replace at end of service life to maximise cost efficiency.
	Local electric point-of-use boilers to sanitary accommodation within the Art Deco Extension, Heritage Centre and Main Hall Green Room.		Install more efficient modern heaters. Also, consider modern, local combination boiler to serve the Green Room; this has the added benefit of improved local heating.	Low-Medium	☺	None	HVAC Engineer Conservation Specialist.	Pipework routes need to be carefully pre-planned to limit impact on key internal features.
Ventilation	Local mechanical extract ventilation is provided to toilets – on the ground floor this is PIR controlled.		Install PIR controls to all mechanical extract vents.	Low	☺	None	HVAC Engineer	PIR installation is likely to have minimal impact on overall consumption can be done when current systems are due for replacement.
	Mechanical extract to the bathroom of the separate flat is poorly routed via a duct that passes, via the private stairwell through a window. The duct/window junction is not well sealed and is a source of air infiltration		Ensure ductwork penetrations through external building fabric are well sealed. Alternatively, re-route ductwork to exit at roof level.	Low	☺		HVAC Engineer	Current arrangement with visible ductwork in stairwell is unsightly. Recommend re-route through roof vent.
	Habitable rooms are naturally ventilated via operable windows.	Ensure locks and handles are in good working order. Where necessary, provide operating instructions to users to avoid damage to historic fabric.		Low	☺	None	None	Management plan only.
	There are a number of disused open fireplaces in the building that are sealed and some that are not; this can lead to cold draughts in winter and subsequent increase in heating load. Conversely, open chimneys can aid natural ventilation in the summer months.	Ensure that chimney pots are capped and that grilles are provided to maintain ventilation and prevent dampness in chimneybreasts.	Where open chimneys are required to maintain ventilation, install inflatable chimney balloons during the heating season, and remove during the summer months.	Low	☺	None	None	Management plan only.
	There is a historic supply air ventilation system with 3 no. fans at sub basement level. These draw fresh air from a sheltered light well, via acoustic louvers to a network of tunnels and vertical risers in the building fabric. These open to local supply grilles, incorporated in walls and ceilings of larger rooms, and terminate in the distinctive roof mounted turrets. At the base of the vertical risers, there are a series of manually operated dampers, LPHW heating coils, and thermostats. Historically the dampers were used to control the flow of supply air to rooms, and the coils to pre-heat / temper cold air before it enters the occupied areas. The pre-heat facility is not fully understood, and the LPHW coils do not have sufficient duty for use during the winter, limiting use to summertime fresh air ventilation only.		Re-activate traditional air handling system.	Medium	😐	Listed Building Consent	HVAC Engineer	Carry out a detailed survey of the historic system to ascertain exact duct routes and how individual rooms are served and controlled to allow more efficient use of the system. It may also be possible to reuse existing tunnels and vertical ducts to incorporate modern fan coil units with automatic controls to effectively heat and ventilate the larger spaces in the building.

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Lighting	Low energy lamps used throughout. PIR control is installed in the basement but not elsewhere.		Install PIR sensor controls to 'back of house' areas	Low	☺	None	Lighting Engineer	Recommended, a relatively low cost option that can be carried out quickly. Consider carefully integration with historic fabric and important internal features.
	The lighting to the central public sanitary accommodation on the ground floor is time clock controlled, with no local switching.		Review time clock controls and make seasonal adjustments as required, or consider the use of PIR control.	Low	☺	None	Lighting Engineer	Recommended, a relatively low cost option that can be carried out quickly. Manage via facilities team.
	There is no daylight sensor control installed.		Install daylight sensor control to areas with good levels of natural light	Low	☺		Lighting Engineer	Recommended, a relatively low cost option that can be carried out quickly. Consider carefully integration with historic fabric and important internal features.
Power Supply	Voltage optimization has been fitted to the main incoming power supply. This acts systematically to control reductions in voltages received by the consumer, thereby reducing energy consumption.				☺			Retrospectively, it is difficult to assess the benefit of this measure. Greatest potential for saving would be achieved with old incandescent or fluorescent and discharge lighting with conventional control gear. Whilst the move to low energy light fittings would reduce the savings in this instance, there are still a number of fixed speed drives and pumps that would benefit from lower energy use.

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MANAGEMENT								
Sub-Metering	There do not appear to be any sub-meters installed in the building.		Install sub-meters to facilitate monitoring of use patterns in different parts of the building	Low	☺	None	HVAC Engineer Electrical Engineer Conservation Specialist	Recommended. For a building of this size and complexity, sub metering provides valuable data to inform decision making on focus for future improvements, and monitoring of those already undertaken.
Display Energy Certificates	As the Town Hall is a public building, it must have a display energy certificate under European Law. The first certificate for the building was issued in March 2009, and the accompanying recommendation report highlighted potential improvements, rating them as having low, medium or high impact. High and medium impact ones are listed under EE options.		Engage experts to review the HVAC control systems settings and propose alterations and /or upgrades to suit current occupancy patterns		😐			Recommend survey of historic ventilation is included in this process as highlighted above.
			Engage experts to review the building lighting strategies and propose alterations and/or upgrades to day lighting provision, luminaires and their control systems, and an implementation plan		☺			Partially implemented, re-lamping with low energy fittings done, control system installed to toilet areas. Recommend further improvement of controls with PIR and daylight sensors.
			Consider fitting variable speed drives to primary heating pumps		☺			Recommended as part of future boiler upgrade works
			Consider fitting voltage optimisation		☺			Implemented, but benefit is not easily measurable.

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RENEWABLE OPTIONS								
Solar Thermal Hot Water	Solar access is available via roof slopes within 30^{O} of due south. Hot water demand would need to be assessed to establish viability.			High	☹	Listed Building Consent	Conservation Specialist Renewables Consultant	This would impact historically important Oxford roofscape. Not recommended
Photovoltaics	Solar access is available via roof slopes within 30^{O} of due south.			High	☹	Listed Building Consent	Conservation Specialist Renewables Consultant	This would impact historically important Oxford roofscape. Not recommended
Wind Turbines	Wind resource assessment required.			High	☹	Listed Building Consent	Conservation Specialist Renewables Consultant	This would impact historically important Oxford roofscape. Not recommended
Biomass Boilers	These could be considered as a boiler replacement option.			Medium	😐		Conservation Specialist Renewables Consultant	Heritage impact in relation to routing of flues. A large fuel storage area would be required and the logistics of delivery and maintenance impractical. Air quality issues around emissions. Not recommended.
Ground Source Heat Pump	Building size suggests the depth/ area of pipework would be substantial. Less efficient in historic buildings as these tend to have higher air change rates. Heat pumps work best on buildings with highly insulated, airtight envelopes that can be heated with relatively low temperature systems such as under floor heating. Resizing/additional heat emitters would be needed.			High	☹		Conservation Specialist Renewables Consultant	Drilling within archaeologically sensitive location would be required. Not recommended.
Air Source Heat Pump	Potential exists to locate outdoor units in internal courtyards, with units serving larger, intermittently used spaces. Performance issues with heat pumps in historic buildings as noted above. Resizing/additional heat emitters would be necessary.			Low	😐		Conservation Specialist Renewables Consultant HVAC Engineer	Explore possibility of incorporating this in the historic ventilation system. Limiting use to intermittently used spaces would reduce energy draw required to drive fans.
Combined Heat and Power Unit	To run efficiently CHP unit would need consistent heat load throughout the year. It would also require coupling with back-up boilers and has implications on plant space, and require additional flues.	Shorter service interval than conventional boilers		Medium	😐		Renewables Consultant HVAC Engineer	Carry out cost-benefit analysis prior to main boiler replacement, note issues around additional plant space and flues.