Leakage Investigation Survey
20 January 2015

Client

Vue Cinema, Star City, 100 Watson Road, Birmingham B7 5SA

Mains water meter information

Size (mm)	15-28		32-50	✓	75-100		125-200		Above 200mm	
Serial number	12KD124019									
Readings (1)	14027.400				Time:	08:50 20 January 2015				
Readings (2)	14028.690				Time:	14:05 20 January 2015				
Location	Meter located in plant room at rear of premises.									

Leakage Activities

Acoustic sounding	✓	Correlation		Ground microphone		Environmental Inspection	
Other	Inspection of all points of water use on premises						
Pipe traced	n/a	CAT & Genny			Distance	n/a	
Pipe correlated	Accelerometer		Hydrophones		Distance		

Background Information

Consumption analysis has shown that the Vue premises at Star City is using more water than expected. Water is used primarily within the washroom areas (6x public and 1x staff) and catering facilities.

Water meter readings taken during the night indicated nearly 1.0 cubic metre of water had been used over a five hour period.

A lot of work has previously been carried out to reduce water use on the premises by the introduction of waterless urinals. Non-concussive (push down type) tap heads are also fitted to all taps in the washrooms.

Activity Summary

Pipework & Metering

The water meter is located in a small plant room at the rear of the building. The rising main is 100mm Ductile Iron. After the meter, the pipework rises with no intermediate offtakes up to the tank room on the top floor (projection level). The water tank is fitted with an Aylesbury K type float valve. This type of float valve has a delayed action when the water level drops and operates either fully open or fully closed (the volume of water required to replenish the tank was measured at an average 184 litres per fill). This prevents water hammer when compared to a typical standard float valve which allows a range of flows through it to maintain a tanks water level. A set of 3 fixed speed pumps then pressurise the water supply from the tank outlet before a pressure reducing valve regulates the delivered pressure to the entire water network. Copper pipework branches off in three directions to supply all points of water use on the premises.

6 no. water heaters are located near each of the main washroom areas to provide hot water to all taps.

Meter location and rising main in plant room

Meter

Aylesbury K type delayed action float valve

Water tank and pumps

Survey Activities

All points of water use were identified around the premises, to check that they were operating correctly. Points checked included all WC's and wash hand basins (male, female & disabled), water heaters, water points in the catering areas (ice & coffee machines, etc.), bin stores etc. All were found to be operating ok, with the exception of minor overflow issues in 3 no. WC cisterns (listed in recommendations below).

All surrounding units were checked to ensure they had their own water supply and did not take water from Vue pipework within the building. Premises checked included the Star City cleaners room adjacent to the Vue plant room, the bowling alley and the virgin active gym (now vacant). Rising mains and water meters were identified in all premises.

Further detailed checks were carried out on all water using equipment in the central catering area, as the pipework supplying this area was very cold to the touch (indicating significant water flow) when there was no legitimate water use between the hours of 9-11am.

Although the wastewater and overflow pipework at the back of the ice machines had previously been checked and found not to be running, it was noticed on this occasion that the waste pipework was discharging water. A significant volume of clear water was found running from the waste pipework into the drain while a batch of fresh ice was dropping into the holding hopper. Each half of the machine was found to produce a batch of ice approximately every 30 minutes, and when the ice drops, approximately 20 litres of clear water is discharged to waste (measured in a bucket). With 2 ice machines producing ice to maintain a level in the holding hopper, each with 2 ice production channels, it was calculated that around 20 litres of water was flowing to waste every 7 or 8 minutes or so between all machines. The ice holding hopper is metallic and was very cold to the touch, suggesting that it is not particularly well insulated. The ice within the hopper was also noted to be melting, suggesting that the machine may have to work through the night to replace ice that melts in addition to that used during the peak evening time.


One of the two ice machines in the catering area


Waste pipework to rear of ice machine


Cold water inlet pipework to ice machine

Enquiries with a supplier of Follett ice machines in the UK (Folletts are based in the United States and Poland) confirmed that this brand of ice machine was particularly thirsty for water, and that it was normal operating procedure for the unit to discharge significant quantities of water during the production of ice.

From water consumption calculations carried out, the ice machines may prove to be the cause of the unexplained water consumption recorded during the night, and the continued high water usage in general. As an average, the calculated water volume (in the table below) used by both ice machines is **160 litres per hour**. This equates to an **unaccounted water loss of 3.84m³ per day**, an **unaccounted cost of £9.48 per day** and an **unaccounted annual loss of £3,461.95** as a result of the ice machines.

This correlates well with the recorded average consumption during the night period of **193 litres per hour**, when considered alongside the other minor issues on WC overflows, which have a constant flow of approximately **33 litres of water per hour.** On their own, the WC overflows **equate to an unaccounted daily cost of £1.95 resulting in an unaccounted annual cost of £714.03 and unaccounted annual consumption of 289m³.**

With a flow rate of **193 litres per hour due to water loss**, this equates to an **unaccounted water loss to VUE of 4.56m³ per day** and an **unaccounted cost of £11.26 per day** and **£4,111.07 per annum**.

Water Consumption

Vue Star City - Water Consumption

Date	Time	Reading	Usage (litres)	Average flow		Equivalent Tank Fills
				Litres per hour	Litres per min	
19.01.15	01:04	14013.054				
	05:58	14014.002	948	193	3.22	5
20.01.15	08:53	14027.400				
	09:56	14027.591	191	191	3.18	1
	11:18	14027.768	177	129	2.15	1
	14:05	14028.690	922	331	5.52	5

Calculated volume of water being used in ice machines:

Water used per cycle:	20	litres
No. of cycles per hour:	2	(every 30 mins)
No. of channels per ice machine:	2	
No. of ice machines:	2	
	160	Total water demand per hour

Summary & Recommendations

Summary:

1. The ice machines were found to be consuming a significant volume of water;
2. Overflows running on 3 no. WC cisterns.

Recommendations:

1. Install water meter on 15mm copper supply pipework supplying one of the ice machines to quantify volumes of water used. Alternatively, isolate water and electricity supplies to both ice machines overnight and monitor water usage through main water meter. If found to be cause of high water consumption, consider replacement to more water efficient model;
2. Repair 3 no. float valves on WC cisterns in washrooms:
   a) WC in ladies near prop shop
   b) WC in staff female washroom area
   c) WC in staff male washroom area

Annual Saving: £4,111.07

Survey carried out by

Company	H²o Building Services	Date	20th January 2015