

REPORT
FOR
THE OWNERS STRATA PLAN LMS 2946
ON
EXISTING DOMESTIC HOT WATER
RECIRCULATION SYSTEMS
AT
THE SEASTAR
1003 PACIFIC STREET
VANCOUVER, BC

PREPARED BY:

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PROJECT NO: 388-168

DECEMBER 2006



1.0 INTRODUCTION

Quadra Pacific Consultants have been retained by Gateway Property Management Corporation to provide a report on the existing domestic hot water recirculation system in the Seastar, 1003 Pacific Street, Vancouver.

With the valuable assistance of Michael Eddington, the Building Manager, we have reviewed:

- a) Previous documentation on this issue;
- b) The original design drawings and inspected the installation on site (where visible);
- c) Inspected samples of the hot water recirculation piping taken from the upper and lower pressure zones.

2.0 OBSERVATIONS

The domestic water system is divided into two pressure zones, low zone serving floors ground to the 11th.

The upper zone serving all floors from level 12 and up.

3.0 RECIRCULATION SYSTEM - UPPER ZONE

Concerns expressed with the upper zone system are:

- That the 1¼" recirculation piping that extends from the 12th floor ceiling up to the 20th floor mechanical room may be in poor condition. This poor condition being created by a reportedly "high flow" recirculation pump.

1. Upper Zone - Description

- a) Recirculation piping is "collected" from each riser (6 in total) at the ceiling of the 12th floor. A 1¼" recirculation pipe then extends to the 20th floor mechanical room.

- b) In 2005, the recirculation "loop" on the 12th floor was replaced and balancing valves installed.

Note: A balancing report was also produced after this installation by Keith Plumbing and Heating. We obtained a copy of this report from Keith Plumbing & Heating and have attached it to this report.

- c) The upper zone recirculation pump is a Bell & Gossett model HV BNFI in-line bronze circulator, 1/6 hp, 1725 rpm, 115/1/60 electrical supply.

2. Conclusions - Upper Zone Recirculation System

Our review of the above balancing report and 2 samples of the 1½" piping indicate the following:

- a) The two samples (1 removed previously from the 12th floor) and the sample removed December 12, 2006 from the 20th floor, both indicate deep scouring of the pipe wall.

This scouring of the pipe wall occurred prior to the installation of the balancing valves in 2005, through the installation of the balancing valves, the flow has now been controlled to a flow of 6.37 gpm.

Unfortunately, the damage to the pipe had already occurred making the pipe now very vulnerable to premature failure as a result of the loss of wall thickness.

4.0 RECIRCULATION SYSTEM - LOW ZONE

Concerns expressed with the low zone system are:

- No balancing valves installed at the 3rd floor collection loop, only ball valve shutoffs. Ball valve shutoff outside suite #306 has not been located.

1. Low Zone Description

- a) Recirculation piping is collected from each riser (6 in total) at the ceiling of the 3rd floor. A 1½" recirculation pipe then extends down to the re-heat tank on the 2nd floor.

- b) Similar to the original installation of the upper zone loop, the low zone loop had only ball valve shutoffs installed, the exception being that the shutoff outside of suite #306 was either not installed or, installed without an access panel.
- c) Unlike the 12th floor upper zone recirculation loop, balancing valves were not installed in the 3rd floor low zone return loop in 2005.
- d) A balancing valve was installed in 2005 on the 1½" return pipe where the recirculation pump and the reheat tank are installed on the 2nd floor. The balancing report indicates the flow through this valve is 7.0 gpm.
- e) The low zone recirculation pump is a Bell & Gossett model in-line bronze circulator, 1/6 hp, 1725 rpm, 115/1/60 electrical supply.

2. Conclusions - Low Zone Recirculation System

- a) Three (3) pipe samples were removed from the "loop" in the 3rd floor ceiling on December 12, 2006. Of the three, only sample #1 indicated normal wear with no signs of irregular flow patterns.
- b) Samples 2 and 3 indicated considerable wear and reduction in the wall thickness which occurs with high flow.
- c) The high flow in this section of the loop is due to the lack of the balancing valves in the system. Without control, the system is "short-circuiting". The other condition that comes with "short-circuiting" is that the suites on the end of the loop always have to wait longer for hot water than the suites that are closer to the source of the short-circuiting.

Although they may not be aware of this condition, the residents in the 01, 02, 06, 07 and 08 suites have a longer wait time for hot water than the 03 and 05 suites.

5.0 RECOMMENDATIONS

1. Upper Zone System (12th floor and up)

- a) Replace the 1½" dia. recirculation piping from the ceiling of the 12th floor up to the 20th floor and to the 20th floor mechanical room.

Replacement of the suspect piping does require cutting, patching and painting sections of the corridors (12th to 20th). Fortunately, this work appears to be outside of the suites.

2. Lower Zone System

- a) Replace the entire recirculation loop on the 3rd floor, from the riser locations inside the suites (on the 3rd floor) and down to the recirculation pump on the 2nd floor.
- b) Install on each connection to the loop a balancing valve and ball valve, where required (in the corridor), complete with an access hatch and hinged door.

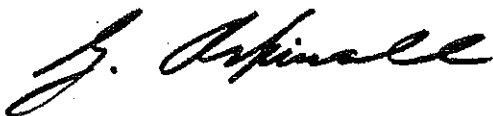
The replacement of the suspect piping does mean cutting, patching and painting of ceilings, closets in the 3rd floor suites and the corridor. With the installation of properly sized balancing valves and the pipe replacement, the residents on the 3rd floor should not experience any pipe failures due to premature failure of the original piping.

6.0 BUDGET COSTS

Actual costs will be determined by competitive bidding by contractors. As an order of magnitude, we would expect the cost to be between \$20,000.00 to \$30,000.00.

END OF REPORT

PREPARED BY:



Graham P. Aspinall
Project Manager
GPA:jms



ENGINEERING CO. LTD. * Consulting Professional Engineers
116 - 930 West 1st Street, North Vancouver, British Columbia, Canada V7P 3N4 * Phone (604) 986-5336 * Fax (604) 980-3747

1395-02

November 30, 2004

Gateway Property Management Corporation
#400 - 11950 - 80th Avenue
Delta, BC
V4C 1Y2

Tel: 604-635-5000
Fax: 604-635-5001

ATTENTION: Mr. Wes Halfyard, PM

Dear Sir:

RE: Seastar - 1003 Pacific Street, Vancouver, B.C.

We have completed our review of the failed hot water piping at the above project and advise the following.

The domestic water piping system has been designed and installed as follows:

- Two incoming 6" water service mains have been provided, one from Pacific Street and one from Burrard Street.
- Two water zones, one that services the upper floors thru a triplex booster pump system and one that services the lower floors using the city water pressure.
- The entire building is served by four gas fired combination domestic hot water heaters and storage tanks located on the top floor. A pressure reducing valve on the 12th floor controls the hot water pressure for the lower floor zone. Each hot water zone has its own domestic hot water return piping system.
- Each suite has a valved hot and cold water manifold with multiple home run piping runs from the manifold to each plumbing fixture; therefore each suite can be shut down independent from all other suites.

The failed domestic hot water piping is a result of the following.

- Continuously running the domestic hot water recirculation pumps
- No balancing valves were installed on the ½" branch return lines from each hot water riser in each zone as called for on the contract documents.
- The hot water return water is short circuiting and causing excessive wearing of the pipe due to the high velocity and high volumes of water forced through the small ½" diameter pipe on the short circuited risers.



Sea star - 1003 Pacific Street, Vancouver

1395-02

November 30 2004

Page 2

We recommend the following:

- Replace all 1/2" hot water return piping from the risers over to the corridor gathering return piping to 3/4" type K copper and install a ball valve check valve and balancing valve on each line with access through the existing access panels.
- Balance the hot water return system using a professional water balancing company so that the existing recirculation pumps draw water equally from all risers rather than short circuiting through the hot water supply riser located in the 03 and 05 suites that are the closest to the main recirculation riser.
- Record all set points for each balancing valve and the valve location on the as-built mechanical drawings and on a valve chart, install in the hot water tank room.
- Provide an aquastat on each return line to stop the recirculation pumps from running when the return temperature is satisfied. Running recirculation pumps continuously is the most common reason hot water copper pipes fail prematurely.

We found the hot water pipe sizes in the areas of failure to be in general code compliance. We feel the balancing valves not installed and the continuous running of the hot water recirculation pumps has caused the premature failure of the piping.

The mechanical Engineer or his representative inspecting the project should have noticed the design features that were not installed as called for on the contract documents and thus had the contractor correct the deficiencies.

We trust the above explains the failures the system is experiencing, should you require further information please call me personally.

Yours truly,

KEEN ENGINEERING CO. LTD.

A handwritten signature in black ink, appearing to read "Peter Hughes".

Peter Hughes, CIPE

Principal

LEED © Accredited Professional

Mech Contract - Seastar



commercial/industrial heating, air conditioning & plumbing



SERVICE AGREEMENT

Customer Name and Address

Owners of Strata Plan LMS2946
1003 Pacific Boulevard
Vancouver, BC

Building Name and Address

Sea Star LMS2946
1003 Pacific Boulevard
Vancouver, BC

Mechanical Systems

- | | | |
|---|--|--|
| <input type="checkbox"/> Boilers | <input type="checkbox"/> Cooling Towers | <input type="checkbox"/> Rooftop/Packaged Air Conditioning |
| <input type="checkbox"/> Chillers | <input checked="" type="checkbox"/> Domestic Water Heaters | <input checked="" type="checkbox"/> Sump Pumps |
| <input checked="" type="checkbox"/> Circulation Pumps | <input checked="" type="checkbox"/> Fans | <input checked="" type="checkbox"/> Unit Heaters |
| <input type="checkbox"/> Computer Room A/C | <input type="checkbox"/> Heat Pumps | <input type="checkbox"/> Water Treatment |
| <input type="checkbox"/> Controls | <input checked="" type="checkbox"/> Make Up Air Units | <input checked="" type="checkbox"/> Ancillary Equipment |
| <input checked="" type="checkbox"/> Condensing Unit | <input type="checkbox"/> Water Cooled Air Conditioning | |

Service Options

- Inspection Comprehensive
- Monthly Bimonthly Quarterly Semi-annually Annually

Price and Term of the Service Agreement

This service agreement will commence on _____ 19__ for a term of one year, and will automatically renew each year. Either party may terminate the contract by giving sixty (60) days notice prior to the conclusion of the contract or any renewal thereof. In the event the premises covered by this contract are sold, the agreement remains in force and the Owner remains bound by its terms and conditions. The service program will be invoiced quarterly in the amount of \$620.00 for a total annual payment of \$2,480.00 (GST extra). Sensors are \$338.00 per annum. Bag filters are \$1,969.00 per annum and backflow device is \$90.00 per annum. (GST extra).

Customer's Authorization

Jim Allison
Name
March 5/98.
Date

Latham's Authorization

Gerald Lees
Gerald Lees
Mar, 4, 1998
Date

* Terms and conditions on reverse apply.

PMQ #98-02-35

http://www.latham.com

CUSTOMER COPY

SCHEDULE OF EQUIPMENT

for

1003 Pacific Boulevard

QTY	EQUIPMENT	MAKE	MODEL#	SERIAL#	LOCATION
1	Make-Up Air Unit	Engineered Air	DJE 140-C	24209-AH1	19 th Floor
1	Condensing Unit	Engineered Air	CUD462-0	24209-C02	Roof
4	Domestic Hot Water Heaters	State	SBT100-400	E97795605 E97795604 E97795606 E97795607	20 th Floor
1	Recirculating Pump	B&G			20 th Floor
1	Hot Water Heater	Rheem	EQ10C-6	0597L11915	Rec. Room
1	Recirculating Pump	B&G			Rec. Room
1	Garbage Exhaust Fan	Penn			Main
1	Supply Air Fan				Common Room Level 2
3	C.O. and Propane Sensors	MSA	TGM8-EMS		P-1
4	In Line Exhaust Fans				Parking
1	Booster Pump System	B&G Tokna-Tech	70M-3		Water Room P-1
1	Sprinkler Backflow Device			2"	Water Room P-1
1	Exhaust Fan	Penn			Water Room P-1
1	Electric Unit Heater				Water Room P-1
1	Exhaust Fan	Penn			Hydro Room - P-1
4	Duplex Sump Pumps		DCP-208/IV	2.0 HP	P-4
1	Cooling Unit	Lennox	CBH-17-95V-2		Transformer Room
1	Exhaust Fan	Penn			Generator Room

QTY	EQUIPMENT	MAKE	MODEL#	SERIAL#	LOCATION
2	Unit Heaters				Lower Bike Room
1	Supply Air Fan	Penn			Lower Bike Room
1	Exhaust Fan				Gardeners Room - Lane
1	Exhaust Fan				Upper Bike Room - Lane

UNIT HEATERS

Flame condition.

Pilot flame.

Check burners.

Check fan motor volts.

Check fan motor amps.

Lubricate motor bearings.

Check motor pulley.

Check fan pulley.

Adjust fan belt.

Check operating and safety controls.

Clean or change air filters.

Check gas pressure and flame signal.

Replace thermocouple annually if indicated below.

Service Inspection

M

BI

Q

SA

A

Filters

Material

Labour

V-Belts

Material

Labour

Thermocouple

Material

Labour

MAKE-UP AIR UNIT

Fan Bearings

Lubricate and inspect bearings
(where applicable).

Damper Motor (where applicable)

Check motor connections.
Check damper linkage.

Motors

Lubricate all bearings (where
applicable).
Inspect for overheating.
Check voltage and amperage.
Inspect general operation.

Pulleys

Alignment.
Condition (tight or worn).
Vibration/noise.

V-belts

Tension.
Condition.

Gas Heat Section

Check ignition controls.
Check burners.
Check safety controls.
Check heat exchanger.

Hot Water Heat Section

Check coil.
Check control (mixing valve).
Check freeze protection.

Service Inspection	<input type="checkbox"/> <i>M</i>	<input type="checkbox"/> <i>BI</i>	<input checked="" type="checkbox"/> <i>Q</i>	<input type="checkbox"/> <i>SA</i>	<input type="checkbox"/> <i>A</i>
Filters	<input checked="" type="checkbox"/> <i>Material</i>		<input checked="" type="checkbox"/> <i>Labour</i>		
V-Belts	<input checked="" type="checkbox"/> <i>Material</i>		<input checked="" type="checkbox"/> <i>Labour</i>		
Thermocouple	<input type="checkbox"/> <i>Material</i>		<input type="checkbox"/> <i>Labour</i>		
Coil Cleaning	<input type="checkbox"/> <i>Included</i>				

DOMESTIC WATER HEATER

Check flame condition.

Check pilot flame.

Check burners.

Check for water leaks.

Check thermocouple.

Check temperature control setting.

Service Inspection

M

BI

Q

SA

A

Thermocouple

Material

Labour

CONDENSING UNITS

Compressor

Check integrity of vibration eliminators.
Verify setting of water regulator.
Acid test oil.
Change oil and filter element as indicated.
Tighten terminal connections at heater elements.

Running Inspection

Verify refrigerant charge.
Verify oil level.
Verify superheat adjustment.
Check for vibrations and unusual noises in bearings, motors, etc.
Check moisture indicator for evidence of moisture.
Check compressor oil pressure.
Check compressor suction pressure.
Check compressor discharge pressure.
Brush loose dirt from condenser coils and report on condition.

Controls

Check control panel components, and tighten connections.
Verify operation of bypass valve.
Verify capacity control operation.
Test and adjust low pressure cutout.
Test and adjust high pressure safety.
Test freeze control cutout.
Check operation of oil temperature control.
Test and adjust oil high temp cutout.

Starter

Check wire insulation for signs of overheating, and abrasion.
Megger motor at starter and report abnormal condition.
Measure and record operating amperage.
Tighten terminal connections at starter.
Measure and record operating voltage.
Check starter for signs of wear, arcing and overheating.

Service Inspection

M

BI

Q

SA

A

Filters

Material

Labour

Coil Cleaning

Included

CIRCULATION PUMP

Mechanical Service

Inspect for unusual noise and vibrations.
Inspect packing or mechanical seal.
Check coupling.
Lubricate motor bearings.
Inspect system for leaks in flexible connects, flanges etc.
Lubricate pump bearings.
Inspect motor windings for dirt buildup where visible.

Starters and Contactors

Check terminals.
Inspect wiring insulation for abrasion and overheating.
Megger motor at starter.
Inspect contacts for arcing and overheating.
Measure operating amperage.

Service Inspection

M

BI

Q

SA

A

FANS

Check for unusual noise and vibrations.
Check housing for corrosion and damage.
Check mounting points for secureness, tighten if necessary.
Remove debris from louvers and dampers.
Inspect flexible connections and ductwork for damage.
Check cabinet for cleanliness, moisture, oil, etc.
Inspect wiring insulation for abrasion and overheating.
Check connections for tightness.

Starter and Contactor

Inspect enclosure and components for cleanliness, moisture, oil, etc.
Check connections for tightness and corrosion.
Inspect wiring insulation for abrasion and overheating.
Inspect contacts for signs of wear, arcing and overheating.
Measure operating voltages and amperages.

Fan and Motor

Check motor, fan and shaft bearings for signs of wear.
Check and adjust belt tension and condition.
Check shieves for wear and alignment.
Check that fan and motor rotate freely and are aligned properly.
Check fan for cleanliness.
Check for noise and vibration.
Check fan and motor mounts.
Check motor's cooling openings.

Service Inspection

M

BI

Q

SA

A

Filters

Material

Labour

V-Belts

Material

Labour

CO & LEL SENSORS

MECHANICAL SERVICE

Calibrate and adjust CO sensor.

Calibrate and adjust LEL sensor.

Ensure fans are energized at setpoint.

Ensure alarm is energizing at setpoint.

Check terminal strip.

Service Inspection

A