Our File: 2531-39204

TECHNICAL MEMO

To	From
Jan Pedersen, Condominium Property Manager **Peka Professional Property Management Ltd.**	Brian Bain, P.Eng Mechanical Engineer
Re	**Date**
Pointe of View Mechanical Review	February 14, 2020

The Pointe of View condominium building at 115 Elk Run Blvd has had several leak issues regarding their plumbing with increasing occurrence over the past few years. The Pointe of View condominium corporation through Peka Professional Property Management Ltd. (Peka) have retained McElhanney Ltd. to complete a mechanical review of the building to help determine potential root cause of the issues. The following report provides a review of McElhanney's inspection and recommendations.

1. Background

Pointe of View building is a three-story multi-family residential building partially occupied in 1995 in the west wing. Construction of the building was completed in 1996 with full occupancy in 1996. The configuration of the building is an L-shape, the mechanical room is located centrally on the first floor and there is a crawl space below. The following is a summary of the domestic hot water, hydronic heating and sanitary drainage piping systems in the building that are reviewed in this report. A complete table of the buildings history since 2005 is included in appendix A.

1.1. DOMESTIC HOT WATER (DHW)

The DHW system consists of two 65 gal hot water tanks located in the mechanical room as shown in Figure 1. The supply lines are then routed through the crawlspace and up through risers to a ¾" recirculation line in the ceiling of the second-floor hallway.

Figure 2 - 2nd Floor Leaks Location

There have been 12 water leak incidents since 2016. Bulk of leaks appear to be pin hole leaks in copper lines. A major leak occurred in 2018 in a section of larger piping in the crawl space. There have also been two leaks shown by drywall repairs in the ceiling of the second floor from the ¾" recirculation line shown in Figure 2.

Figure 1 - DHW Tanks

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1.2. HYDRONIC SYSTEM

All rooms in the building are heated by base board heaters. A water boiler system, shown in Figure 3, feeds piping to each units' heaters and zone valves are actuated to control flow based on the thermostat setting.

All zone valves were replaced on the second and third floor in 2007. Starting in 2014 there have been 16 zone valve leaks.

Figure 3 - Hydronic Boiler

1.3. SANITARY DRAINAGE SYSTEM

The drainage system consists of various plumbing stacks that all feed down to the crawl space and eventually to the Town of Canmore wastewater piping.

The main line for the building was augured in 2012 and various building drain lines have required auguring 23 times since 2016.

2. Observations

2.1. DOMESTIC HOT WATER

All lines in the crawl space and the visible areas of the recirculation line in the ceiling of the second floor are not insulated. There does not appear to be any balancing valves for each of the risers to ensure equal recirculation flow to all. Much of the copper piping is type M while some of the repaired lines in the second-floor ceiling have been replaced by PEX as shown in Figure 4.

Figure 4 - 2nd Floor Ceiling

The crawl space also felt very warm for only a single vent from the furnace discharged into the crawl space.

2.2. HYDRONIC SYSTEM

There are two pumps in the system for flow that are plumbed in parallel with only one running at time. They are fixed speed operated with no flow control for different levels of demand. Much of the system was not visible as mostly located in units. The system is heated by a 1188 MBH non-condensing boiler at a design temperature of 82°C (180°F) and is vented through a common 18" vent to the roof.

Figure 5 - Sanitary Drainage

2.3. SANITARY DRAINAGE SYSTEMS

The only visible drainage is in the crawl space. Visual inspection showed many of the drains having slope issues and pipe supports missing.

3. Analysis

3.1. DOMESTIC HOT WATER

Original drawings completed by Allen Wasnea Engineering, shown in appendix B state that domestic hot water and recirculation lines shall be insulated with 12mm of economy insulation in the mechanical room, crawlspace and recirculation lines below the upper floor. The uninsulated piping could be contributing to the warmth in the crawl space and in 2005 the piping was not insulated due to concerns of additional problems arising if the crawl space became too cool. After insulating the piping if the crawl space does become cool an alternative method of heating the space with more ducting from the furnace would be a more efficient method.

Most of the recirculation line leaks appear to be between the first risers and the hot water tanks. This would indicate that the first risers are receiving more flow than the rest likely due to no balancing of the system.

Figure 6 - DHW Recirculation Pump

The drawings while hard to read indicate the pump to be a Grundfos UP 15-18 SBU pump with 0.5 L/s flow at 1 m of head. The actual pump installed is a UPS 15-58 FC and was set on the low setting as shown in Figure 6 and the pump curve can be found in appendix C. To confirm the flow rate in the piping a rough estimate was complete as no flow measurements have been completed. The farthest riser from the hot water tank is roughly ~60 m and the closest is ~5 m with the second-floor ceiling being about ~5 m up. Depending on if the system is balanced with equal flow to the farthest riser or being short circuited through the closest riser flows could range from 0.26 to 0.32 L/s (4.1 to 5.1 GPM) which results in 0.84 m/s to 1.02 m/s (2.8 to 3.3 ft/s) flow velocities in a ¾" cooper pipe. It is recommended to keep the maximum flow velocity of hot water in copper piping between 0.6 and 0.9 m/s (2 and 3 ft/s) which results in a flow rate of 0.19 to 0.29 L/s (3.0 to 4.6 GPM) in a ¾" line.

Another potential issue with copper piping is corrosion pitting. A water study by Alberta Environment completed in 2013 showed free chlorine to be 0.74 mg/L, PH to be 8.4, and Alkalinity/hardness (CaCO3) at 140 mg/L. The chlorine and PH while not overly high have been shown to cause pitting in copper piping at these levels over time. The CaCO3 has also shown to decrease corrosion pitting however it appears the chlorine and PH are having a greater effect in this instance since large and small diameter copper piping have leaked. The water analysis can be found in appendix D.

On top of all the above possible corrosion issues the original piping installed was type M copper which is the thinnest wall thickness available. The combination of high-water velocity, high water temperature, water chemistry and thin wall piping appear to be causing widespread leaks through out the system.

An alternative to the copper piping is PEX piping with the proper designation. Piping should be confirmed it is tested and listed to PEX 5106 NSF-pw (CL5). Per ASTM F876, the CL5 chlorine resistance rating is intended for an end-use condition of 100 percent at 60°C (140°F), which is the highest chlorine resistance rating available through ASTM. Products marked with a '5' in the first digit of the four-digit code and also bearing the CL5 designation [e.g., PEX 5106 NSF-pw (CL5)] indicate the product is approved for use in continuous, domestic, hot-water circulation systems with up to 60°C (140°F) water temperatures.

The flow velocities for PEX are also limited to 0.6 m/s (2 ft/s) and a max temperature of 60°C (140°F). Any operation of the system in excess of those values will result in decreased life span of the piping.

3.2. HYDRONIC SYSTEM

Majority of the leaks in the hydronic system have been at zone valves. Since the pumps for the system run at a single speed and are continuous this can result in large flow to the valves depending on how much demand there is in the system. Honeywell also indicated that the existing pumps were starting to leak and were due for a service during the summer of 2018, there was no indication if this was completed.

The boiler is the original and is 25 years old now which is pushing the expected life span. However, the boiler is still operating and there was no indication on the provided documentation that heating of units is a problem. Thus, there is no reason why it can't remain in service with regular maintenance. The risk of waiting for a replacement is that it could fail at an inopportune time when the outside temperature is below zero. This would result in a more expensive replacement, and potential repairs to other components in the system, and increased stress for all parties involved.

Quotes have been provided by Banff Plumbing and Honeywell for replacement of the boiler system. Both are proposing similar options of a single boiler replacement to two small boilers. The differences in their proposals are shown below,

Item	Honeywell	Banff Plumbing
Boilers Brand	RBI Futera II boilers	Raypac Raytherm
Efficiency	82%	85%
Pumps	New pumps included	Single boiler system does not indicate if new pumps are included.
Outdoor temp sensor	Included	Not included.
Concrete Pad	Included	Not included.

The two estimates appear very close with minor differences which should not affect price too much.

3.3. SANITARY DRAINAGE SYSTEMS

No matter how much effort is put in to ensuring proper drain slopes and pipe supports all drainage systems are reliant on minimal grease and hair being put down drains. The number one solution to drainage blockages will be tenant education to ensure compliance.

To limit the effect of grease, ensuring that all piping has proper slope and support is the next best solution. If water is not able to sit and build grease on the walls it is less likely to accumulate blockages.

Blockages can still develop even if increased education, proper pipe slopes and supports are implemented. It is recommended that a periodic maintenance plan to clean drainage piping should be implemented to reduce surprise blockages.

There is also the underground sewer line that runs from the building to the Town system. This line is susceptible to ground heave, roots penetration and general deterioration that is not visible from above

grade. A camera should be used to inspect the integrity of the line as well, a thorough cleaning and a maintenance plan developed for regular cleanings.

4. Recommendations

The following table details the recommendations for repair in the building,

Area	Repair	Urgency	Estimate Cost
Domestic Hot Water	Replacement of all recirculation lines starting with the risers closest to the hot-water tanks and working your way out to the farthest riser. Piping shall be replaced with type L/K copper or PEX with the designation as discussed in section 3.1.	High	$40,000 for piping + drywall
Domestic Hot Water	The system shall be balanced to ensure equal flow through all risers. This shall be completed once all the piping has been replaced. Depending on material used for replacement flow restriction valves shall limit pipe velocities to 0.6 m/s (2 ft/s) for PEX and 0.6-0.9 m/s(2-3 ft/s) for copper.	Med	$10,000
Domestic Hot Water	Piping shall be insulated as per drawings. This will reduce the energy requirements of the hot water tanks.	Low	Inclusive of the $40,000 for piping
Hydronic System	A continual replacement schedule for zone valves shall be implemented to limit any surprise leaks. A smart pump should be investigated for replacement of the existing pumps. The smart pump would adjust flow based on the demand required limiting damage to the zone valves.	Low	Smart pump $4,000 including installation.
Sanitary Drainage System	The complete drainage system in the crawl space shall be reviewed and all piping shall be sloped and supported as per the requirements of the National Plumbing Code 2015.	Low	$15,000, highly dependent on how much needs to be fixed.
Sanitary Drainage System	The main sewer line which connects to the Town system shall be scoped with a camera to ensure integrity along its length and a thorough cleaning completed.	Low	$3,000

Note: This construction estimate has been prepared using the design and technical information currently available and without the benefit of an detailed as-built of the building. Furthermore, McElhanney cannot predict the competitive environment, weather or other unforeseen conditions that will prevail at the time the contractors will prepare bids. This cost estimate is therefore subject to factors over which McElhanney has no control, and McElhanney does not guarantee its accuracy.

5. Limitations

The foregoing opinions and recommendations are based on the results of our visual assessment of readily accessible areas of the building and are limited to visual observations of apparent condition existing at the time of the inspection. All engineering reviews of existing buildings involve inherent risk that some conditions will inadvertently go undetected. Therefore, reports describing such investigations will be based, by necessity, on assumptions of what can be seen and what is hidden from view. All persons making use of this report should be advised of this and accept that risk.

McElhanney has completed this assessment with due diligence and the report can be relied upon to the extent of the available information and logically inferred conclusions therefrom. The absence of any indication of concerns beyond those already noted does not preclude the possibility of an occurrence that could not be determined by this type of study.

This report has been prepared by McElhanney Ltd. at the request of the Peka. The information and data contained herein represent McElhanney's best professional judgment in light of the knowledge and information available to McElhanney at the time of preparation. Except as required by law, this report and the information and data contained herein are to be treated as confidential and may be used and relied upon only by the client, its officers, and employees

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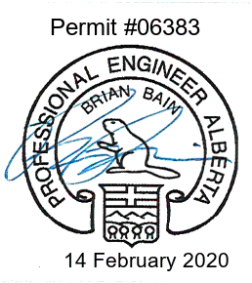
Prepared by:



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Appendix A

Point of View Mechanical Incident Review

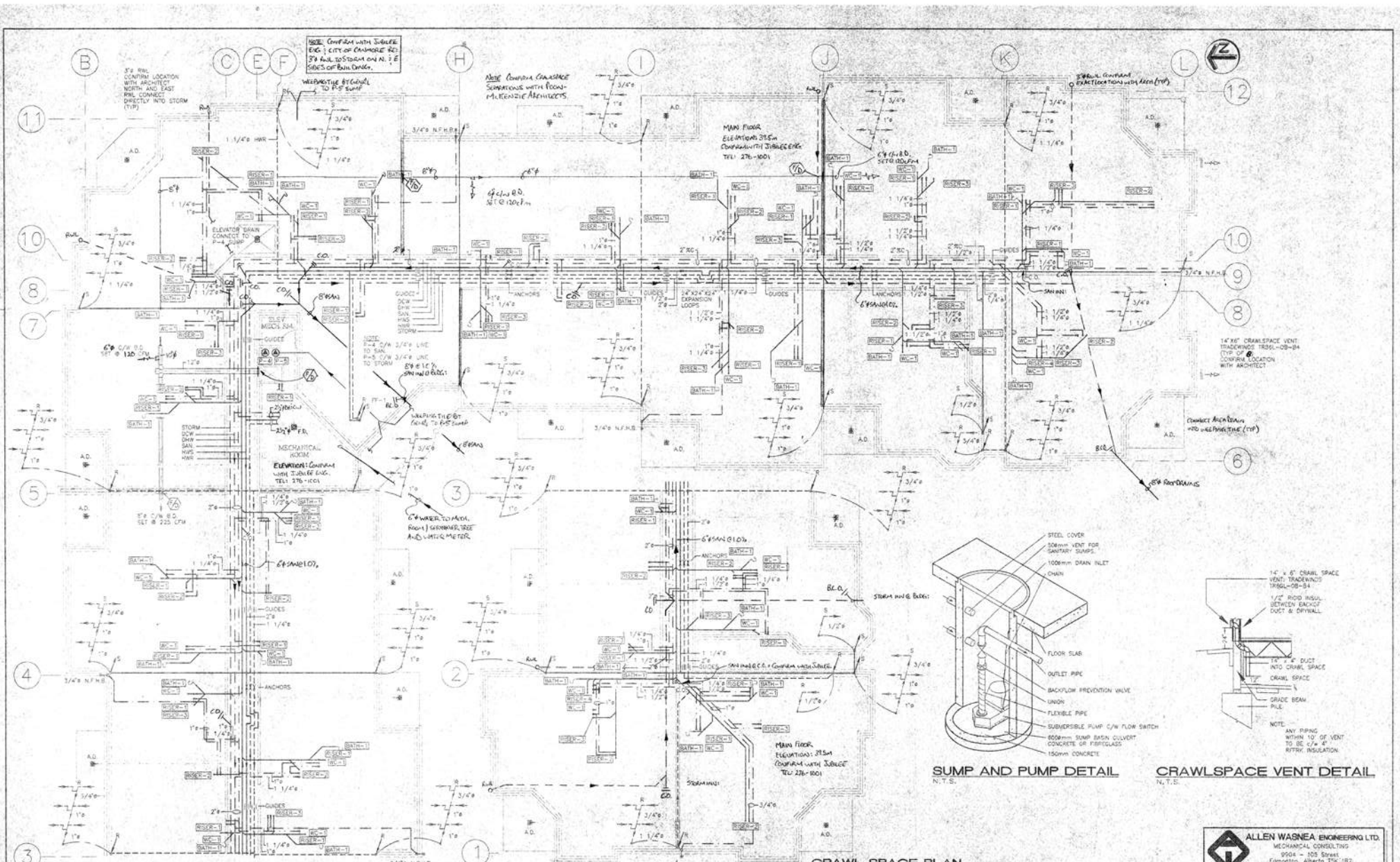
Date:	Issue:	Location:	Issue:	Supporting documentation:	Action:	Notes:
5-Nov-05	Crawl Space	Crawl Space	**Crawl Space:** Board confirmed they did not approve the insulating of the heating pipes due to concerns of additional problems arising if the crawl space became too cool/cold and additional costs to complete work. Asset West recommends heating inspection by Honeywell.	Meeting Minutes	Requested	
4-Nov-06	Dryer Vents	Dryer Vents	**Dryer Vents:** Board Requested Asset West Completes Dryer Vent Cleaning - Annually.	Meeting Minutes	Requested	
4-Nov-06	Valve Replacement	Valve Replacement	**Valve Replacement:** Replacement of taps - In-Suite Landry throughout building. Requested by board.	Meeting Minutes	Requested	
31-Jan-07	Dryer Vents	Dryer Vents	**Dryer Vents**: Dryer vent cleaning 2 years ago by P.R Cleaning. Quote received from McKnight to complete work.	Meeting Minutes	Requested	Do not have confirmation Dryer Vents were cleaned in 2005.
31-Jan-07	Valve Replacement	Valve Replacement	**Valve Replacement:** Asset west to obtain quotes for all unit valves, kitchen sink, toilet, washer/dryer, zone valves and any leaking taps. Asset west to provide inspection sheet and coloured tags that have recent replacement of valves to avoid duplication.	Meeting Minutes	Requested	
4-Sep-07	Dryer Vents	Dryer Vents	**Dryer Vents:** Dryer vent cleaning completed. Recommended to screen off vents.	Meeting Minutes	Complete	Do not have confirmation vents were screened off.
4-Sep-07	Dryer Vents	Dryer Vents	**Dryer Vents**: Renewed Honeywell contract - 3 years.	Meeting Minutes	Complete	
4-Sep-07	Valve Replacement	Valve Replacement	**Valve Replacement:** Confirmed 3rd floor valve replacement completed. Letter of concern from Ross Probert.	Meeting Minutes	Complete	
4-Sep-07	Water Damage	104	**Water Damage - Unit 104:** Cascade Mechanical found cracked shower pipe and main water line.	Meeting Minutes	Complete	
24-Nov-07	Valve Replacement	Valve Replacement	**Valve Replacement:** Confirmed 2nd floor valve replacement completed. Completed by Cascade Mechanical.	Meeting Minutes	Complete	Do not have confirmation 1st floor was completed.
21-Nov-09	Dryer Vents	Dryer Vents	**Dryer Vents:** Board will review dryer vent cleaning in spring 2010.	Meeting Minutes	Requested	
21-Nov-09	Main Line	Main Line	**Main Line Auguring:** Asset West to determine cost of installing clean-out access points to aid in cleaning sewer lines.	Meeting Minutes	Requested	Do not have confirmation clean-out access points were installed
21-Nov-09	Main Line	Main Line	**Main Line Auguring:** Board requested drain auguring of building's drain lines.	Meeting Minutes	Requested	
24-Feb-10	Dryer Vents	Dryer Vents	**Dryer Vents:** Board requested dryer vent cleaning for May 2010.0	Meeting Minutes	Requested	
24-Feb-10	Main Line	Main Line	**Main Line Auguring:** Board requested drain auguring of building's drain lines for May 2010.	Meeting Minutes	Requested	
29-Aug-12	Dryer Vents	Dryer Vents	**Dryer Vents**: Dryer vent cleaning completed by McKnight	Meeting Minutes	Complete	
29-Aug-12	Main Line	Main Line	**Main Line Auguring:** The main sewer lines were augured by Banff Plumbing.	Meeting Minutes	Complete	
29-Jan-13	Dryer Vents	Dryer Vents	**Dryer Vents**: Cleaning of dryer vents. Cleaned by McKnight. Recommended by McKnight that owners purchase back flow valves for installation in their dryer exhaust pipes.	Meeting Minutes		
29-Jan-13	Main Line	Main Line	**Main Line Auguring**: Auguring of three main sewer lines for 2013.	Meeting Minutes	Requested	
28-Jan-14	Dryer Vents	Dryer Vents	**Dryer Vents:** Schedule dryer vent cleaning.	Meeting Minutes	Requested	
1-Apr-14	Water Damage	214 & 314	**Water Damage - 214 & 314**; caused by cracked toilet in 314. a) Arranged plumber to repair toilet in 314, McKnight completed repairs and mold remediation. B) Based on plumbers report 50% of cost/charges sent to owner; 50% paid by corporation.	Meeting Minutes	Complete	
1-Apr-14	Water Damage	212	**Water Damage - 212;** flooring, drywall, cause of leak worn out zone valve leak. A) plumber repaired/replaced leaking zone valve. McKnight replaced damaged carpet, flooring, drywall, mold remediation. Below deductible. B) Board approved 1,984 to McKnight	Meeting Minutes	Complete	
10-Mar-15	Water Damage	202	**Water Damage - Unit 202** - Roof leak. Exterior roof leak fix 2,184 for exterior, $85 interior.	Meeting Minutes	Complete	
1-Aug-16	Water Damage	214	Water Damage - Unit 214: Water Leak, recirculation line, heavy scale build up, pin hole leak	Banff Plumbing Invoices		

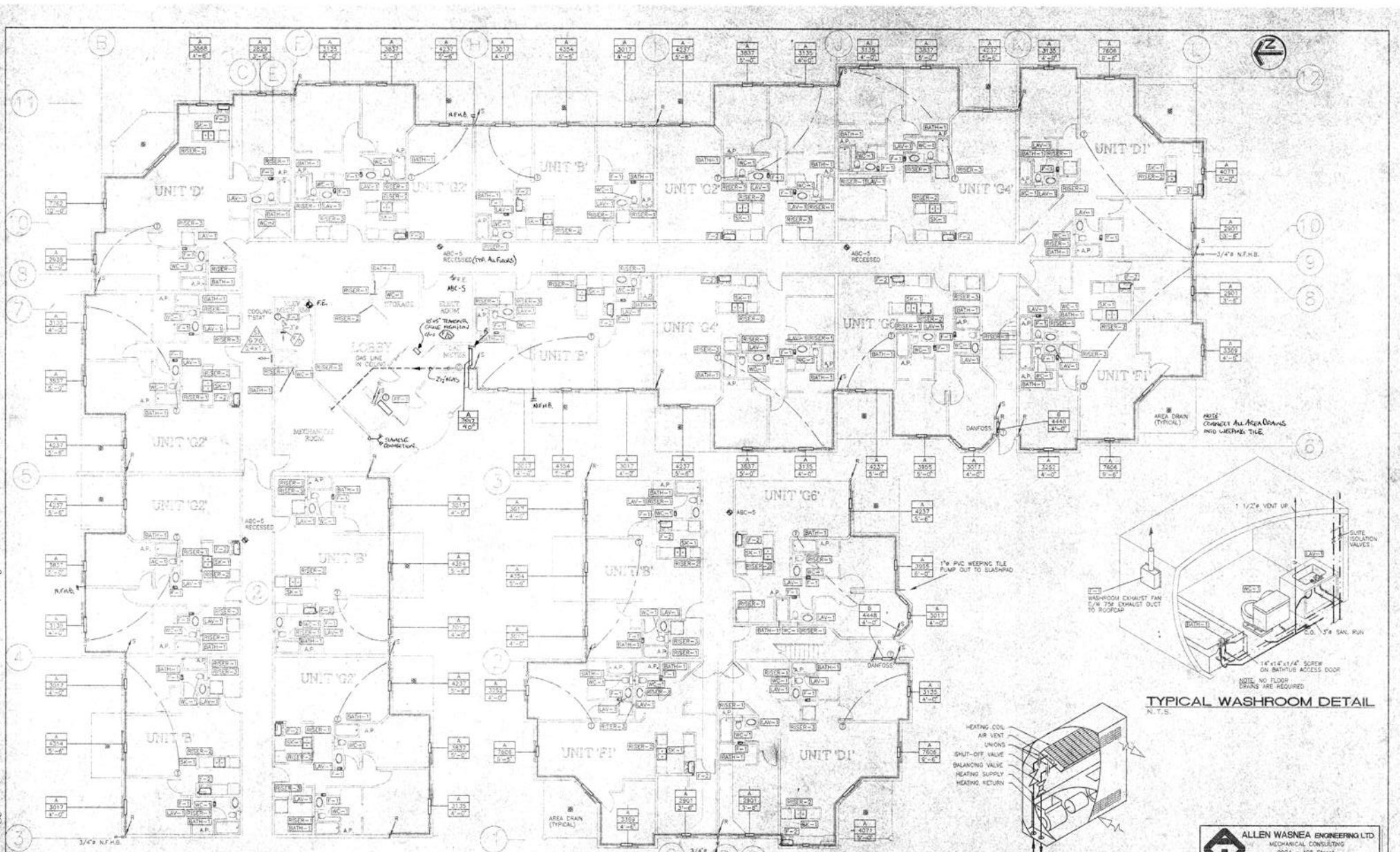
24-Mar-15	Main Line	Main Line	**Main Line Auguring:** Auguring of main lines, quotes to be received by April 9, 2015 for review.	Meeting Minutes		
25-Oct-16	Water Damage	214	Water Damage - Unit 214; Water Leak	Banff Plumbing Invoices		
19-Jan-16	Drain Filters	Drain Filers	**Drain Filters:** Kitchen Drain Filters - Paul to provide pictures to AW for review.	Meeting Minutes	Requested	
19-Jan-16	Stack	Stack	**Plumbing Stack Auguring:** Drain Auguring - Ross will work with Banff Plumbing to coordinate drain auguring.	Meeting Minutes	Requested	
22-Mar-16	Stack	Stack	**Plumbing Stack Auguring:** Drain Auguring - Asset West to contact Banff Plumbing regarding auguring of drains.	Meeting Minutes	Requested	
25-Oct-16	Water Damage	218	Water Damage - Unit 218; Water Leak	Banff Plumbing Invoices		
4-Aug-16	Water Damage	209	Water Damage - Unit 209: Blocked kitchen sink 209 - line augured with K50 machine to 25 ft.	Banff Plumbing Invoices		
18-Aug-16	Water Damage	101	Water Damage - Unit 101: Small leak in laundry area. No leaks. Asset West to contact	Banff Plumbing Invoices		
23-Aug-16	Stack	Stack	**Plumbing Stack Auguring** - Asset West confirmed Banff Plumbing can auger the lines for 94$ per hour. Board to review with PEKA.	Meeting Minutes	Requested	
30-Aug-16	Water Damage	217	Water Damage - Unit 217: Emergency call for sink backup	Banff Plumbing Invoices		
1-Sep-16	Water Damage	217	Water Damage - Unit 217: Auguring required up to 25 ft.	Banff Plumbing Invoices		
19-Sep-16	Water Damage	318 & 218	Radiant Heat - Unit 318 & 218: Pin hole leak on 1/2 poly-b hot supply line right on manifold. Tightened shower trap and replaced tub spout. Shut offs in crawl space valve seized.	Banff Plumbing Invoices		
16-Mar-18	Drain	214	Auguring kitchen sink and bathroom sink. Clear waste pipe.	Banff Plumbing Invoices		
5-Oct-16	Radiant Heat	307	Radiant Heat - Unit 307: Lack of heat in unit 307. Zone valve not working, replaced val	Banff Plumbing Invoices		
7-Oct-16	Radiant Heat	202	Radiant Heat - Unit 202: Replace inaccurate thermostat	Banff Plumbing Invoices		
18-Oct-16	Radiant Heat	206	Radiant Heat - Unit 206: Heat issues and knocking issues, zone valve replacement.	Banff Plumbing Invoices		
25-Oct-16	Radiant	Radiant	**Radiant Heat**: Unit 202 No Heat	Meeting Minutes		
25-Oct-16	Radiant	Radiant	**Radiant Heat:** Unit 206 No Heat	Meeting Minutes		
25-Oct-16	Water Damage	210 & 213	Water Damage - Unit 210 & 213; Repairs to units 210 and 213 are complete	Banff Plumbing Invoices		
25-Oct-16	Water Damage	113	Water Damage - Unit 113; Water Leak	Banff Plumbing Invoices		
12-Jan-19	Water Damage	214	Overflowing appliance in 214, not a plumbing issue. Water has been cleaned up.	Banff Plumbing Invoices		
10-Mar-15	Water Damage	215	**Water Damage - Unit 215**, Sewer backup. Cost $7,431.70 to McKnight	Meeting Minutes	Complete	
25-Oct-16	Water Damage	314	Water Damage - Unit 314; Bathtub Leak	Banff Plumbing Invoices		
20-Nov-16	Radiant Heat	317	Radiant Heat - Unit 317: Replace faulty zone valve	Banff Plumbing Invoices		
21-Nov-16	Radiant Heat	106	Radiant Heat - Unit 106: Replace faulty zone valve	Banff Plumbing Invoices		
22-Nov-16	Radiant Heat	Radiant Heat	Radiant Heat: Replace faulty zone valve	Banff Plumbing Invoices		
24-Mar-15	Water Damage	215	Water damage - Unit 215, Sewer backup. Cost $7,431.70 to McKnight. Work expected to be completed by March 31, 2015.	Banff Plumbing Invoices		
7-Dec-16	Water Damage	212	Radiant Heat - Unit 212: Replace faulty zone valve	Banff Plumbing Invoices		
4-Oct-16	Water Damage	215	Water Damage - Unit 214: Leak on Grey pex line in Unit 214	Banff Plumbing Invoices		
26-Dec-16	Radiant Heat	105	Radiant Heat - Burst pipe in baseboard heating line.	Banff Plumbing Invoices		
22-Nov-16	Hot Water	215	Hot Water Tank - Unit 215: Re-Set Hot Water tank	Banff Plumbing Invoices		
24-Jan-17	Engineering	Engineering	**Engineering for Building Mechanical Systems**: Board has commissioned PEKA to get in touch with an engineer for a more permanent solution to plumbing leaks occurring in the building. Board will continue to research options.	Meeting Minutes	Requested	
31-Jan-17	Sink Backup		Auguring plugged kitchen sink with K50 machine.	Banff Plumbing Invoices		
12-Dec-16	Radiant Heat	215	Radiant Heat - Malfunctioning Air Vent. Replace Auto Air Vent.	Banff Plumbing Invoices		
3-Feb-17	Radiant Heat	311	Radiant Heat - Replace thermostat and check operation of zone valve	Banff Plumbing Invoices		
9-Feb-17	Water Damage		Water Damage - Faulty toilet plumbing lead pipe not attached to flange correctly. Replaced with plastic line and toilet reinstalled.	Banff Plumbing Invoices		
21-Feb-17	Drain Issues	315	Clogged drain in ensuite, removed soap from p trap and augured line.	Banff Plumbing Invoices		
2-Feb-17	Hot Water	215	Hot Water - Both hot water tanks not working. Pulled recirc line to ensure good flow. Suggested to service both hot water tank and looking into issues with re-circ lines. Gas line needs to be replaced and sensor replaced.	Banff Plumbing Invoices		
3-Jan-17	Radiant Heat	215	Hot Water - Exhaust damper was not staying open on the second boiler in mechanical room causing boiler not to fire.	Banff Plumbing Invoices		
16-Jun-17	Water Damage		Leaking faucet - Remove and replace faulty cartridge.	Banff Plumbing Invoices		

11-Jul-17	Hose Bib	107	Hose Bib - Running outside tap near front entrance. Running off hose bib from crawl space. Removing old hose. Install new hose bib and test.	Banff Plumbing Invoices		
4-Aug-17	Drain	101	Drain - Auger kitchen drain, tighten faucet.	Banff Plumbing Invoices		
8-Sep-17	Drain	Not specified	Drain - Auger bathroom sink	Banff Plumbing Invoices		
27-Sep-17	Hose Bib	Outside	Isolate 5 outside hose bibs for winter	Banff Plumbing Invoices		
23-Mar-17	Water Damage	Hallway	Leaking pipe in hallway, temporary repair until hot-water shut down. Isolate and drain domestic hot water recirc line.	Banff Plumbing Invoices		
20-Oct-17	Water Damage	209	Toilet flange in unit 309 was sitting well below finished floor. Wax ring was not compressed causing water leak through floor. Removed old lead flange from floor and rebuild with XFR PVC	Banff Plumbing Invoices		
17-Nov-17	Radiant Heat	115	No heat in unit - turns out the thermostat was all the way down.	Banff Plumbing Invoices		
22-Nov-17	Drain	Not specified	Auger kitchen drain, auger bathroom drain, replace leaking fitting line	Banff Plumbing Invoices		
27-Dec-17	Drain	315	Auguring kitchen sink	Banff Plumbing Invoices		
5-Apr-17	Hot Water	215	Hot Water - Left hot water tank. Not kicking on flame sensor. Replace pilot assembly and fire appliance.	Banff Plumbing Invoices		
20-Oct-17	Water Damage	Hallway	Pin hole leak second floor hallway/ shut down hot water and recirc line drain hot water lines. Replace section of copper pipe. Turning on tanks, bleed line to remove air.	Banff Plumbing Invoices		
23-Jan-18	Engineering	Engineering	**Engineering for Mechanical Systems:** Leaks - Several leaks over the past year, most of which occurred with the domestic recirculation line. PEKA asked the plumber to coordinate with an engineer to propose solutions. The plumber found it was cheaper to treat the leaks on a case-by case basis rather than reconfiguring the plumbing - a few sink back-ups also occurred. PEKA arranged for all stacks to be augured and no additional back-ups have been reported.	Meeting Minutes	Update	
4-Feb-18	Radiant Heat	308	Bolt on zone valve faulty, causing O-ring leak, zone valve replaced.	Banff Plumbing Invoices		*Double billed us for same work
14-Feb-18	Drain	101	Backup in kitchen sink, auguring sink, removing hair from basin and tub pop up.	Banff Plumbing Invoices		
3-Jan-18	Water Damage	214	Leak in ceiling between kitchen and living room unit 214. Water line leak.	Banff Plumbing Invoices		
19-Feb-18	Radiant Heat	217 & Hallway	Replacing failed zone valve in 217 and hallway directly below.	Banff Plumbing Invoices		
19-Feb-18	Radiant Heat	308	Bolt on zone valve faulty, causing O-ring leak, zone valve replaced.	Banff Plumbing Invoices		
16-Jan-18	Water Damage	Hallway	Leak in hallway outside unit 214, pin hole leak in copper re-circ line.	Banff Plumbing Invoices		
16-Feb-18	Hot Water	Not specified	No hot water in multiple units. Air in recirc line.	Banff Plumbing Invoices		
19-Mar-18	Drain	Not specified	blocked sink and dishwasher - auguring.	Banff Plumbing Invoices		
21-Mar-18	Drain	306	Auguring blocked bathroom sink, re-installing p-trap and test.	Banff Plumbing Invoices		
6-Apr-18	Water Damage	218	Pinhole leak in copper line in ceiling of 218. Found multiple pin holes in 1.2 copper line. Replaced section of pipe.	Banff Plumbing Invoices		
1-May-18	Water Damage	Mechanical Room	Leak in mechanical room, replacing leaking section of 3.4 recirc pipe.	Banff Plumbing Invoices		
17-May-18	Radiant Heat	220	Replace zone valve and thermostat	Banff Plumbing Invoices		
19-Jun-18	Water Damage	206	Leak behind shower wall. Replaced shower trim.	Banff Plumbing Invoices		
20-Jun-18	Water Damage	Not specified	Major Leak on hot water line, repair damaged section of pipe	Banff Plumbing Invoices		
28-Jul-18	Drain	102	Sink back up, auguring to 10 ft.	Banff Plumbing Invoices		
6-Sep-18	Water Damage	204	Pin hole leak in shower valve from 204 into 104. Shut down building water, install isolation on hot and cold in shower. Replace copper elbow and replace damaged section of pipe.	Banff Plumbing Invoices		
26-Oct-18	Faucet	206	Water cartridges in unit 2016 was installed backwards. Cartridges replaced.	Banff Plumbing Invoices		
14-Nov-18	Drain	211	Drain backing up, auguring drain to 21ft.	Banff Plumbing Invoices		
30-Nov-18	Radiant Heat	115	Zone valve failed in open position. Changed zone valve and tested. Replace original mercury thermostat.	Banff Plumbing Invoices		
10-Jan-19	Water Damage	215	Leak on recirc line into left hot water tank. Shut down tank, cap gas, patch leak. Provided quote for hot water tank replacement and repair of recir line.	Banff Plumbing Invoices		
24-Feb-18	Drain	218	Plugged kitchen sin. Auguring from unit 318 to clear blockage in the stack.	Banff Plumbing Invoices		
14-Jan-19	Drain	210	Drain blockage in bathroom sink. Augured 14 ft. to remove blockage.	Banff Plumbing Invoices		
19-Jan-19	Drain	102	Blocked kitchen sink to 28ft.	Banff Plumbing Invoices		
27-Jan-19	Radiant Heat	113	Leaking zone valve, replaced it.	Banff Plumbing Invoices		
3-Feb-19	Water Damage	218	1.2 inch copper pipe leaking at several points. Replaced section of copper pope to 1.2" PEX.	Banff Plumbing Invoices		

4-Feb-19	Drain	101	Sewer backing up in ks 101. Augured line and test.	Banff Plumbing Invoices		
3-Mar-19	Radiant Heat	113	zone valve leaking badly. Shut off zone valve. Boiler pressure below 10 psi, repressurized system. Boiler pressure returned top up to 50 psi.	Banff Plumbing Invoices		
15-Mar-19	Water Damage	216	Leak in ceiling also found pinhole in hallway, replaced pipe and tested.	Banff Plumbing Invoices		
17-Apr-19	Toilet	306	Loud gurgling from tub when flush toilet. Augured sink and plunged bathtub to clear.	Banff Plumbing Invoices		
30-Apr-19	Drain	Not specified	Auger kitchen sink to 25 ft. Install cleanouts and auger to 16 ft. on both basins. Change pop ups on both basins.	Banff Plumbing Invoices		
7-Jun-19	Drain	201	Plugged kitchen sink augured from unit 310 roughly 14 ft. to clear blockage.	Banff Plumbing Invoices		
10-Fe-17	Hot Water	215	Hot Water - Right hot water tank was not working. Traced connection problem to ignition board. Strongly advise having tanks services including flame sensor and ignitor. Did not proceed with service due to maintenance contract and gas is not hooked up correctly. Strongly advise having finish pipework	Banff Plumbing Invoices		

Appendix B





MAIN FLOOR PLAN
SCALE: 1/8"=1'-0"

TYPICAL WASHROOM DETAIL
N.T.S.

FORCE FLOW PIPING DETAIL
N.T.S.

ALLEN WASNEA ENGINEERING LTD.
MECHANICAL CONSULTING
9904 - 105 Street
Edmonton, Alberta T5K 1B3
PH: (403)424-5006 FAX: (403)424-5216

9531 PLOTTED JUNE 6, 1995

POINTE OF VIEW

CANMORE, ALBERTA

MAINSTREET DEVELOPMENTS LTD.

pma
poan mckenzie architects
A PARTNERSHIP OF LIMITED COMPANIES

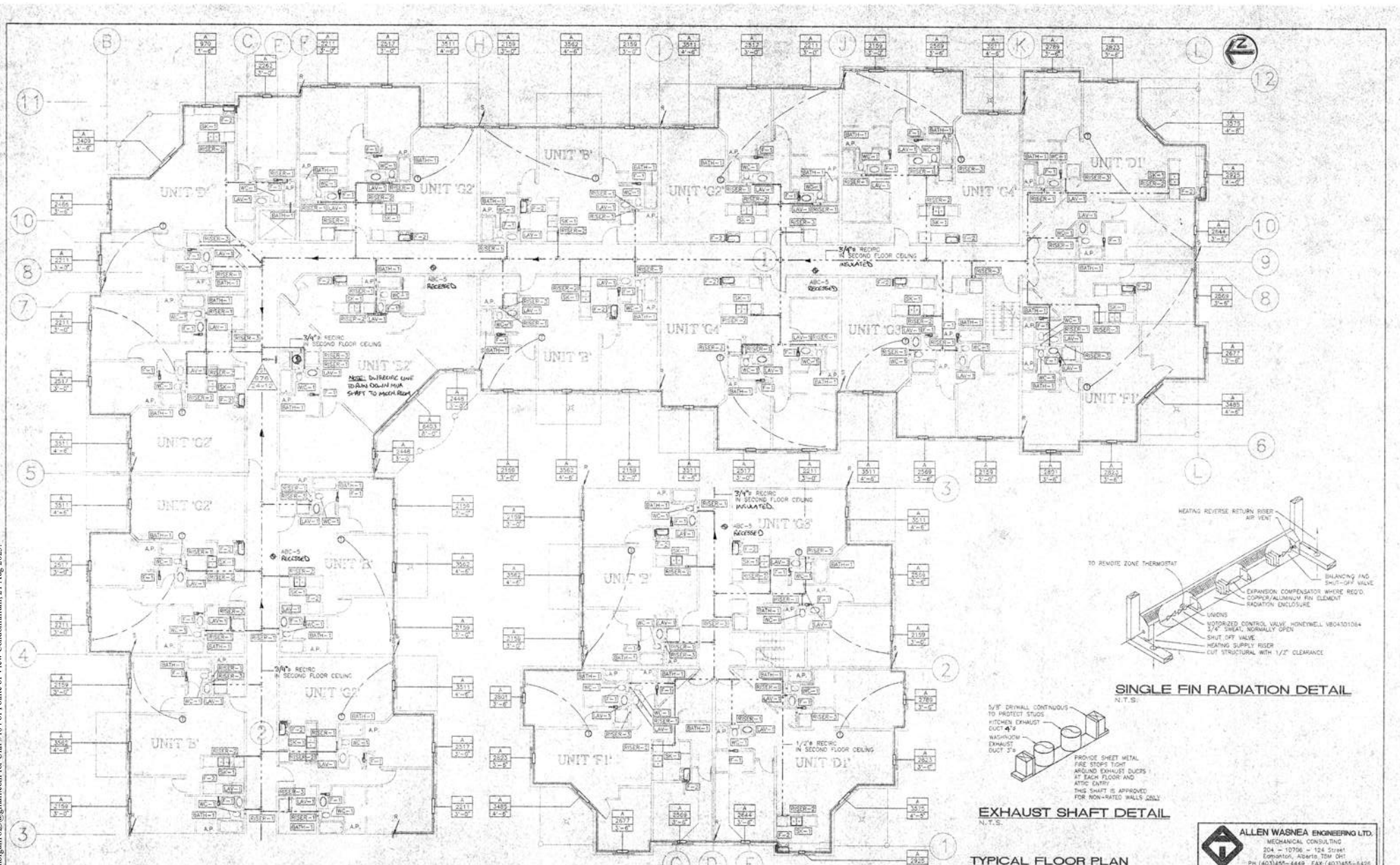
PROFESSIONAL ENGINEER ALBERTA

PERMIT TO PRACTICE
ALLEN WASNEA ENGINEERING LTD.
Signature
Date
PERMIT NUMBER P 2900
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REVISIONS	CHECKED BY	SCALE
① ISSUED FOR PERMIT JUNE 7, 1995		AS NOTED
	ISSUED	DATE
		05/06/95
	PROJECT NUMBER	DRAWN BY
	9431	R.P.

DRAWING TITLE: MAIN FLOOR PLAN

DRAWING NUMBER: M2 of 5



SINGLE FIN RADIATION DETAIL

N.T.S.

EXHAUST SHAFT DETAIL

N.T.S.

TYPICAL FLOOR PLAN

SCALE: 1/8"=1'-0"

ALLEN WASNEA ENGINEERING LTD.
MECHANICAL CONSULTING
204 – 10706 – 124 Street
Edmonton, Alberta, T5M 0H1
Ph.(403)455-4449 FAX.(403)455-6426

POINTE OF VIEW

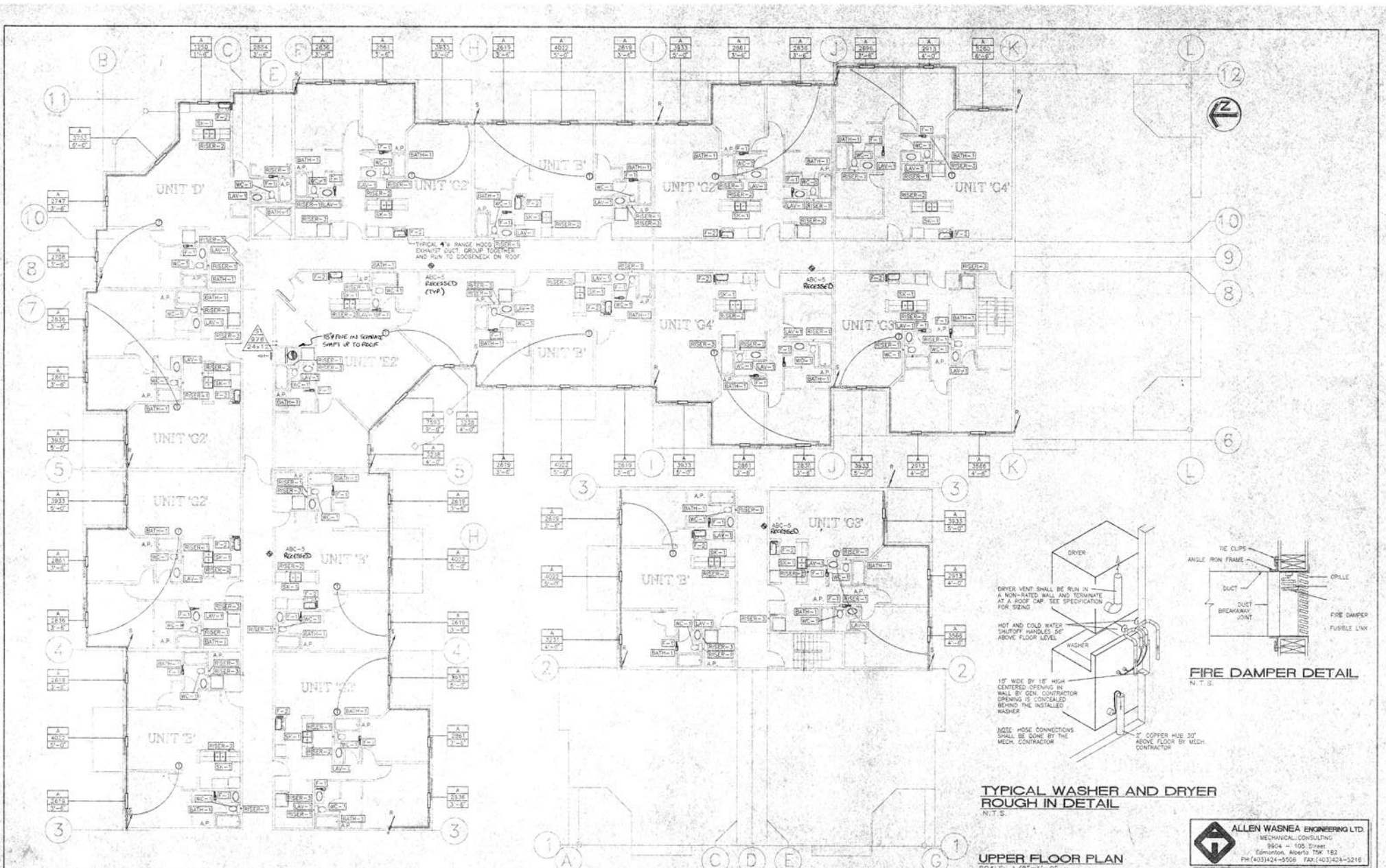
CANMORE, ALBERTA

MAINSTREET DEVELOPMENTS LTD.

pma
poon mckenzie architects
A PARTNERSHIP OF LIMITED COMPANIES

PERMIT TO PRACTICE
ALLEN WASNEA ENGINEERING LTD.
Signature
Date
PERMIT NUMBER P 2900
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REVISIONS	CHECKED BY	SCALE	DRAWING TITLE	DRAWING NUMBER
① ISSUED FOR PERMIT JUNE 7, 1995		AS NOTED	TYPICAL FLOOR PLAN	M3 of 5
	ISSUED	DATE 06/06/95		
	PROJECT NUMBER 9531	DRAWN BY RJF		



FIRE DAMPER DETAIL
N.T.S.

TYPICAL WASHER AND DRYER ROUGH IN DETAIL
N.T.S.

UPPER FLOOR PLAN
SCALE: 1/8"=1'-0"

ALLEN WASNEA ENGINEERING LTD.
MECHANICAL CONSULTING
9904 - 105 Street
Edmonton, Alberta T5K 1B2
PH:(403)424-5506 FAX:(403)424-5216

9531 PLOTTED JUNE 6, 1995

POINTE OF VIEW
CANMORE, ALBERTA
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PERMIT TO PRACTICE
ALLEN WASNEA ENGINEERING LTD.
Signature
Date
PERMIT NUMBER P 2900
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

ISSUING	
①	ISSUED FOR PRICING JUNE 7, 1995

CHECKED BY	
ISSUED	
PROJECT NUMBER	9531
SCALE	AS NOTED
DATE	95/06/05
DRAWN BY	RJP.

DRAWING TITLE: UPPER FLOOR PLAN
DRAWING NUMBER: M4 of 5

MECHANICAL SPECIFICATIONS

1. GENERAL

-Regulations-All work shall be as per local codes and regulations.

-Examine Site-The contractor shall visit the site prior to submitting his price to familiarize himself with the work involved and to include in his price any additions that may be required to make his installation a complete and operating system.

-Complete System-The mechanical contractor shall provide all labor and equipment, pay all fees, carry insurance coverage and obtain all permits required to provide a complete mechanical system without additional charges after award of contract.

-Extra Charges-Any discrepancies and omissions discovered shall be reported to the engineer immediately and prior to tender closing for rectification by addendum. Change orders after tender shall have max. 5% mechanical mark-up and disputed pricing shall be finalised from "Means Mechanical Cost Data".

-Shop Drawings- Submit 8 copies to the engineer for approval. The contractor shall ensure that equals for the major equipment fit in the allocated space and meet codes and specifications.

-Warranty- mechanical contractor shall provide a written warranty on his system for one full year from time of acceptance by the owner.

-Services- Provide sewer and water services (designed and inspected by Jubilee - Mr. Hamid Mohammed) Check invert elevations required and verify suitability of the existing sanitary and water line indicated on the drawings.

-Excavation- Trenching Mechanical contractor shall excavate for his work and backfill to 300mm. above pipes with sand provided by Gen'l. Backfilling to 98% Proctor density, cutting and patching shall be by Mechanical Contractor himself. Coordinate elevations and locations of gas, water and sewer services and provide 2 meter separation from gas, elect. and tel. before installing.

-As-Built Drawings-Mechanical contractor shall keep on site one set of ozalid white drawings and specifications on which all changes shall be noted daily. All information including all changes by addenda, change order, field changes etc. Transparencies shall be marked "As-Built".

-Thrust Blocks- Water services 6" and larger shall have concrete thrust blocks at every change of direction.

-Water Services- Water services 40mm or greater shall be chlorinated with detailed written records, flushed and have bacteriological tests completed at U of A. by mech. The trenching contractor must include in his mechanical tender the extra cost of having the tests witnessed on site and approved by his own Professional Engineer. Fire lines shall be certified 200psi hydrostatic for 2 hours or 50psi air for 1 hour.

-Maintenance manuals- Contractor shall provide 3@ 3 ring binder copies c/w shop drawings, maintenance and installation instructions, marked up record dwgs, list of suppliers. Provide on-site operating seminar for the owner.

-Frost Cover-provide min. 1.5 m. over storm, 1.8 m. above sanitary and 2.7 m. above water lines outside building.

Weeping tile- connections shall be provided c/w backflow valve and line cleanout to storm pumpout sump.

-Testing- Water services 40mm or greater shall be chlorinated with detailed written records, flushed and have bacteriological tests completed by mech. The mechanical contractor shall include in his mechanical tender the extra cost of having the tests approved by a Professional Engineer.

Fire lines shall be certified 200psi hydrostatic for 2 hours or 50psi air for 1 hour. Inside domestic water lines shall hold 100 psi air for 2 hour.

-Plastic Pipe- may be used underground for drainage but not through fire ratings (including roofs, walls and floors). Drainage within building shall be SDR41, Underground within building shall be SDR35, Between building and property line sanitary shall be BSP DR35 and storm shall be UltraRib, outside water services over 50mm shall be C-900DR25 100 class and 50mm or under shall be copper. Underground water lines within building shall be "K" soft copper with joints underground accessible via cleanouts.

-Door hold-open releases "Simplex" FM-998 provided and installed by Elect. and wired to fire panel. Allows air transfer past door.

-Electrical Co-ordination- Motor disconnect switches and starters shall be by elect. unless otherwise specified. -Electrical contractor shall wire in line voltage thermostats, electric heaters and control transformers provided by mech. -Mech. contractor shall complete his own controls wiring which he may separately contract the elect. contr. to do for him. CONFIRM VOLTAGES ON SITE BEFORE ORDERING EQUIPMENT.

-Gas- Mech. shall sign for application and pay for gas service complete to supply side of gas meters. If charges are delayed and not included in contract then he shall later request and process a cheque from the owner with the gas company. Plumber shall provide low pressure gas from meter to Appliances c/w aluminized paint coating on pipe where exposed to outdoors. Lines concealed shall be brazed seamless copper K or L (up to 1.25") or welded steel. Meter space 1200 deep x1500 wide x 2100 high (for up to 4000 mbh).

-Windows- owner will install R2 double pane, infiltration will be less than "A-3" .55 for openable and .25 for fixed per A440M91 window code. Owner shall thoroughly caulk with Hilti foam per installation instructions and inspect.

-Design Documents - These design documents are prepared solely for the use by the party with whom the design professional has entered into a contract and there are no representations of any kind made by the design professional to any party with whom the design professional has not entered into a contract.

2. PLUMBING EQUIPMENT SCHEDULE

LAV-1 - Crane Cranada (450 mm O.D.) 1-400, white, taps: Delta 2520 blade handles and pop up waste

WC-1 -Eljer Savoy ULF. (1.3 gal/flush) 27.5" high, ($104) white, Olsonite seat #5 white open front, no cover, Olsonite seat #90 white with cover. Max. 27.5" high to fit under banjo/porkchop counter.

BATH-1 -Crane Cranada 2-180, White, Slip resistant c/w Delta 2640 taps, tub diverter, fixed shower and rubber stopper. Coordinate 12"x12"x3/16" screwed on smooth plyboard wall access for each trap/brass by gen'l who will provide 150 mm plumbing walls for sewer stacks. Provide line cleanout on tub overflow.

SK-1 -Double Sink Steel Queen QDL-303 with tap ledge 755x406x178 deep bowls, stainless steel, c/w taps Delta 100 lever. Provide all sinks with dishwasher connections.

Washing Machine - connections shall have hot/cold handles in finished wall 6" above machine and hub drain c/w backflow valve (sude control) and 3/4" hose connections.

Floordrains- use Ancon FD-200, iron grate for unfinished areas, 4" round funnel strainers for directly piped equipment drains.

DWH-1,2-Jetglas 65T-370, 370 MBH GAS input, 359 gph recovery @ 55deg. C. 65 gal. storage, 44" high, 8" vent, 1.5" water, 1" gas.

3. HYDRONIC PIPING

-Water Treatment -Heating piping shall be flushed 8 hours with 3% non-foaming, phosphate-free detergent, degreased and water treated with corrosion inhibitor and pH adjustment by qualified water treatment contractor.

-Pumps shall be within 1500 of floor for easy maintenance access.

-Piping must be suspended with clevis hangers. -Mechanical room piping shall have pipe hangers to prevent pressure on boilers.

-Branch takeoffs off heating pipes shall be off the top half of mains.

-Trim all structure min 18mm away from heating pipes to avoid future binding and noises.

-Cabinets c/w hinged access doors for valves and prime coated for painting on site.

-All hydronic copper lines shall be soldered 95% zinc / 5% lead.

-Expansion compensation for piping shall be provided including offsetting of pipes.

P-1,2 Duplex Pumps Grundfos UPC 65-160, 44 GPM at 30 ft. head, 1.5 HP each, 208V/3 phase, (confirm voltage before ordering). 2.5" discharge, 71 lb. . Each of two heating pumps sized for 66% of full circulation when on high speed. Confirm voltage on site before ordering.

P-3 Domestic Recirc Grundfos UP 15-18 SBU, bronze, .5 L/s @ 1 m. head, 22 Watts, 115-1-60, run recirc below upper floor.

P-4,5 Elevator and Weeping tile Sump pumps Little Giant 5-MSP, fract. HP, 120 V/1 phase, 10' cord, 19 gpm @ 5', 8 gpm @ 20' head, 1.5 m. head at 1.2 L/s, 7.0 m. head at 0.5 L/s, submersible c/w piggyback RS-5 float switch (on at 7", off at 1"), pump suspended by chain and connected via 18mm dia. garden hose adaptor discharge.

-B-1-Superhot AAE 1320 boiler 1188 MBH N.A. input/950 MBH N.A. output derated (80% efficient), 2' PD @ 90 gpm, 1141 lb. weight, 18" vent, 49" wide x 56" deep x 77" high. Boiler c/w indoor outdoor controller Honeywell T678D, on/off firing, transformer.

TX-1 - Expansion Tank Extrol SX110V 60 gal., accepts 36 gal., 42" high x 22 dia., c/w float vent, air purger, automatic fill valve and tank.

-Provide in-suite valves c/w manual air vent to isolate each suite radiation.

"A" Radiation -FU-10 Rosemex, 10", 610 BTU/ft. at 190 deg.F. water, 2" x 2" element, ..5" wide cabinets, with back panel, 18 ga., pencil proof louvers.

"b" Radiation (for public corridors and stairwells) -FU-12 Rosemex, 12" high, 4.88" wide, 1112 BTU/ft. at 190 deg.F. @ 4" x 4" element, dampers optional, pencil proof louvers.

-Electric radiation zone valves shall be low voltage Honeywell V8043D1064, 18 mm. sweat, Normally Open, 24 volt c/w transformers- Maid-o-Mist #71 air vents at all high points.

FF-1,2 - (entry + stairwells) Forced flow heater Rosemex R-40-3, 22.7 mbh output at 190 deg.F. water, 26" high x28"x9.5", 1/20 hp fan, 1050 RPM, 325 cfm. RW-3A Wall semi-recessed. Integral stat shall cycle the fan.

4. HEATING AND VENTILATION

-Duct Gauge-galvanized .6 mm (26 gauge) for up to 300mm wide or 300mm dia, .8 mm (24 gauge) for 325 to 762 mm wide or 325 to 762mm dia, all fittings to meet SMACNA design Standards

-Smoke Detectors- by elect., mounted in main makeup air supply ducts shall stop supply fan and signal fire panel when actuated.

-Air Balance- report shall be done by independent qualified air balance contractor and submitted in triplicate at +-10% of specified cfm design vs. actual readings:

a. Fans - supply and exhaust fans, air systems amps, RPM, L/s, suction and discharge static pressure.
b. Grilles - supply and exhaust air volumes.
c. Sketch layout of duct systems showing details of balance.
d. Balance building for 5% net positive pressurisation during operating full exhaust mode.

-Drier Vents - Provide max. 40' length for 4" dia, by subtracting 8' length per elbow. Eg. with 2 elbows 16' is allowed. Increase to 5" dia. for longer lengths.

-Combustion air duct c/w eskimo trap to diffuse cold air.

-Access Doors-shall be provided for each fire damper or duct heater, Mallor Mart 0810 12"x6" hinged with sash locks.

-Fire Dampers - shall be Type "B". ULC labelled, with damper blades fully clear of the air stream, seal with Dow Corning RTV silicone foam.

-Mechanical Room Pressurization- Provide 6" dia. S/A outlet c/w balancing damper set at 200 cfm.

-Door Undercuts- Rated doors may be undercut a full 9.35mm for air transfer of 130 cfm. Assure that rugs do not restrict.

-Provide sheet metal fire stops tight around ducts passing through fire separations and ceilings. Drywaller boxes around all bath fans.

-Accessibility- Maintain piping and ducts high as possible in attic for easy access below.

-"B" gas vent, combustion and relief air vents shall be in a 1 hour rated fire enclosure (eg. 2 layers of 5/8" drywall) to underside of roof. Provide clearance min. 1" from combustibles for "B" gas vent, 6" for single wall breeching.

-Extend the duct separation between combustion and fresh air direct to outside surface of louver blades to eliminate potential short cycling.

HEATING AND VENTILATING EQUIPMENT SCHEDULES

5. GRILLES

S-1 -Wall Supply Steel E.H. Price 520 FSG/3/0/A/B13 off white Double Deflection, c/w balancing damper, fire damper.

T-1 -Crawlspace vent Tradewinds TR 86L OB-BS c/w birdscreen and damper aluminum.

Louvers -Airolite K609 Extruded Aluminum c/w 12 mm birdscreen, confirm color before ordering, prime coat for painting on site.

MAKEUP FURNACE MUA-1 -Corridor pressurization - indirect fired indirect heating furnace I.C.E. UFB indoor-12-600, 540 MBH input, 435 MBH H.A. output, stainless heat exchanger, 129" long x 52" wide x 46 high, roof curb, down discharge, 1" throwaway filter, 1717 CFM supply air, 1/2" S.P., 1.5 hp., 208 volt, 3 phase, 1920 lb. weight. Equivalent Suppliers: Sterling tel.479-1946, Modine tel. 440-1555, Engineered Air, I.C.E. 461-7860, Reznor 455-3300.

6. FANS

F-1 -Broan 650, 25 L/s, 3 sones, 120 V, 75 dia duct, 200 sq. x 95 deep.

F-2 - Kitchen Exhaust fan Broan 583001, white, 75 W. bulb, (confirm 30" width and color on site before ordering) to 70 L/s 120 V./1 phase 91 Watts, 2 speed.

F-3 (elevator machine room) -Broan 650, 25 L/s, 3 sones, 120 V, 75 dia duct, 200 sq. x 95 deep c/w reverse acting thermostat

7. INSULATION

Piping -Domestic hot water and recirc. lines shall be 12 mm economy insulated in mech. room, throughout crawlspace and recirc below upper floor.

-Hot water heating mains shall not be insulated in in mech. room or crawlspace.

-Pack and seal "Thermo-fiber" tight around piping penetrating fire separations.

Ductwork-exhaust ducts, plumbing vents and rainwater leaders within 1800mm of cold outlet at attic, roof or wall shall have 25mm. insulation c/w foil faced vapour barrier. -Exhaust ducts shall be 1" insulated flex duct "Thermaflex" complete throughout attic and cold spaces for all exhausts including toilet, kitchen and driers.

-Cold outside air supply ducts, combustion air all the way shall have 50mm. insulation c/w foil faced vapour barrier.

-Ensure cold air intake duct clear internal dimensions are maintained with insulation added.

-Combination fresh air/combustion air/relief air intakes shall have sheet metal dividers complete out to the birdscreen.

FIRE PROTECTION

-Fire Extinguishers - Mechanical contractor shall provide portable fire extinguishers as per plans. ABC-5 (2A-10BC rating) c/w recessed #102R Kern cabinet (for 150mm dia.) 225x600high fits 100mm wall. ABC-10 (10lb., 4A-60BC rating) for mechanical room and elevator machine room and ABC-5 for electrical room.

-Sprinklers - Mechanical contractor shall contract a qualified sprinkler contractor who shall provide a complete wet sprinkler system to this contract area c/w approved engineered drawings. System shall start at a flange connection inside the building and have sprinkler tree c/w Victaulic Testmaster 718 alarm valve, control valves (one zone per 52,000 sq.ft.), approved double check valve assembly, 1/3 HP, 120 V.? Albany excess pressure pump, etc., siamese connection c/w ball drip valve, flow switch wired to fire panel etc. System shall meet all IAO, NFPA 13 and Local codes.

a. Light Hazard system (c/w standard chrome pendant/ chrome recessed pendant) for offices. Plastic CPVC Blazemaster may be used in Light Hazard wet systems where allowed by code and concealed behind 1/2" drywall, acoustic ceiling tile or plywood. It may be run through fire rated walls and return air plenums.

b. Residential over 2 dwellings shall meet NFPA-13R (max. 4 heads calculated) within the suites. Amenity, storage, stairwells, mech. rooms, lobby shall be NFPA-13 with standard sprinklers. Plastic CPVC Blazemaster may be used in Light Hazard wet systems where allowed by code and concealed behind 1/2" drywall, acoustic ceiling tile or plywood. It may be run through fire rated walls and return air plenums.

Note: if combustible fiberglas plumbing fixtures are being used the sprinkler contractor cannot delete heads from the washrooms smaller than 54 sf.

-High temperature heads shall be installed above hot equipment such as boilers, unit heaters, etc.

CONTROLS

-Thermostats 24 Volt shall be provided and installed by Mech. Contr.

-Electrical contractor shall wire in line voltage thermostats, electric heaters and control transformers provided by mech.

-Mech. contractor shall complete his own controls wiring which he may separately contract the elect. contr. to do for him

MECHANICAL PRICES

Mechanical contractor shall present price breakouts and list each subtrade in the following order;

1. Plumbing within building
   Site services outside of building
   Service charges payable to Municipality and Gas Co.
2. Sheet Metal
3. Insulation
4. Fire Protection

TOTAL for a complete operational system $ . .00

8. SEPARATE COST ITEMS

Provide the owner with separate extra prices to add to the mechanical contract price:

1. Suite cooling
   Mitsubishi wall mount slimline unit c/w condensor on patio, condensate c/w drain pipe outlet. Wireless remote controller, Fan cycles on only upon call for cooling.

   For suites facing east or north.
   CU-1 (1 ton Mitsubishi PKL12EK indoor wall unit 15" high x 9" deep x 48" long, 120 volt, 1 amp, 55 lb., 43 dB. Outdoor condensing unit PUL12EK, 230 volt/1 phase, compressor FLA 6.9, LRA 29, 11 ampacity, 34"w x 12" x 26" high, 50 dB, 130 lb.

   For suites facing west or south
   CU-2 1.5 ton Mitsubishi PKL18EK indoor wall unit 15" high x 9" deep x 60" long, 120 volt, 1 amp, 68 lb., 43 dB. Outdoor condensing unit PUL18EK, 230 volt/1 phase, compressor 12 FLA, 37 LRA, 16 ampacity, 34"w x 12" x 33" high, 50 dB, 130 lb.

2. Provide gas barbecue outlets on balconies and gas fireplace connections. Provide barbecue outlets no closer than 1 m to patio door and steel piping fixed solid within .5 m. of outlet.

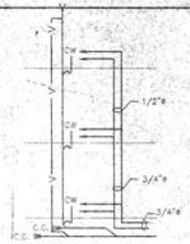
3. Provide separate extra price to install cooling on the corridor makeup air unit MUA-1. Install the cooling unit on paving stones at the side of the building.

   CU-1 4 ton Condensing Unit Carrier 38 AK-007, (net $3000) 1 hp fan, 208 Volt/3 Phase, compressor 137 LRA, 27 FLA, Min. circuity amps 37. [illegible]0 lb. unit weight, unit 33" x 33" x 32" high.

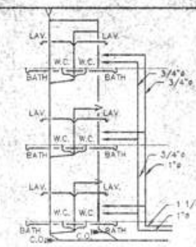
GAS COMPANY INFORMATION		
METER	APPLIANCE	LOAD
GM-1	B-1	1188 MBH
	MUA-1	540 MBH
	DWH-1 2@ 370MBH EA.	740 MBH
	TOTAL	2468 MBH

MECHANICAL CONTRACTOR INFORMATION

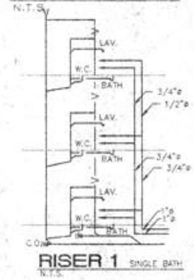
MINIMUM DISTANCE BETWEEN GAS LINE AND UNDERGROUND SERVICES = 2 METERS. MECHANICAL CONTRACTOR SHALL, BEFORE BEGINNING INSTALLATION INSIDE THE BUILDING, CHECK THE LOCATION AND INVERT ELEVATIONS OF ALL SERVICE LINES INCLUDING SANITARY SEWER, STORM SEWER, WATER MAINS AND GAS MAINS WITH LOCAL AUTHORITIES TO INSURE THAT THESE SERVICES CAN BE INSTALLED AS SHOWN.



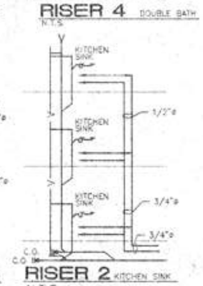
RISER 3 CLOTHES WASHERS
N.T.S.



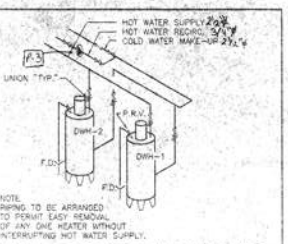
RISER 4 DOUBLE BATH



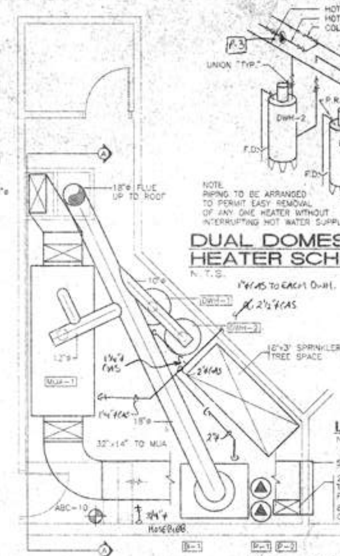
RISER 1 SINGLE BATH



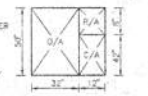
RISER 2 KITCHEN SINK
N.T.S.



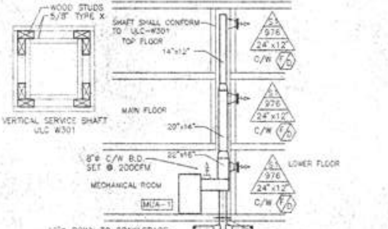
DUAL DOMESTIC WATER HEATER SCHEMATIC
N.T.S.



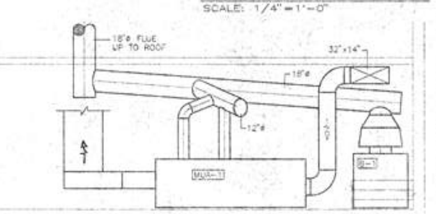
MECHANICAL ROOM
SCALE: 1/4" = 1'-0"



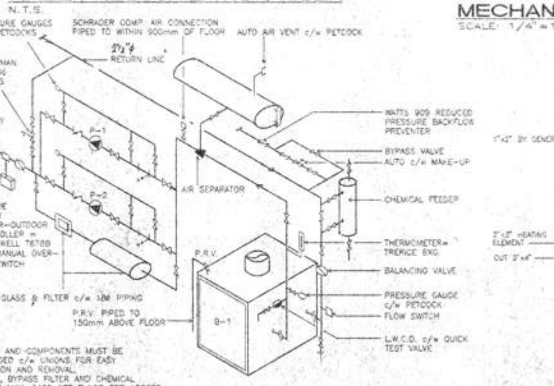
LOUVRE DETAIL
N.T.S.



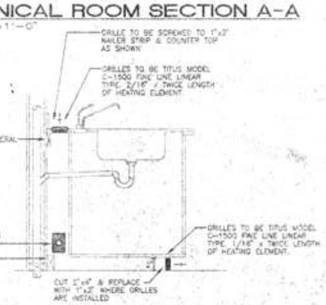
HALL PRESSURIZATION RISER
N.T.S.



MECHANICAL ROOM SECTION A-A
SCALE: 1/4" = 1'-0"



BOILER PIPING SCHEMATIC
N.T.S.



Typical Fin Installation Behind Sink
N.T.S.

ALLEN WASNEA ENGINEERING LTD.
MECHANICAL CONSULTING
9904 - 105 Street
Edmonton, Alberta T5K 1B2
PH:(403)424-5606 FAX:(403)424-5216

9531 PLOTTED JUNE 6, 1995

POINTE OF VIEW

CANMORE, ALBERTA

MINSTREET DEVELOPMENTS LTD.

pma
poon mckenzie architects
A PARTNERSHIP OF LIMITED COMPANIES

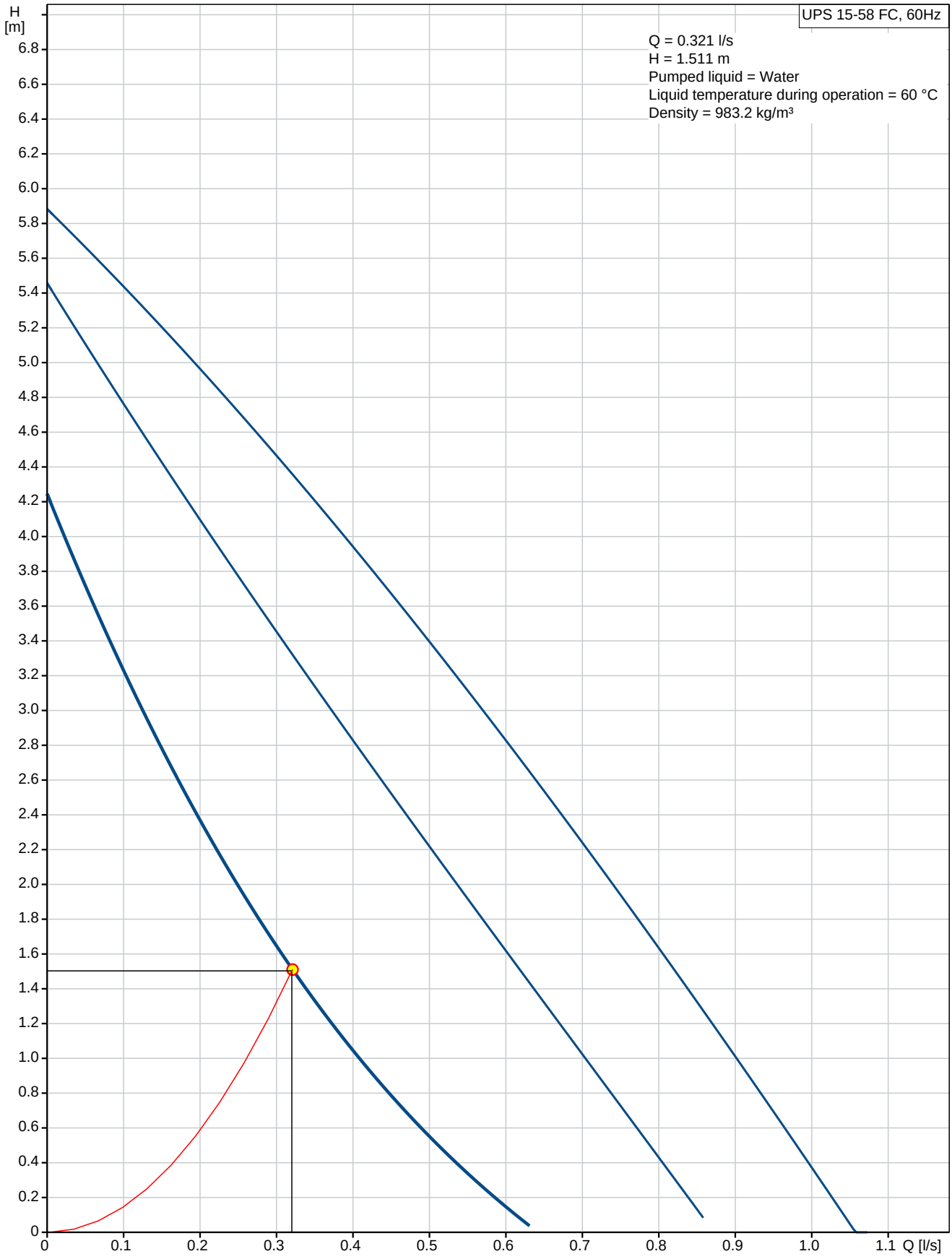
REVISIONS	CHECKED BY	SCALE	DRAWING TITLE	DRAWING NUMBER
① ISSUED FOR PRICING JUNE 7, 1995		AS NOTED	DETAILS AND SPECIFICATIONS	M5 of 5
	ISSUED	DATE 06/06/95		
	PROJECT NUMBER 9531	DRAWN BY R.P.		

Appendix C

Company name:
Created by:
Phone:

Date: 17/12/2019

59896341 UPS 15-58 FC 60 Hz



Company name:
Created by:
Phone:

Date: 17/12/2019

Description	Value
General information:	
Product name:	UPS 15-58 FC
Product No:	59896341
EAN number:	5700395855203
	5700395855203
Technical:	
Speed no:	3
Actual calculated flow:	0.321 l/s
Max flow:	1.083 l/s
Resulting head of the pump:	1.511 m
Head max:	5.9 m
Approvals on nameplate:	UL, CSA
Valve:	pump with built-in isolating and non-return valves
Materials:	
Pump housing:	Cast iron
	EN-JL1030
	ASTM 30 B
Impeller:	Composite, PES
Installation:	
Maximum ambient temperature:	40 °C
Amb. max at 80 dgr C liquid:	80 °C
Maximum operating pressure:	10 bar
Flange standard:	USA Oval
Type of connection:	C.I. Flange
Pipe connection:	2 - Bolt Flange
Pressure rating:	10
Port-to-port length:	165 mm
Liquid:	
Pumped liquid:	Water
Liquid temperature range:	2 .. 110 °C
Selected liquid temperature:	60 °C
Density at selected liquid temperature:	983.2 kg/m³
Electrical data:	
Power input in speed 1:	60 W
Power input in speed 2:	80 W
Max. power input:	87 W
Mains frequency:	60 Hz
Rated voltage:	1 x 115 V
Current in speed 1:	0.55 A
Current in speed 2:	0.66 A
Current in speed 3:	0.75 A
Capacitor size - run:	10 µF/180 V
Number of poles:	2
Insulation class (IEC 85):	F
Motor protec:	CONTACT
Thermal protec:	internal
Controls:	
Pos term box:	9H
Others:	
Gross weight:	3.29 kg

Maxxam

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Appendix D

ALBERTA ENVIRONMENT
Attention: ANGELA BROWN
Client Project #: DRINKING WATER TESTING
P.O. #:
Site Location: 3 SITES

Sample Description : CANMORE WTP
Sample Date & Time : 2013/07/16 13:00
Sampled By : LW
Sample Type :
Sample Received Date : 2013/07/16
Sample Station Code :

Maxxam Sample Number : GX6096
Maxxam Job Number : CB360337
Sample Access :
Sample Matrix : Water
Report Date : 2013/08/12

PARAMETER DESCRIPTION	Results	UNITS	VMV Code	QA/QC Batch	MDL	RDL	meq/L
Misc. Inorganics							
UV absorbance (254nm)	<0.010	AU/cm	80226	7004160	0.010	0.010	
Calculated Parameters							
Hardness (CaCO3)	140	mg/L	010602	6990131	0.50	0.50	
Hydrogen Sulphide (H2S)	<0.0020	mg/L	109225	6989162	0.0020	N/A	
Nitrate plus Nitrite (N)	0.014	mg/L	102649	6990408	0.0030	0.0030	
Misc. Inorganics							
Free Chlorine	0.74	mg/L	017001	6991116	0.020	0.020	
pH	8.14	N/A	010301	6994575	N/A	N/A	
Residual Chloramines	0.050	mg/L		6986720	0.020	0.020	
Strong Acid Dissoc. Cyanide (CN)	<0.0020	mg/L	097806	6997585	0.0020	0.0020	
Total Chlorine	0.79	mg/L		6991117	0.020	0.020	
Total Organic Carbon (C)	0.67	mg/L	006005	6996913	0.50	0.50	
Total Dissolved Solids	180	mg/L	010451	6996517	10	10	
Low Level Elements							
Dissolved Cadmium (Cd)	<0.0050	ug/L	100880	6988627	0.0050	0.0050	
Anions							
Dissolved Bromate	<0.010	mg/L	103468	6995924	0.010	0.010	
Dissolved Fluoride (F)	0.11	mg/L	009105	6994695	0.050	0.050	0.006
Dissolved Sulphate (SO4)	33	mg/L	106150	6998885	1.0	1.0	0.688
Sulphide	<0.0020	mg/L	016101	6997579	0.0020	0.0020	
Dissolved Chloride (Cl)	3.7	mg/L	017206	6998817	1.0	1.0	0.104
Nutrients							
Total Ammonia (N)	<0.050	mg/L	007505	6994285	0.050	0.050	
Dissolved Nitrite (N)	<0.0030	mg/L	102648	6995736	0.0030	0.0030	
Dissolved Nitrate (N)	0.014	mg/L	102647	6995736	0.0030	0.0030	0.001

N/A = Not Applicable
RDL = Reportable Detection Limit
MDL = Method Detection Limit - Calculated on the basis of the instrument detection level, the dilution used, and the weight of the sample.
Results are not corrected for surrogate or moisture values unless otherwise stated.

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ALBERTA ENVIRONMENT
Attention: ANGELA BROWN
Client Project #: DRINKING WATER TESTING
P.O. #:
Site Location: 3 SITES

Sample Description : CANMORE WTP
Sample Date & Time : 2013/07/16 13:00
Sampled By : LW
Sample Type :
Sample Received Date : 2013/07/16
Sample Station Code :

Maxxam Sample Number : GX6096
Maxxam Job Number : CB360337
Sample Access :
Sample Matrix : Water
Report Date : 2013/08/12

PARAMETER DESCRIPTION	Results	UNITS	VMV Code	QA/QC Batch	MDL	RDL	meq/L
Physical Properties							
True Colour	<2.0	PtCo units	002021	6999817	2.0	2.0	
Physical Properties							
Turbidity	<0.10	NTU	002074	6993340	0.10	0.10	

N/A = Not Applicable
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ALBERTA ENVIRONMENT
Attention: ANGELA BROWN
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Site Location: 3 SITES

Sample Description : CANMORE WTP
Sample Date & Time : 2013/07/16 13:00
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Sample Type :
Sample Received Date 2013/07/16
Sample Station Code :

Maxxam Sample Number : GX6096
Maxxam Job Number : CB360337
Sample Access :
Sample Matrix : Water
Report Date : 2013/08/12

Elements by Atomic Spectroscopy

PARAMETER DESCRIPTION	Results	UNITS	VMV Code	QA/QC Batch	MDL	RDL	meq/L
Elements							
Dissolved Aluminum (Al)	0.16	mg/L	102024	6994993	0.0030	0.0030	0.018
Dissolved Antimony (Sb)	<0.00060	mg/L	102039	6994993	0.00060	0.00060	
Dissolved Arsenic (As)	<0.00020	mg/L	102021	6994993	0.00020	0.00020	
Dissolved Barium (Ba)	0.015	mg/L	100782	6995951	0.010	0.010	0.000
Dissolved Boron (B)	<0.020	mg/L	100802	6995951	0.020	0.020	
Dissolved Calcium (Ca)	40	mg/L	020111	6995951	0.30	0.30	1.996
Dissolved Chromium (Cr)	<0.0010	mg/L	102038	6994993	0.0010	0.0010	
Dissolved Copper (Cu)	0.00031	mg/L	102027	6994993	0.00020	0.00020	0.000
Dissolved Iron (Fe)	<0.060	mg/L	102090	6995951	0.060	0.060	
Dissolved Lead (Pb)	<0.00020	mg/L	102029	6994993	0.00020	0.00020	
Dissolved Magnesium (Mg)	9.1	mg/L	012111	6995951	0.20	0.20	0.746
Dissolved Manganese (Mn)	<0.0040	mg/L	102089	6995951	0.0040	0.0040	
Dissolved Selenium (Se)	0.00042	mg/L	102037	6994993	0.00020	0.00020	0.000
Dissolved Silver (Ag)	<0.00010	mg/L	102028	6994993	0.00010	0.00010	
Dissolved Sodium (Na)	<0.50	mg/L	011111	6995951	0.50	0.50	
Dissolved Uranium (U)	0.00039	mg/L	102018	6994993	0.00010	0.00010	0.000
Dissolved Zinc (Zn)	<0.0030	mg/L	102026	6994993	0.0030	0.0030	
Low Level Elements							
Total Mercury (Hg)	<0.0020	ug/L	100249	6992466	0.0020	0.0020	

RDL = Reportable Detection Limit
MDL = Method Detection Limit - Calculated on the basis of the instrument detection level, the dilution used, and the weight of the sample.
Results are not corrected for surrogate or moisture values unless otherwise stated.

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ALBERTA ENVIRONMENT
Attention: ANGELA BROWN
Client Project #: DRINKING WATER TESTING
P.O. #:
Site Location: 3 SITES

Sample Description : CANMORE WTP
Sample Date & Time : 2013/07/16 13:00
Sampled By : LW
Sample Type :
Sample Received Date : 2013/07/16
Sample Station Code :

Maxxam Sample Number : GX6096
Maxxam Job Number : CB360337
Sample Access :
Sample Matrix : Water
Report Date : 2013/08/12

Volatile Organics by GC-MS

PARAMETER DESCRIPTION	Results	UNITS	VMV Code	QA/QC Batch	MDL	RDL	meq/L
Volatiles							
Total Trihalomethanes	16	ug/L	107593	6987481	2.0	2.0	
Benzene	<0.40	ug/L	108963	6994199	0.40	0.40	
Carbon tetrachloride	<0.50	ug/L	108964	6994199	0.50	0.50	
Chlorobenzene	<0.50	ug/L	108965	6994199	0.50	0.50	
1,2-dichlorobenzene	<0.50	ug/L	108960	6994199	0.50	0.50	
1,4-dichlorobenzene	<0.50	ug/L	108962	6994199	0.50	0.50	
1,2-dichloroethane	<0.50	ug/L	108961	6994199	0.50	0.50	
Dichloromethane	<2.0	ug/L	108966	6994199	2.0	2.0	
Ethylbenzene	<0.40	ug/L	108967	6994199	0.40	0.40	
Tetrachloroethene	<0.50	ug/L	108971	6994199	0.50	0.50	
Toluene	<0.40	ug/L	108972	6994199	0.40	0.40	
Trichloroethene	<0.50	ug/L	108973	6994199	0.50	0.50	
Vinyl chloride	<0.50	ug/L	108974	6994199	0.50	0.50	
Xylenes (Total)	<0.80	ug/L		6994199	0.80	0.80	
m & p-Xylene	<0.80	ug/L		6994199	0.80	0.80	
o-Xylene	<0.40	ug/L	108969	6994199	0.40	0.40	

Surrogate Recoveries (%):

1,4-Difluorobenzene (sur.):	99	Control Limits: 70 - 130
4-BROMOFLUOROBENZENE (sur.):	98	Control Limits: 70 - 130
D4-1,2-DICHLOROETHANE (sur.):	94	Control Limits: 70 - 130

RDL = Reportable Detection Limit
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
MDL = Method Detection Limit - Calculated on the basis of the instrument detection level, the dilution used, and the weight of the sample.
Results are not corrected for surrogate or moisture values unless otherwise stated.

Sodium Sulfate Lot: Syringe ID: ISTD Lot: Spike Lot: Dispenser ID 10mL:

Maxxam Job #: B3B5846
Report Date: 2013/08/02

Maxxam Analytics
Client Project #: B360337

RESULTS OF ANALYSES OF WATER

Maxxam ID		SH5324	SH5324		SH5325	SH5326		
Sampling Date		2013/07/16 10:30	2013/07/16 10:30		2013/07/16 11:30	2013/07/16 13:00		
COC Number		na	na		na	na		
	Units	**GX6075\EXSHAW WTP**	**GX6075\EXSHAW WTP Lab-Dup**	**RDL**	**GX6095\HARVEY HEIGHTS**	**GX6096\CANMORE WTP**	**RDL**	**QC Batch**
NTA	mg/L	<0.1 (1)	<0.1 (1)	0.1	<0.05	<0.05	0.05	3288650

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) NTA: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B3B5846
Report Date: 2013/08/02

Maxxam Analytics
Client Project #: B360337

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		SH5324	SH5325	SH5326		
Sampling Date		2013/07/16 10:30	2013/07/16 11:30	2013/07/16 13:00		
COC Number		na	na	na		
	Units	**GX6075\EXSHAW WTP**	**GX6095\HARVEY HEIGHTS**	**GX6096\CANMORE WTP**	**RDL**	**QC Batch**
2,3,4,6-Tetrachlorophenol	ug/L	<0.50	<0.50	<0.50	0.50	3287792
2,4,5-T	ug/L	<1.0	<1.0	<1.0	1.0	3287792
2,4,6-Trichlorophenol	ug/L	<0.50	<0.50	<0.50	0.50	3287792
2,4-D	ug/L	<1.0	<1.0	<1.0	1.0	3287792
2,4-Dichlorophenol	ug/L	<0.50	<0.50	<0.50	0.50	3287792
Alachlor	ug/L	<0.50	<0.50	<0.50	0.50	3287792
Aldicarb	ug/L	<5.0	<5.0	<5.0	5.0	3287792
Atrazine	ug/L	<0.50	<0.50	<0.50	0.50	3287792
Des-ethyl atrazine	ug/L	<0.50	<0.50	<0.50	0.50	3287792
Atrazine + Desethyl-atrazine	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Bendiocarb	ug/L	<2.0	<2.0	<2.0	2.0	3287792
Bromoxynil	ug/L	<0.50	<0.50	<0.50	0.50	3287792
Carbaryl	ug/L	<5.0	<5.0	<5.0	5.0	3287792
Carbofuran	ug/L	<5.0	<5.0	<5.0	5.0	3287792
Chlorpyrifos (Dursban)	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Cyanazine (Bladex)	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Diazinon	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Dicamba	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Diclofop-methyl	ug/L	<0.90	<0.90	<0.90	0.90	3287792
Dimethoate	ug/L	<2.5	<2.5	<2.5	2.5	3287792
Dinoseb	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Malathion	ug/L	<5.0	<5.0	<5.0	5.0	3287792
Metolachlor	ug/L	<0.50	<0.50	<0.50	0.50	3287792
Metribuzin (Sencor)	ug/L	<5.0	<5.0	<5.0	5.0	3287792
Ethyl Parathion	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Pentachlorophenol	ug/L	<0.50	<0.50	<0.50	0.50	3287792
Phorate	ug/L	<0.50	<0.50	<0.50	0.50	3287792
Picloram	ug/L	<5.0	<5.0	<5.0	5.0	3287792
Prometryne	ug/L	<0.25	<0.25	<0.25	0.25	3287792
Simazine	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Terbufos	ug/L	<0.50	<0.50	<0.50	0.50	3287792
Triallate	ug/L	<1.0	<1.0	<1.0	1.0	3287792

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B3B5846
Report Date: 2013/08/02

Maxxam Analytics
Client Project #: B360337

SEMI-VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		SH5324	SH5325	SH5326		
Sampling Date		2013/07/16 10:30	2013/07/16 11:30	2013/07/16 13:00		
COC Number		na	na	na		
	Units	**GX6075\EXSHAW WTP**	**GX6095\HARVEY HEIGHTS**	**GX6096\CANMORE WTP**	**RDL**	**QC Batch**
Trifluralin	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Benzo(a)pyrene	ug/L	<0.0090	<0.0090	<0.0090	0.0090	3287792
Methyl parathion	ug/L	<1.0	<1.0	<1.0	1.0	3287792
Surrogate Recovery (%)						
2,4,6-Tribromophenol	%	76	78	82	N/A	3287792
2,4-Dichlorophenyl Acetic Acid	%	83	85	89	N/A	3287792
2-Fluorobiphenyl	%	70	70	73	N/A	3287792
D14-Terphenyl (FS)	%	100	101	106	N/A	3287792
D5-Nitrobenzene	%	75	73	77	N/A	3287792

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B3B5846
Report Date: 2013/08/02

Maxxam Analytics
Client Project #: B360337

PESTICIDES & HERBICIDES BY HPLC (WATER)

Maxxam ID		SH5324	SH5324	SH5325	SH5326		
Sampling Date		2013/07/16 10:30	2013/07/16 10:30	2013/07/16 11:30	2013/07/16 13:00		
COC Number		na	na	na	na		
	Units	**GX6075\EXSHAW WTP**	**GX6075\EXSHAW WTP Lab-Dup**	**GX6095\HARVEY HEIGHTS**	**GX6096\CANMORE WTP**	**RDL**	**QC Batch**
Glyphosate	ug/L	<10	N/A	<10	<10	10	3283969
Diuron	ug/L	<10	<10	<10	<10	10	3285280
Guthion (Azinphos-methyl)	ug/L	<2	<2	<2	<2	2	3285280
Temephos	ug/L	<10	<10	<10	<10	10	3285280

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B3B5846
Report Date: 2013/08/02

Maxxam Analytics
Client Project #: B360337

ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

Maxxam ID		SH5324	SH5325	SH5326		
Sampling Date		2013/07/16 10:30	2013/07/16 11:30	2013/07/16 13:00		
COC Number		na	na	na		
	Units	**GX6075\EXSHAW WTP**	**GX6095\HARVEY HEIGHTS**	**GX6096\CANMORE WTP**	**RDL**	**QC Batch**
Methoxychlor	ug/L	<0.01	<0.01	<0.01	0.01	3296663
Surrogate Recovery (%)						
2,4,5,6-Tetrachloro-m-xylene	%	74	73	73	N/A	3296663
Decachlorobiphenyl	%	105	107	110	N/A	3296663

N/A = Not Applicable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

HydroQual Laboratories Ltd.

Microcystin-LR Test Report

Client: MAX110
Reference: 13-1283

Result Summary

Client: Maxxam Analytics; operation Calgary

Sample: GX6075-10R \ EXSHAW WTP, GX6095-10R \ HARVEY HEIGHTS, GX6096-10R \ CANMORE WTP
Collection: collected on 2013/07/16 at 1030, 1130, 1300
Receipt: received on 2013/07/17 at 1000 by O. Cruz
Containers: received 3 x 250mL bottles at 4 °C, in good condition with no seals and no initials
Description: type: water; collection method: not given

Contents

Analysis: extracted on 2013/07/24 by A. Pounden; analyzed on 2013/07/24 by A. Pounden

Result:

lab reference	Sample Information client	collection date	Microcystin-LR (µg/L)	MDL (µg/L)	Comment
13-1283-01	GX6075-10R \ EXSHAW WTP	2013/07/16	<0.14	0.14	none
13-1283-02	GX6095-10R \ HARVEY HEIGHTS	2013/07/16	<0.14	0.14	none
13-1283-03	GX6096-10R \ CANMORE WTP	2013/07/16	<0.14	0.14	none

The test data and results are authorized and verified correct.

Legend:

µg/L	unit of concentration based on volume, parts per billion
MDL	Method Detection Limit

HydroQual Laboratories Ltd., #4, 6125 12th Street SE, Calgary, Alberta, Canada T2H 2K1
Tel (403) 253-7121 fax (403) 252-9363 www.hydroqual.ca