REQUEST FOR MODIFICATION

TO PROPOSAL NO. TUMC.1.08 DATED 10/31/08 (DELETE ITEMS 1,2, & 3) TO CHANGE TO SUBMITTAL OF THIS REPORT AS SCOPE OF WORK TO REHABILITATE EXISTING BOILER

Tuesday, February 24, 2009

TURNAGAIN UNITED METHODIST CHURCH

Internal Design of Existing Three-Pass High Efficiency Industrial Type Boiler

PREPARED BY:

NUSHAGAK CONSULTANTS
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ANCHORAGE, ALASKA 99503
907 277 1864

IAPMO MEMBER

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NUSHAGAK CONSULTANTS
SINCE 1962
NEW BUILDINGS - RENOVATIONS - MECHANICAL

February 23, 2009

Turnagain United Methodist Church
3300 W. Northern Lights Blvd
Anchorage, Alaska 99517

Project: Proposal No. TUMC1.08 Dated 10/31/08

Subject: Existing Three-Pass Boiler

Dear Trustees,

It has been determined by Harvey Brownlow, President of Industrial Boiler and Controls, Inc (see tab), myself, and other qualified commercial/Industrial boiler professionals that the existing three-pass boiler has excellent status for rehabilitation. This particular type industrial boiler is of the highest efficiency and if the church were to replace it on an or-equal value, the material and labor cost would exceed $75,000.

Therefore, in the interest of the church to save substantial moneys by not installing a new boiler system, I am requesting your approval not to proceed with the design and cost estimate of a new boiler system as described in line items 1, 2, & 3 of the proposal dated 10-31-08. Upon your approval of our discovery, I request deletion of these items from the proposal and replaced with this report submitted as the scope of work already completed. I have documented all time involved to justify the intensity of this research.

As delineated in the enclosed drawing that references equipment and thermostat locations (see “Efficiency Upgrade” tab), I am in the process of completing this survey in which shall show added cost energy savings for the church. You will have this report in the near future.

Best Regards,

Jerry Nicholson, MA
Chief Mechanical Administrator

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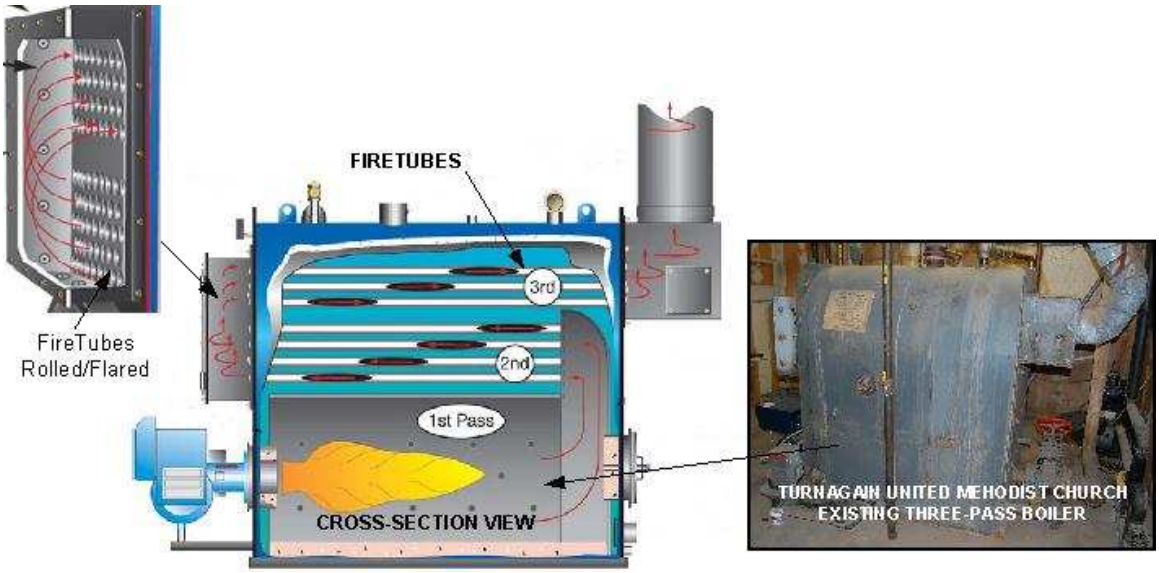
TURNAGAIN UNITED METHODIST CHURCH

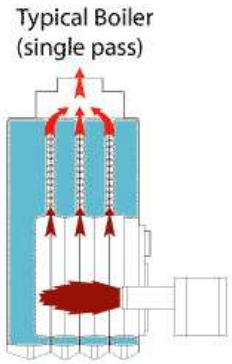
BOILER CONDITION & REVISED RECOMMENDATION

February 2009



PREFACE OF EXISTING BOILER DESIGN FEATURE AND EFFICIENCY

Turnagain United Methodist Church's *three-pass* fire-tube steel boiler passes hot combustion gases through long, small-diameter tubes, heat is than conveyed to water through the tube walls. This achieves very high efficiency by circulating the hot flue gases through the heat exchanger *three times*. This high efficiency industrial boiler (registered with the National Board of Pressure Vessels) is superior and far exceeds any efficiencies of a light commercial cast iron **Single Pass Boiler** which provides only one opportunity for hot gases to transfer heat to the boiler water. New, this three-pass fire-tube boiler would have an estimated cost value of $28,000.



Designed and built by Burnham Commercial in 1965 (a leading boiler manufacture in the United States), Burnham still incorporates the same internal three-pass design today in its commercial boilers (see Burnham tab) as well as in the last few years bringing this high efficiency design into the residential market.

OBSERVATIONS AND ANALYSIS

On January 7th, 10am, Jerry Nicholson arrived at the TUMC's boiler room to layout the preliminary pencil drawing of existing floor plan, boiler, piping, and appurtenances. He spent two hours in the boiler room doing the drawing and taking other pertinent information off pumps, etc. The outside temperature was -15F below zero with no wind.

During the course of his work, he observed that the boiler pressure was about 10 psi and the set point temperature of the boiler was shutting down at 190 degrees.

Having 40 years of experience in listening to hot water boiler on/off efficiency cycles, Mr. Nicholson particularly took notice of the Power Flame gas burner on (about 7 minutes) and off (about 15 minutes) cycles of the boiler during this -15 below weather. The surveillance demonstrated an excellent example of an efficient operating boiler during extreme cold weather.

Normally an old antiquated inefficient boiler during cold weather would be running all the time trying to keep up with building heat load demand, which wastes natural gas. This boiler was not doing that, in fact, it was operating adequate, as any new high efficiency boiler would be doing.

Mr. Nicholson, impressed with the efficiency performance, realized that perhaps the Turnagain United Methodist Church should consider renovating the existing boiler instead of replacing it with a new boiler(s). A new or-equal three-pass boiler could be beyond TUMC's budget thus resulting in purchasing of a light commercial single-pass cast iron boiler(s) that in determination would most likely run more than this existing high efficiency three-pass boiler during cold weather; costing TUMC monies in wasted natural gas costs.

On the same day of observation, to substantiate Mr. Nicholson's findings he called Russ Westover of Ray Burner Company in California to get his opinion of the boiler (Ray Burner Company through an agreement with Burnham Industries sold these boilers under the name Burnham Ray that is on the nameplate of TUMC's boiler).

After explaining his discovery to Mr. Westover, he too was impressed with the operation of the boiler especially at indicated outside air temperature (-15F). Mr. Westover also commented that he confides with customers that have the same type 30 horsepower boiler and one that has been in operation since 1939. Mr. Nicholson suggested to him that instead of replacing the boiler, perhaps, it would be more beneficial and appropriate for TUMC to inspect the innards of the boiler (fire-tubes, refractory, etc.), to insure no harmful damage is apparent. If this process passes inspection, replace corroded fire-tubes if needed, fix water leaks, and clean the boiler during the next spring season. This would prolong the life of the boiler and most likely give many years of more service. Mr. Westover agreed with Mr. Nicholson's analogy.

Concluding that this would be the right economical solution and save substantial monies for the church, later that day (January 7th) Mr. Nicholson contacted Chuck Kennedy to meet at TUMC boiler room. Upon meeting with Mr. Kennedy, Mr. Carl Jones, a Boiler & Machinery inspector for The Hartford Steam Boiler Inspection and Insurance Company appeared coincidentally at the same time. In discussions about Mr. Nicholson's findings, Mr. Jones agreed that the correct decision for TUMC, was to do a complete inspection and cleaning of this boiler come spring time to insure that a new boiler is not needed. Mr. Jones provided pointers for this procedure and at the same time certified the boiler as fit for operation with a State of Alaska inspection sticker he placed on the boiler.

On January 19, a warm 42-degree day Mr. Nicholson further authenticated his finding of the efficiency of the existing boiler. Spending 2 hours in the boiler room Mr. Nicholson timed the on and off cycles. It was observed that boiler came on for about 4 minutes and stayed off for 28 minutes. This was a clear indication the boiler was operating in an efficient manner.

BOILER RENOVATION SCOPE OF WORK and COST ESTIMATE

Unlike a light commercial cast iron boiler, which only is a matter of inspection and cleaning, and because TUMC's three pass boiler is registered with the National Board of Pressure Vessels, any inspection or work (e.g. fire-tube replacement) has to be performed by a company that specializes in Industrial boilers.

Finding no manufacture boiler manual or parts drawing on TUMC's property to facilitate this revised recommendation for precise clarity, on January 21st Mr. Nicholson contacted the factory Burnham Commercial in Lancaster, Pennsylvania for an archived manual. They referred him to an Anchorage Burnham factory representative, Glenn Evans of Mechanical Sales.

Having found no archived manual, Glenn Evans contacted Harvey Brownlow, President of Industrial Boiler and Controls, Inc who specializes in industrial boilers throughout the state of Alaska. In meeting at TUMC's boiler room on February 3rd, Mr. Nicholson briefed them in his discovery and all agree that the boiler has excellent potential for restoration to increase its longevity. As an added measure in efficiency performance Mr. Brownlow advised inserting spinners (baffles) into the fire-tubes (If not already installed), these help extract more heat from the combustion gases into the water instead of heat wasted by going up the stack.

Discussions by all examined the advantage for TUMC to install a new low/high/low fire gas burner. The new burner would reduce the number of on/off cycles and the amount of time the burner spends firing at full rate. This provides optimum load matching, e.g. Building BTU heat loss during warm weather 300,000 btu (low fire) and cold weather 600,000 btu (high fire).The burner will stay on for a greater length of time at the lower firing rate but saves a significant amount in natural gas costs. Including incidentals or other problems an installer may encounter, a new low/fire/low gas burner could be as much as $7,500.00 installed.


Low/High/low Burner

An inspection of boiler innards (fire-tubes, etc.), must be performed before an actual estimated cost of internal repairs can be accurately determined. Worse cost case scenario would be the discovery that all fire-tubes are in need of replacement due to heavy corrosion and/or pits; however, this cost would be substantial less than a full replacement of existing boiler. The ideal situation for cost renovation of the boiler innards would be the discovery of minor corrosion and/or pits of the fire-tubes. In retrospect to the worst cost scenario, this less costly discovery would require no replacement of fire-tubes but only to add an arresting chemical that would minimize any further corrosion and/or pitting of the fire-tubes. Upon inspection of the innards of the boiler, this approach should be a top priority in the interest of TUMC.

Boiler inspection that encompasses shutting the boiler down and removal of covers and cleanouts, etc. for observation of innards (fire-tubes, etc.) would be under $1,500.00.

OTHER BOILER OBSERVATIONS

Asbestos, a fire-retardant used extensively for heating pipe insulation to mold in elbows, etc. in the 1960's could be present on the boiler room heating pipes.

However, without testing, it is speculation, but be noted that if TUMC should choose to install new boilers, a permit would have to taken out from the Municipality of Anchorage. TUMC would lose all grandfather rights and then the boiler room would have to be brought up to existing codes, e.g. It was also observed that water damage is apparent to the sheetrock next to the domestic hot water heater. This would add extensively to the cost.

No permit is required to rehabilitate the existing boiler.


Boiler Supply Elbow


Water Damaged Sheetrock

The front cover of the boiler was not removed to inspect fire side surfaces or to determine if additional heat extraction devices are in place as were originally included in this design.
The burner currently used is of current design but can be improved upon by retrofit or addition of multiple rate firing. The current is on-off firing and is at full rate of design. This can be reduced to approximately half by retrofitting the burner with a newer burner with better excess air control and multiple firing rates, 2 stages for this size is recommended. The boiler temperature sensors appear to be working properly but without removal and testing cannot be certain of calibration. The addition of outside air temperature setback in addition to required boiler temp controls is recommended for improved efficiency.
The burner drive motor is in need of service, primarily the armature bearings are dry and dragging, this also works to increase burner operating cost and reduce efficiency.

On inspection of water side it may be reccomended to change the tubes within the boiler due to accumulated corrosion and scale condition, this alone can increase the heat transfer ratio by upwards of 7 to 8 percent

The boiler is of sufficient age, with the change in manufacture ownership, we were unable to retrieve much records as pertain to the unit. The current costs of replacement boilers and associated cost of installation make this unit a very good project for efficiency retrofits. This is all dependent on waterside inspection and condition of boiler basic structure, which from external inspection appear to be in fair to good condition.

Submitted by

Harvey T. Brownlow
President

Industrial Boiler & Controls, Inc.

106 E. Dowling Road, Suite B
P.O. Box 91418
Anchorage, Alaska 99509-1418
(907) 562.2827

Report of inspection

16 February 2007

Nushagak Consultants
225 E. Fireweed Lane
Anchorage, Alaska 99503

Property inspected;
Turnagain United Methodist Church
3300 W. Northern lights Blvd.
Anchorage, Alaska 99517

February 3rd I with Glenn from Mechanical Sales and Jerry Nicholson of Nushagak Consultants, visited the heating plant of the Turnagain Methodist Church.

Equipment observed:
1 each Ray-Burnham water boiler operating at less than 30 psig and a temperature in excess of 180 deg. F. General observation of piping design and boiler, building controls.

The boiler is of an older design with at least 1 burner conversion since installation. The current burner and controls are adequate as to application. As today's cost of fuels and maintenance, there are upgrades that will reduce fuel consumption and provide for better heating temperature control. The boiler is in need of immediate service as it has leaking gaskets at the waterside inspection ports on the lower side, additionally it is evidenced it has been some length of time since boiler safety controls have been tested for operation.
The boiler should be drained as soon after critical heating season for replacement of gaskets and internal inspection. Water side flushed of accumulated dirt's and sludge, as this does hinder heat transfer within the boiler.

1 AIRHANDLER

2 PNEUMATIC THERMOSTATS (T)

3 ELECTRIC PROPORTIONING THERMOSTATS (T)

4 ELECTRIC THERMOSTAT

5 HOT WATER HEATER

6 COMPRESSOR

7 AIR HANDLER FILTER

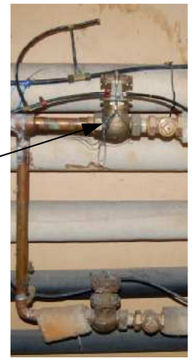
8 PROPORTIONAL ZONE VALVES

9 JANITOR SINK FAUCET

10 BOILER DIRECT DIGITIAL (DDC) OUTSIDE TEMPERATURE CONTROL

SCOPE OF FORECOMING RECOMMENDATION UNDER CONSIDERATION FOR REPAIRS & ENERGY SAVINGS UPGRADES

(1) AIRHANDLER ….Install two each electric night setback thermostats one in Fire Place Lounge second in hallway to control existing fan motor that is currently running 24/7.
(2) PNEUMATIC THERMOSTATS….Install new thermostats that have night setback capabilities.
(3) PROPORTIONING THERMOSTATS...Install new programmable setback thermostats that control the air recirculation fan with a by-pass switch for fan
(4) ELECTRIC THERMOSTAT PASTOR OFFICE….Install new night setback thermostat.
(5) HOT WATER HEATER….Install new instantaneous hot water heater.
(6) AIR COMPRESSOR….Install new compressor with dryer and time clock that controls PRV's for night set back
(7) AIRHANDLER FILTER…. Maintenance schedule for replacement of dirty filters
(8) PROPORTIONAL ZONE VALVES...To be continued to be re-used
(9) JANITOR SINK FAUCET…..Replace with new.
(10) DDC CONTROLLER...Install new automatic boiler setpoint temperature controller based on outside air temperature.



WIRED

LOWER FLOOR PNEUMATIC ZONE VALVES UNDER STAIRWELL

COLD AREA

BOILER ROOM

10 6 5

LOWER FLOOR
DAY CARE
4104 SQ FT TOTAL 2 FLOORS

Up

2 T 2

KITCHEN

9

Up

2 T 2

SECOND FLOOR

OFFICE

2 T

Up

T 2

Up

FIREPLACE LOUNGE

AIR DUCTS

AIR DUCTS UNDER CONCRETE

1 7

HALLWAY
1522 SQ FT

It was observed in this area that the baseboard radiation is overheating the room due to a malfunction thermostat or zone valve

2 T 2

FOYER

2 T 2

TURNAGAIN UNITED METHODIST CHURCH

MAIN CHURCH
3418 SQ FT

T 4
PASTOR

3 T T

8

AIR RECIRCULATION FAN

EQUIPMENT AND THERMOSTAT LOCATION

TURNAGAIN UNITED METHODIST CHURCH

EFFICIENCY UPGRADES

Revision: None
REVISION: None
None

PROJECT | SYSTEM | REVISION

NUSHAGAK CONSULTANTS
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DESIGN CONSULTANT

100% INDIAN OWNED COMPANY

Scale: N/A
Drawn by: jn
Date: 2/21/09
Job NO. TUMC.09
Contents:

Category	Sheet
M	1 OF 1

Turnagain United Methodist Church
Heat Loss Calculation Report

Designed By:		Nushagak Consultants					ZONE: Main Church		Estimator: Jerry Nicholson					Date:	October 23, 2008	
1	Space under consideration						**Foundation Wall**		**Wall Level @ 9'-6**		**Wall Lev. @16'-6**		**End Walls**		**Entire Church**	
2	Running perimeter of exterior wall (feet)						257		145		166		56			
3	Floor area (square feet)										3418					
4	Wall height (feet)						5		10		16		26			
TYPE OF EXPOSURE			Material	R	U	Δ T	Area	BTU/hr	Area	BTU/hr	Area	BTU/hr	Area	BTU/hr	Area	BTU/hr
5	Net exposed walls	A.	Concrete earth	0	0.89	10	1285	11437	0	0	0	0		0	1285	11437
		B.	3" Deck Upper	5.61		93		0	0	0	1976	32757		0	1976	32757
		C.	2x6 Lower	17.6		93	0	0	1154	6098	166	877	0	0	1320	6975
		D.	2x8 End walls	18.83	0	93		0	0	0	0	0	1306	6450	1306	6450
6	Windows and Glass doors	E.	Window Plate		1.25	93		0		0	0	0	150	17438	150	17438
		F.	Window Double	0	0.4	93		0	232	8630	514	19121	0	0	746	27751
		G.			0	93		0		0	0	0		0	0	0
7	Solid doors	H.	Exits		0.35	93		0	64	2083	0	0		0	64	2083
8	Gross roof	I.	Flat ceiling	30		93				0	3418	10596	0	0	3418	10596
		J.			0.5	93				0		0		0	0	0
8a	Gross roof	Ia.	Sloped ceiling	0		93				0	0	0		0	0	0
	Pitch in 12															
	Skylights	Ja.			0.5	93				0		0		0	0	0
9	Floors on grade	K.	Slab insulation	6		38	3418	21647		0	0	0		0	3418	21647
10	Floors / unheated	L.		0		93	0	0		0		0		0	0	0
11		M.		0		93		0		0		0	0	0	0	0
12	**Building Envelope Heat Loss**						**33,084 BTU/hr**		**16,811 BTU/hr**		**63,351 BTU/hr**		**23,888 BTU/hr**		**137,134 BTU/hr**	
13	**Infiltration Heat Loss (based on average of .75 ACH)**						**0 BTU/hr**		**25,635 BTU/hr**		**41,016 BTU/hr**		**0 BTU/hr**		**66,651 BTU/hr**	
14	**Total Heat Loss**						**33,084 BTU/hr**		**42,446 BTU/hr**		**104,367 BTU/hr**		**23,888 BTU/hr**		**203,785 BTU/hr**	
15	Safety Margin						Output		Output		Output		Output		Total Output	
		(constant) About 20%				80%	41,355 BTU/hr		53,058 BTU/hr		130,459 BTU/hr		29,860 BTU/hr		254,731 BTU/hr	
16	Loss	Heating System Distribution Loss					Input		Input		Input		Input		Total Input	
		(constant) About 20%				80%	51,693 BTU/hr		66,323 BTU/hr		163,073 BTU/hr		37,325 BTU/hr		**318,414 BTU/hr**	

DELTA T

Outside Design Temp: -23
InSide Design Temp 70
Design Temp 93 Δ T

Note: Foyer and Church Wing (Pastor office) roof areas have not been upgraded from current R-5 to R-30 insulation to this date. It is anticipated that within a year these roof areas will be upgraded to R-30, therefore all roof calculations for this report are calculated using a R-30 factor submitted via e-mail from Chuck Kennedy. Actual material used for the new current upgrades to R-30 have not been vertified personally by this estimator.