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The following pages will outline a case study, which shows the benefits in energy and cost savings of properly installed mechanical insulation.

Insulation is a proven means for conserving energy, reducing greenhouse gas emissions, increasing process productivity, providing a safer and more productive work environment, controlling condensation (which can lead to mold growth), supporting sustainable design technology and a host of other benefits.

Mechanical insulation does all of this, while providing a return on investment (ROI) rate, which is seldom rivaled. Despite the proven ROI, insulation is often overlooked and its benefits undervalued. Insulation is truly the lost or forgotten technology. Can you think of a more important time than now to think about how insulation can help you?

An insulation system is a technology, which needs to be engineered and maintained throughout the entire process. Several studies have estimated roughly 10 to 30 percent of all installed insulation is now missing or damaged.

The practice of not replacing or maintaining an insulation system in a timely and correct manner reduces the full benefits of insulation, and in return, decreases the ROI. In many cases, significant other issues - such as excessive energy loss, corrosion under insulation (CUI), mold development, increased cost of operations and reduced process productivity or efficiency - develop.

You can learn more on www.MechanicalInsulatorsLMCT.com, where additional case studies can be viewed.

Please do not hesitate to contact me should you have any additional questions.
Thank you,

Peter Ielimi

Executive Director
Mechanical Insulators Labor Management Cooperative Trust

SALAMANDER INSPECTIONS LTD

Mechanical Insulation Energy Audits

Energy Audit

For the Brownlee Building
10365 – 97 Street, Edmonton Alberta

April 5, 2016

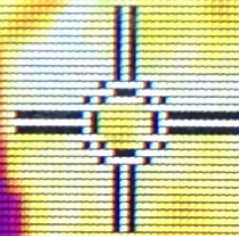


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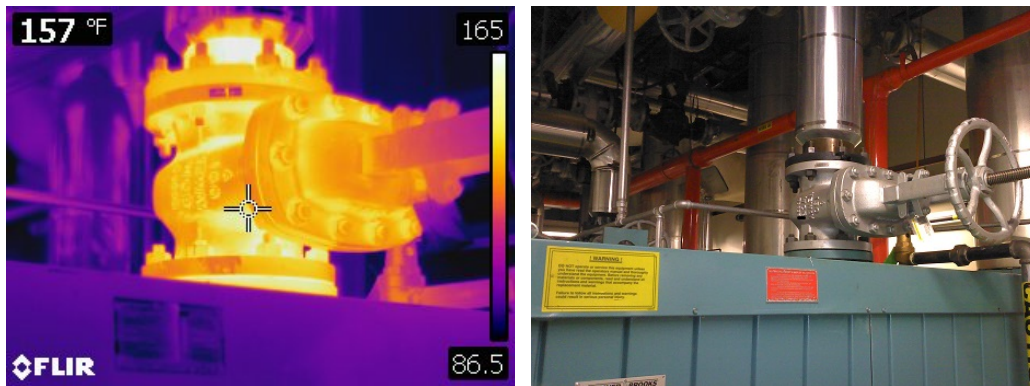
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Exposed valves in the boiler room of the Brownlee Building as seen by the thermographic camera.

About Salamander Inspections and the FLIR Thermographic Camera

Salamander Inspections Ltd. is a third party inspection service providing energy audits for mechanical insulation systems in the Commercial /Institutional sector. We are utilizing a state of the art FLIR thermographic camera to provide us with accurate measurements and photographs of heat loss and gain on mechanical systems within the scope of work determined by our clients.

This valve, as photographed by the FLIR camera uses sensors within the camera to show the heat radiating from the valve. The brighter the color the hotter the temperature of the object. The camera must be set up to filter out the ambient heat from surrounding objects to ensure that the temperatures are accurate. The camera then takes a thermal image as well as a digital picture for reference.

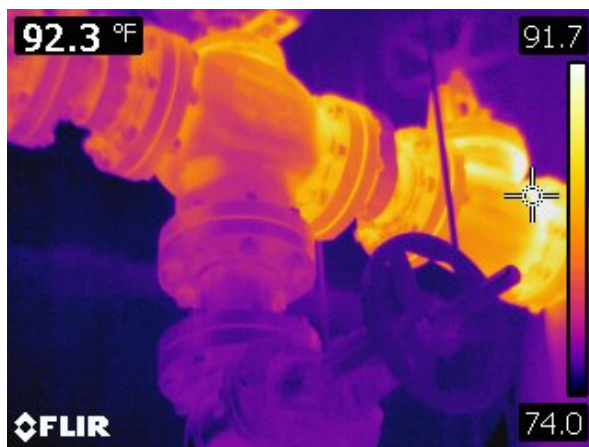
Methodology

The audit was performed by systematically inspecting the condition of all mechanical systems within the scope of work. The type of system, condition, temperature and footage was recorded and used to determine outcomes that will be beneficial to the operation of the building. The areas targeted within the scope of work have been checked using a FLIR digital thermal imaging camera which shows clearly problem areas that may not be seen with the naked eye. The photographs clearly show the areas of concern which can be addressed by applying mechanical insulation products.

Executive Summary

Brownlee Building is located at 10365 – 97 Street, Edmonton Alberta. This building comprises several governmental services.

Salamander Inspections has performed an energy audit of the heating system within the Boiler Room, Penthouse Mechanical Rooms, and the mechanical spaces and piping in the parking garage. The purpose of the audit was to determine the current state of mechanical insulation applied to the systems. These areas are the four areas within our scope of work.



There are some areas where pumps, valves and piping remain without insulation applied.

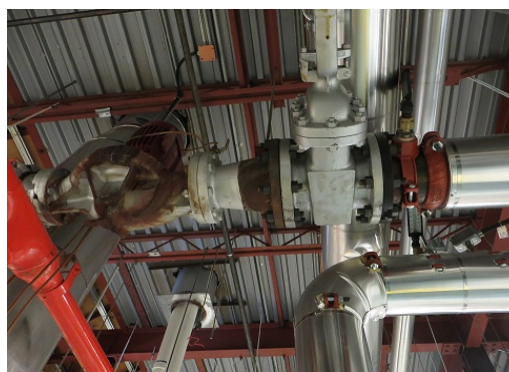
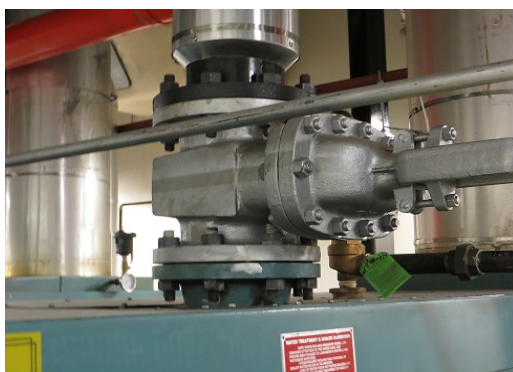
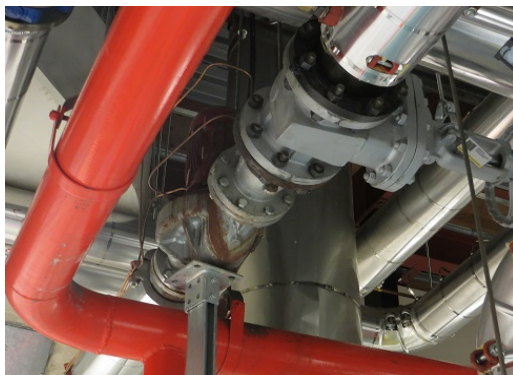
We are pleased to tell you that if all areas within this report are addressed Brownlee Building will save 934 GJ per year saving \$3,736. The cost associated with the insulation of items contained within this report is \$5,208 with a ROI of approximately 1.3 years. The insulation costs do not include the finish ie: PVC elbows and canvas. The ROI is determined by dividing costs by the savings.

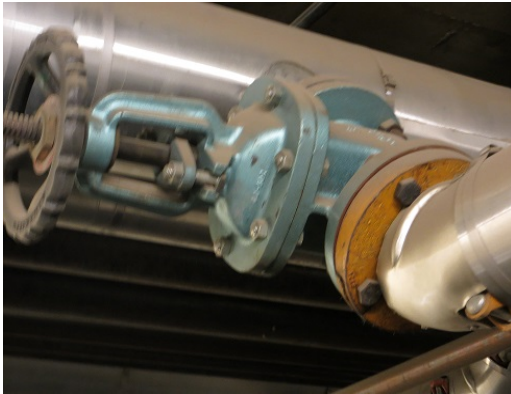
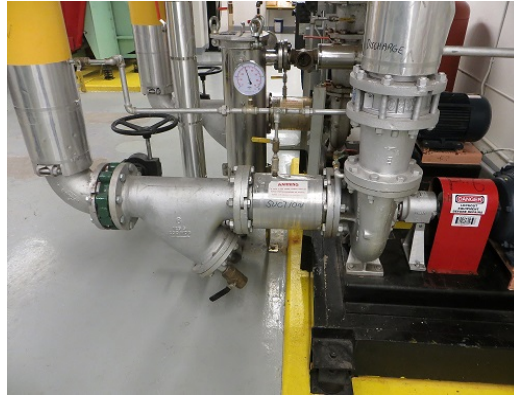
We have calculated from the 934 GJ savings a 46.4 Mt reduction of CO2 emissions. There will also be a reduction of NOx emissions from .017 Mt to .0012 Mt per year.

Boiler Room and Penthouse Fan Rooms

We have assessed the boiler room and found that the insulation applied to the mechanical systems is in good condition. However, there are some instances where pumps, valves and piping have no insulation applied and therefore, an opportunity to receive some savings is available. During the course of this inspection we counted at least (13) valves, (2) strainers, (6) pumps and a number of flanges and couplings as well as and other areas which should be insulated.

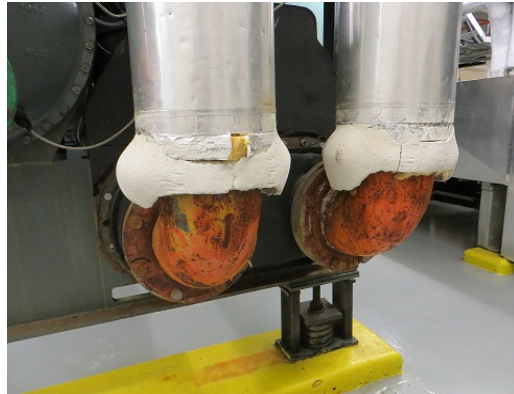
The workmanship of the existing insulation is in good condition but some bad practices were followed when these materials were installed. We observed that the metal cans (elbows) installed in the boiler room and in the adjacent fan rooms were cut open to allow the ears of the Victaulic clamps to be exposed rather than oversize the insulation materials to completely enclose the elbow. This practice was also done to some of the chilled system and the vapor barrier is compromised in these areas. There isn't a reason to not insulate valves, piping and or fittings but to achieve cost savings at the time of construction or a specification which allowed these practices to take place. We can now show that not insulating pipes hot or cold will cost money for the operation of the building and or repairs to equipment or piping. The report contains visual inspection of these systems utilizing thermographic analysis and conventional digital photographs for reference. **The boiler room comprises 90% of the items listed on the 3e spreadsheet.**

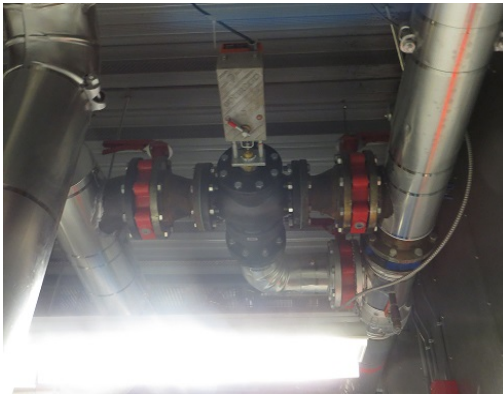




Chilled Piping

We have inspected the chilled mechanical piping and found most of the system was well insulated and the workmanship good. We have found areas where obvious maintenance has taken place and the insulation has yet to be applied in these areas. There were areas where oversize insulation was not applied to the Victaulic ears compromising the vapor barrier. At the time of inspection the chilled system was not operational and we could not confirm that the exposed piping, valves or pumps was condensing for lack of mechanical insulation.





Mechanical Room in Parking Garage

We have inspected mechanical room AS-3 and found that there are valves, piping, pumps and a heat exchanger that have not been insulated. There are signs of maintenance that have been done and the mechanical insulation has not been repaired or replaced.





At the time of the inspection of this area both the heating system and cooling system were not active. The thermographic images which are in the appendix (Pictures) show very low temperatures for both cooling and heating. There are still many areas within this room and the connecting fan rooms on other levels of parking garage which have exposed piping and equipment that should be insulated to maximize efficiency.

Parking Garage

The insulation materials applied to the piping in the parking garage is in good condition. The same application methods have been used in this space with various amounts of insulation not done or missing from maintenance work and possibly from specifications not requiring it. In our conversations with maintenance personnel their view is that the missing insulation on the heating side is helping to heat the space during the colder months.

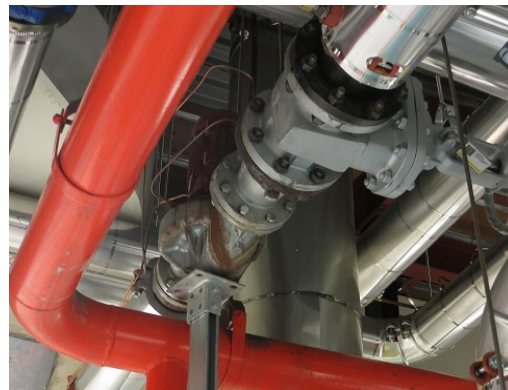


Items missing insulation	in parking garage	
Elbows	2 inch	2
Elbows	6 inch	2
Valves	½ inch	8
Valves	¾ inch	10
Valves	1 inch	7
Victaulic Clamp Ears		29
Piping	1 inch	3 ft
Piping	½ inch	2 ft

Personnel Protection

We also would like to address the hazards that the hot exposed items present to personnel. The boiler rooms and fan rooms generally are tightly packed with equipment and piping systems operating up to 121°C, the systems and equipment which are not insulated leave many opportunities for employees and maintenance personnel to come in contact with these surfaces which can burn skin. Properly insulated systems and equipment eliminate the possibility of individuals coming into contact with these hot surfaces and will prevent accidental burns which will add value by individuals not having claims and or lost time incidents.





The following is a list of calculations using energy calculators and the known cost of fuel. The heat loss number (BTU) is derived from the 3EPlus spreadsheet using the information gathered during the site visits, known temperatures, and the measurements of known missing and or damaged insulation.

Energy Calculations

Brownlee Building	Heating system cycle @ 6048 hours operation	Boiler room penthouse mechanical rooms and mechanical spaces in parking garage
Heat Loss per hour	134,167 btu	
@24 hrs	3,220,008 btu	
@31 days	99,820,248 btu	
total	105.31 GJ @ 1 month	5 months = 526.55 GJ
Heat Loss per hour	134,167 btu	
@24hrs	3,220,008 btu	
@30 days	96,600,240 btu	
total	1101.91 GJ @ 1 month	4 months = 407.64 GJ
	total	934.19 GJ &
	Cost of fuel	\$ 4.00/GJ
	Savings per year	\$3,736.76

Insulation Materials

This is a list of materials needed to insulate areas noted during our inspection, these are used as input for the 3EPlus spreadsheet for heat loss calculations. The insulation costs are estimates and should not be used as actual costs.

Pumps	6	10” @ 12 ft	\$158.40
Gate Valves	8	10” @ 51.04 ft	\$673.72
Flanges	6	10” @ 6 ft	\$79.20
Elbows	6	10” @ 24 ft	\$316.80
Valves	6	6” @ 33.48 ft	\$294.95
Strainers	2	10” @ 12.76 ft	\$168.43
Elbows	3	6” @ 12 ft	\$105.72
Expansion Tanks	3	110 sq ft	\$183.46
Heat Exchangers	2	29.27 sq ft	\$66.03
Pipe		4” @ 20 ft	\$95.80
Pipe		10” @ 9 ft	\$93.51
Pipe		12” @ 10ft	\$120.10
Pipe		8” @ 6ft	\$52.86
		Based on 1.5 wall material	
Total materials cost			\$2,408.98
Work days	7@ \$400 per day		\$2,800.00
Total materials & labor			\$5,208.98

The calculations from the spreadsheet indicate that if mechanical insulation were to be applied to all areas that are highlighted by this report energy cost savings would be realized. We also recommend that insulation be reapplied to equipment so as to increase its longevity and the time between service intervals.

Recommendations and Conclusions

Upon consideration of all observed conditions and the information gathered from the 3EPlus program, we recommend that all areas identified within this report be insulated or repaired. We also recommend that **Best Practices** be followed when applying insulation to these items as any deviation from applying insulation will reduce any potential savings. For example, we know that the elimination of canvas can shorten the lifespan of fiberglass with an ASJ finish because of the lack of a protective cladding system. We also recommend using removable insulating pads where necessary or feasible. This will allow maintenance to take place by removing the insulation pad whenever maintenance needs to take place.

If all areas are addressed, you will receive:

- 1) Reduction of heat loss - **934 GJ**
- 2) Cost savings derived through properly insulated piping, valves, strainers and equipment- **\$3,736**
- 3) Potential savings on maintenance costs for equipment
- 4) Elimination of personal protection hazards

Disclosure

We have no relevant financial or non-financial relationships to disclose.

Limitations

This building was assessed at the winter/spring changeover where the building was utilizing free cooling. The chilled areas were not in operation and the heating cycle was not running at its highest point. The building is occupied and inspection above the ceiling spaces was not done. We have used information provided to us from various sources but information such as operational heating cycles and cooling cycles are based on conversations with maintenance personnel.

Disclaimer

Results stated in this report are estimated and based upon the data supplied or determined during the audit process. Only the previously agreed to areas have been included in this report. These results are not covered by warranty nor are they guaranteed. The results are intended to portray a reasonable estimate of potential energy savings and emissions reduction with the use of an upgraded and maintained insulation system.

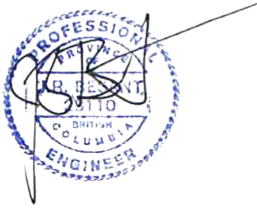
Best regards,

Report prepared by:
Salamander Inspections



Bob Barter (Project Coordinator)

Reviewed by:
Besant and Associates Engineers Ltd.



Jeff Besant, MBA, P.Eng.

PHOTOGRAPHS