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DOMESTIC WATER SERVICES

CONDITION REPORT AND RECOMMENDATIONS

April 2023

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1. INTRODUCTION

PB Design and Consultancy Ltd were commissioned by Ware Town Council on 22nd February 2023 to carry out a site survey and report on the existing domestic water services at the Priory Lido changing facilities.

The survey was carried out on 14th March 2023, by Peter Murphy of PB Design

In attendance were Terry Philpott (TP) Town Clerk Ware Town Council, Kat Harter (KH) Operations Manager Ware Priory and Stuart Roberts (SR) Managing Director iCON Building Consultancy.

2. SITE SURVEY AND BACKGROUND INFORMATION

A visual non intrusive survey was carried out, where information was gathered on the existing domestic water plant etc.

Both KH and TP provided guidance on the usage patterns, numbers of occupants, frequencies of use etc which assisted in developing the recommendations of this report.

The main issue highlighted is that the existing hot water systems do not provide sufficient hot water for the users, and they frequently run out of hot water during periods of high occupancy.

There is also concern over the lack of number of showers, however there is little that can be done to alleviate this problem given the lack of space to provide additional shower points.

In looking at possible solutions to provide additional hot water storage, the client is keen to ensure that energy conservation is a high priority and therefore any recommended solutions need to avoid heating up large quantities of hot water during periods of low usage.

3. DESCRIPTION OF EXISTING DOMESTIC WATER SERVICES

There is an existing 63mm MDPE incoming cold water main within the plant room that serves both the pool and the domestic water outlets.

All cold water within the building is direct from the main with no cold water storage on site.

Hot water is provided by 2No 250 litre capacity unvented direct electric cylinders serving the changing areas and a point of use electric water heater that serves the maintenance area sink only.

There are currently 2 showers in the family changing room served from one of the cylinders and a total of 5 showers in the male and female changing rooms served from the other cylinder.

There are also 5No shower outlets externally served with cold water only.

Each shower is provided with a thermostatic blending valve (with the exception of the external showers)

Pipework is generally copper and in reasonable condition however significant quantities of the pipework is uninsulated and there is no secondary return pipework or trace heating which results in wasted energy and excessive water consumption and is also a potential risk in terms of the control of Legionella bacteria.

It has been advised that the current electrical supply to the building has recently been upgraded however it is close to its maximum capacity due to the installation of the new heat pump to serve the refurbished pool plant.

There is an existing gas supply to the plant room that previously served the pool water boilers (which have been removed)

The new pool plant includes for the provision of 2No 50KW gas boilers (to provide back up to the air source heat pump)

The existing gas supply is metered and the meter capacity is 3000 ft^3/hr (approximately 85m^3/hr) and the incoming supply pipe is 65mm.

Whilst the actual supply capacity would need to be confirmed by the gas supplier, it appears that there is more than sufficient capacity in the existing supply to serve future gas fired water heaters in addition to the new boilers.

4. PRELIMINARY CALCULATIONS AND ASSUMPTIONS

The showers at the Lido are the main demand on the hot water systems and therefore form the basis of the sizing of the plant.

For the purpose of this report the wash hand basins have not been considered in preliminary sizing as the loading on these is minimal compared to the showers.

Normally, when sizing plant and pipework for showers and allowance of 9-10 litres per minute (l/m) is made for a reasonable shower supply. Of that 6 l/m would be hot water based on a showering temperature of 40^{o}C

An average showering time in public buildings such as leisure facilities, sports centres etc. would be around 5-6 minutes.

Based on the above, a typical shower in a public shared facility will use around 35 l/m.

In the case of the public swimming pools the showering time is generally a lot lower as users are only using showers to wash off chlorine etc.

Also, the actual shower temperature is normally required to lower so that it is only 1 or 2 degrees above the actual pool water temperature.

Taking the above into account, it is assumed that a typical shower at the Lido would last around 2-3 minutes at a mixed water temperature of 30^{o}C, meaning that a total of around 10 litres of hot water per shower is required.

The existing hot water cylinders are 250 litre, meaning in theory each cylinder should provide hot water for around 25 showers (ignoring losses due to pipework dead legs and heat loss)

It is very likely that the showers in the male and female changing rooms will get used more frequently than the family changing area meaning that system will get used up quickly.

It has been advised that a peak usage session could be up to 200 people.

It is unlikely that all users would use the showers (especially given the restricted numbers of showers present)

Therefore assuming a maximum of 50 showers as peak demand over say a 15 minute period at the end of a session the total hot water required would be 500 litres within 15 minutes.

The main issue with the existing system is that each cylinder will take over 2 hours to recover its contents from 10^{o}C cold fill to 60^{o}C using the 6KW immersion heaters installed, which explains why the current system cannot cope at peak times.

5. OPTION APPRAISAL

When considering the options available, it has been advised that it would be preferable for the existing external cold water showers to be converted to warm showers which will provide a total of around 12 showers available for users.

Whilst a hot water volume per shower of 10 litres has been established in section 4, this should be considered the absolute minimum provision. A more realistic figure for a new system would be around 15 litres per shower.

Electric Cylinders

As previously stated, the existing electrical supply is at close to maximum capacity, so installing larger capacity cylinders with higher rated immersion heaters is unlikely to be feasible.

Using 15 litres of hot water per shower, the cylinder serving the male/female changing rooms (and also allowing for the external showers to be converted to warm) would need to cater for 10 of the 12 available showers so would need to be around 600 litre capacity.

Using the available 6KW of immersion heater power it would take approximately 6 hours to recover the full contents.

There is also the consideration that in periods of low usage, the volume of hot water stored would be far to high and therefore wasteful of energy.

Air Source Heat Pump

Again this option would not be considered viable due to the electrical load required and the fact that large volume water storage would be needed due to the lower operating temperatures of the units.

Gas Fired Water Heaters

These would provide a far better solution as they generally work with low storage and high recovery rates, meaning that in periods of low usage hot water is not being generated and left unused.

The other advantage is that unlike direct electric heaters, gas fired heaters are very suitable for systems with secondary circulation pipework which it is advised to prevent energy and water wastage and reduce risks associated with Legionella.

For the male, female and outside shower area, 2No gas fired waters heater rated at 32KW with a storage volume of 200 litres could provide around 400 litres of hot water over the 15 minute peak period with a recovery time of less than 30 minutes.

A single gas fired unit of around 60KW could be used instead to reduce capital costs however the overall storage would then increase to around 360 litres which may be considered too high for periods of low occupancy (although the gas heaters are highly efficient and have very low standing losses)

For the family changing room a smaller 32KW model would be more than sufficient and could accommodate additional showers should there be an opportunity to install these in future.

6. RECOMMENDATIONS

Install Gas Fired Water Heaters

The existing direct cylinders should be replaced with gas fired condensing water heaters in the same locations as the existing cylinders. The heaters would be approximately 700mm in diameter and around 1900mm high (60KW) or 1400mm high (32KW)

The flues for the water heaters which are around 150mm diameter would be installed through the flat roof.

A new gas supply pipe could be installed from the boiler room, across the flat roof to serve the heaters.

Each gas supply should be fitted with a gas safety panel which would shut off the gas supply in the event of gas leaks or fire.

Replace Existing Pipework

The cold water supply pipework from the plant room would need to be replaced along with the outlet pipework to include a secondary circulating system with associated pump, .and all pipework insulated where possible.

This will reduce energy consumption and avoid excessive dead legs in the hot water system that are currently present.

Replace Existing Showers

It is recommended that the existing showers, which are in poor condition be replaced with tamper proof shower panels. These will provide timed flow control via push button and automatic flow regulation along with individual thermostatic blending which will minimise any dead legs on the system.

A typical shower panel is shown in appendix A

8. APPENDIX A

Example of Recommended Shower Panels