COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E., LEED AP
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: June 22, 2012

RE: CP 1664 - Energy Conservation @ Various County Facilities
Install High-efficiency Condensing Boiler at C0151, Telecomm/Health

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As a part of the energy improvements at Telecomm/Health, the existing boiler will be replaced with a high-efficiency condensing model. DPW will install the boiler and the contractor will supply the materials.

The scope of work from the contractor is to furnish a boiler and an indirect fired water heater. The boiler will be wall hung Triangle Tube model Solo 250. The water heater will be a 30 gallon Super Store model SSU-30. The contractor will disconnect gas piping from the old boiler and connect gas piping to the new boiler. The old boiler will be abandoned in place. The proposal includes $4,000 material such as valves, pipe, bends, tanks, etc. to install the boiler.

The County staff has installed a boiler at C0351 Health, 4 Udall Rd. Using DPW's manpower has saved the County money. DPW staff also understands the typical problems in these types of system and provide materials for ease of maintenance. Installing the boiler ourselves will save labor and maintenance costs of the project.

Total cost of this beneficial project is not to exceed $ 20,008
I wish to propose funding as follows: CP 1664.318 $ 20,008
It is requested that the proposed project be approved.

JA/SH
Cc: Gilbert Anderson, P.E., Commissioner
Philip Berdolt, Deputy Commissioner
Craig Rhodes, Director, Buildings O&M
Robert Frevele, Asst. Director, Buildings O&M
Judd Classie, Maintenance Mechanic IV

335 YAPHANK AVENUE ■ **YAPHANK, N.Y. 11980** ■ **(631) 852-4010**
FAX (631) 852-4150

ALL SYSTEMS MAINTENANCE, INC.

PLUMBING CONTRACTORS
Licensed, Insured & Bonded
Suffolk County WBE Certified
New York State WBE Certified

20 Inez Drive
Bay Shore, NY 11706
(631) 435-3981 Fax (631) 273-7401
asmplumbing@optonline.net

Contract # PSS-030113-P

#1091

PROPOSAL

SUBMITTED TO: **Suffolk County Department of Public Works**
335 Yaphank Road
Yaphank, New York 11980

FOR: **Suffolk County Hauppauge Complex**
Building #151

DATE: **June 22, 2012**

WORK PROPOSED: Plumber will provide the following:

2) Triangle Tube- Prestige Solo high efficiency gas fire condensing boilers Model # Solo 250 natural gas.
1) Super Store-indirect hot water heater Model SSU-30
All above equipment will be delivered to site.
All Systems to disconnect gas piping to existing boiler.
Return and make all necessary changes to re route existing gas piping and reconnect to new boiler.

Note: Installation of new boilers and any additional piping to make new boilers operational will be done by county staff.

This proposal has a $4,000. allowance to provide additional materials to county upon their request. If allowance is not used, associated costs will not be invoiced.

All work is bid to be done during normal working hours.

Exclusions:

- Removal of old boiler
- Any labor for piping supply & return lines to the new boiler
- Wiring of new boiler
- Installation of flue piping.

Materials **$17,308.00**
Labor **$ 2,700.00**

NOT TO EXCEED PRICE: $20,008.00

TERMS: Progressive payments in accordance with work completed to date

Anthony Cincotta

Anthony Cincotta
Vice President

Customer
Date Signed _____

Advanced Heating and Hot Water Systems

P.O. Box 429 · 120 Braley Road · East Freetown, MA 02717 · 508-763-8071 · Fax: 508-763-3769

SSU Ultra Water Heater Submittal Sheet

SuperStor Ultra Water Heaters

JOB NAME:

LOCATION:

ARCH./ENGR.:

WHOLESALER:

MECH. CONTRACTOR:

MODEL NUMBER:

NOTES:

Stainless Steel Tank

- **Tank constructed of type 316L stainless steel for tolerance of high temperatures and superior corrosion resistance**
- **Insulated with environmentally safe, CFC free, water-blown, extra thick foam insulation**
- **Allows less than ½ degree Fahrenheit per hour heat loss**
- **Outer shell constructed of silver finished durable plastic for rust and impact resistance**
- **NPT stainless steel inlet and outlet domestic connections for all models – side tappings**
- **Temperature and pressure relief valve port**
- **Stainless steel control well for accurate current temperature measurement inside vessel**
- **Internal bent hot water outlet tube extracts 5 – 7% more hot water off the top of the tank dome**

High Efficiency Heat Exchanger

- **High output finned 90/10 cupronickel heat exchanger provides corrosion resistance and maximum heat transfer of solar energy to domestic water**
- **Gasketless heat exchanger design**
- **1" NPT heat exchanger inlet/outlet size – all models**

Additional Features

- **Limited warranty – Lifetime residential and 7 years commercial coverage**
- **UL Listed File #E113265 per UL 174 and Canadian Standard C22.2 No. 110-M90**
- **NSF Listed Components**

SUPERSTOR ULTRA SPECIFICATIONS

SUPERSTOR ULTRA

MODEL	HEAT EXCHANGER SURFACE/VOLUME	PRESSURE DROP (FT.)	TEST PRESSURE	WORKING PRESSURE	180° BOILER WATER FIRST HOUR RATINGS (GAL) *		200° BOILER WATER FIRST HOUR RATINGS (GAL) *		180° F BOILER BTU/SIZE	200° F BOILER BTU/SIZE	RECOMMENDED FLOW RATE
					140° F	115° F	140° F	115° F			
SSU-20	15 SQ. FT./1.5 GAL.	6.0	300 PSI	150 PSI	121	168	136	185	84,000	87,000	8
SSU-30					154	212	172	234	102,000	117,000	
SSU-30LB					169	234	189	257	114,000	131,000	
SSU-45	20 SQ. FT./2.0 GAL.	7.9			212	292	237	322	141,000	161,000	10
SSU-60					266	370	298	405	174,000	198,000	
SSU-80	34 SQ. FT./3.0 GAL.	9.1			330	440	370	503	212,000	241,000	12
SSU-119		11.3			423	564	474	645	269,000	301,000	14

*DOE TEST METHOD BASED ON 90° F TEMPERATURE RISE, 50° /140° W/BOILER WATER AT 180° F

NOTE: TANK RECOVERY FROM COLD START WILL BE BETWEEN 10-13 MINUTES WHEN SIZED WITH CORRECT FLOW RATE, BOILER SIZE AND PRESSURE DROP RATINGS FROM LIST IN ABOVE CHART.

SUPERSTOR ULTRA COMMERCIAL

MODEL	HEAT EXCHANGER SURFACE/VOLUME	PRESSURE DROP (FT.)	TEST PRESSURE	WORKING PRESSURE	180° BOILER WATER FIRST HOUR RATINGS (GAL) *		200° BOILER WATER FIRST HOUR RATINGS (GAL) *		180° F BOILER BTU/SIZE	200° F BOILER BTU/SIZE	RECOMMENDED FLOW RATE
					140° F	115° F	140° F	115° F			
SSU-45C	40 SQ. FT./4.0 GAL.	6.8	300 PSI	150 PSI	314	414	351	477	215,000	246,000	20
SSU-60C		9.2			354	467	396	539	245,000	270,000	22
SSU-80C	68 SQ. FT./6.0 GAL.	10.0			490	647	548	745	331,000	374,000	24
SSU-119C		12.7			637	841	713	970	425,000	490,000	28

*DOE TEST METHOD BASED ON 90° F TEMPERATURE RISE, 50° /140° W/BOILER WATER AT 180° F

NOTE: TANK RECOVERY FROM COLD START WILL BE BETWEEN 10-13 MINUTES WHEN SIZED WITH CORRECT FLOW RATE, BOILER SIZE AND PRESSURE DROP RATINGS FROM LIST IN ABOVE CHART.

SUPERSTOR ULTRA DOUBLEWALL

MODEL	HEAT EXCHANGER SURFACE/VOLUME	RECOMMENDED FLOW RATE (GPM)	PRESSURE DROP (FT.)	TEST PRESSURE	WORKING PRESSURE	180° BOILER WATER FIRST HOUR RATINGS (GAL) *		200° BOILER WATER FIRST HOUR RATINGS (GAL) *		180° F BOILER BTU/SIZE
						140° F	115° F	140° F	115° F	
SSU-45DW	15 SQ.FT/1.5 GAL	6	8.2	300 PSI	150 PSI	70	108	40	63	107,000
SSU-60DW		7	12.8			90	144	50	76	176,000
SSU-80DW		10	13.6			138	215	72	113	208,000
SSU-119DW		12	15.9			210	326	110	171	231,000

*DOE TEST METHOD BASED ON 90° F TEMPERATURE RISE, 50° /140° W/BOILER WATER AT 180° F

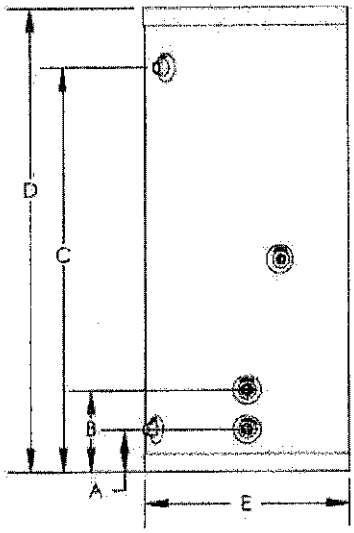
NOTE: TANK RECOVERY FROM COLD START WILL BE BETWEEN 10-13 MINUTES WHEN SIZED WITH CORRECT FLOW RATE, BOILER SIZE AND PRESSURE DROP RATINGS FROM LIST IN ABOVE CHART.

LP-83-BB
08/05/11

CONTINUOUS FLOW PERFORMANCE CALCULATION

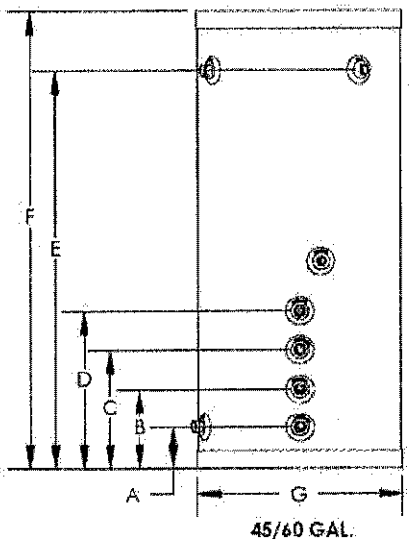
FIRST HOUR RATING – (.75 X TANK CAPACITY) = CONTINUOUS FLOW

EXAMPLE: SSU-45C = 314 – (.75 X 45) = 280.25



SUPERSTOR ULTRA

MODEL	A	B	C	D	E	CAPACITY U.S. GAL.	DOMESTIC CONNECTION	SHIPPING WEIGHT
SSU-20	4-1/2"	9"	22"	27"	19-1/4"	20 GAL.	3/4" NPTM	60 LBS
SSU-30			34"	39-1/2"		30 GAL.		72 LBS
SSU-30LB			22"	28-1/2"	23-1/4"			79 LBS
SSU-45			46"	52-1/2"	19-1/4"	45 GAL.		88 LBS
SSU-60					23-1/4"	60 GAL.	1" NPTM	110 LBS
SSU-80	6"	29"	64-3/4"	72"		80 GAL.	1-1/2" NPTM	141 LBS
SSU-119	7-1/4"	30-1/4"	66"	74"	27"	119 GAL.		210 LBS

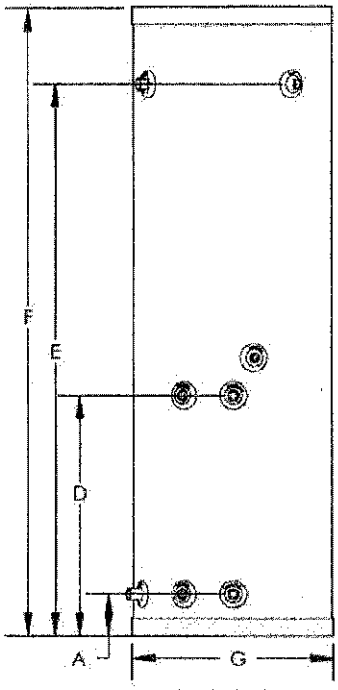


45/60 GAL.

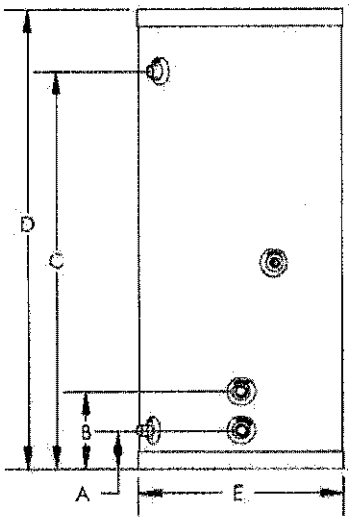
SUPERSTOR ULTRA COMMERCIAL

MODEL	A	B	C	D	E	F	G
SSU-45C	4-1/2"	9"	13-1/2"	18"	35"	42"	23-1/4"
SSU-60C			13"	18"	46"	52-1/2"	
SSU-80C	6"	N/A	N/A	29"	64-3/4"	72"	
SSU-119C	7-1/4"	N/A	N/A	30-1/4"	66"	74"	19-1/4"

MODEL	CAPACITY U.S. GAL.	DOMESTIC CONNECTION	SHIPPING WEIGHT
SSU-45C	45 GAL.	3/4" NPTM	99 LBS
SSU-60C	60 GAL.		115 LBS
SSU-80C	80 GAL.		141 LBS
SSU-119C	119 GAL.		210 LBS



80/119 GAL



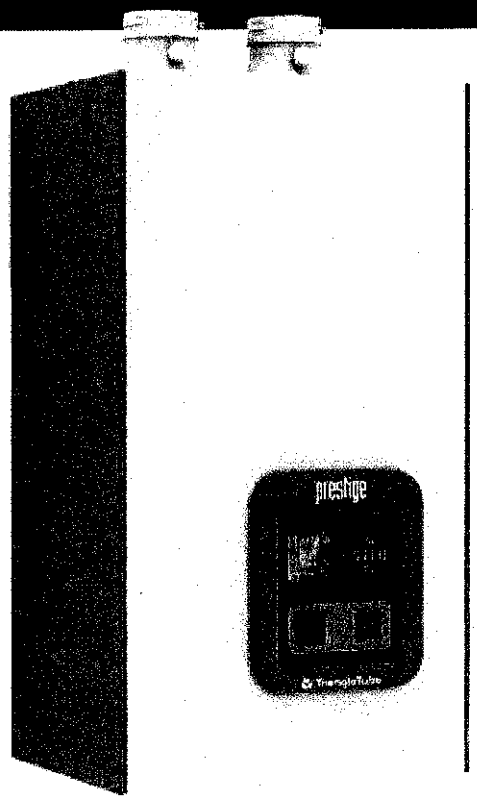
SUPERSTOR ULTRA DOUBLE WALL

MODEL	A	B	C	D	E	CAPACITY U.S. GAL.	DOMESTIC CONNECTION	SHIPPING WEIGHT
SSU-45DW	4-1/2"	9"	46"	52-1/2"	19-1/4"	45	3/4" NPTM	88 LBS.
SSU-60DW					23-1/4"	60	1" NPTM	110 LBS.
SSU-80DW	6"	21"	64-3/4"	72"		80	1-1/2" NPTM	141 LBS.
SSU-119DW	7-1/4"	22-1/2"	66"	74"	27"	119		210 LBS.

TriangleTube

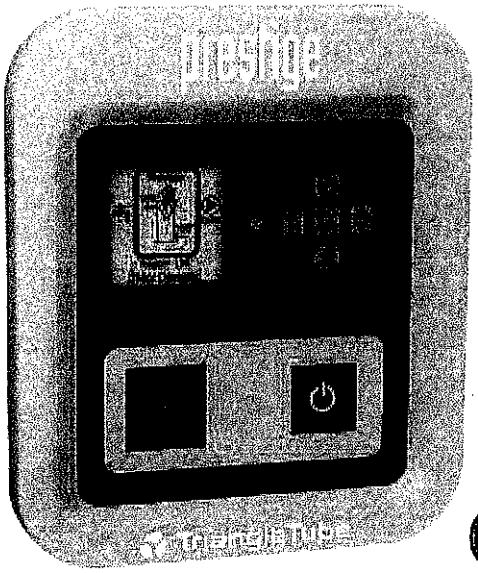
PRESTIGE Solo

Condensing High Efficiency Gas Boiler

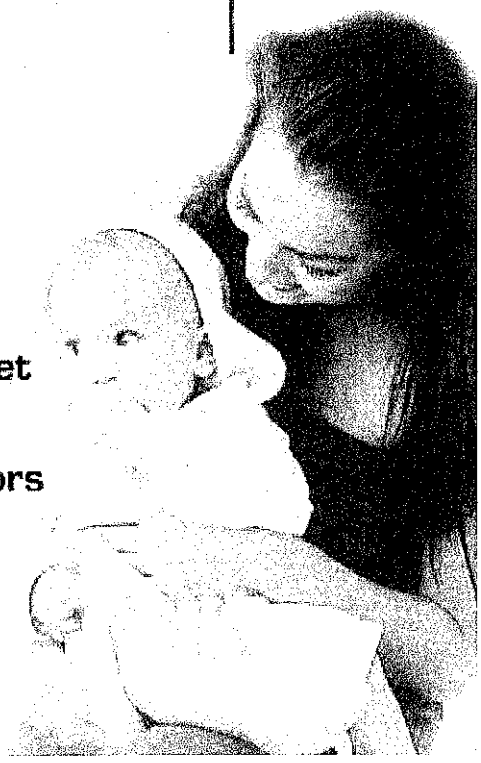


- Stainless Steel Fire Tube Heat Exchanger
- 96% AFUE
- Low Pressure Drop
- Proven Performance
- 2" to 4" Venting
- Multiple Termination Options
- Low NOx - 2012 SCAQMD Certified
- 5 Models from 60 to 399 MBH

Featuring TriMax Control with:

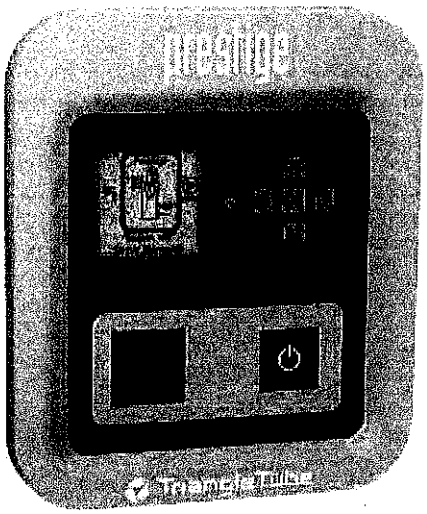


- 60 Second Set-Up
- Integrated Cascade
- Two Reset Curves/Set Points
- Control of 4 Circulators



prestige - Leader in Contractor Friendly Features

TriMax Control



60 Second Set-Up

Choose from 6 standard applications to set up the boiler in 60 seconds or less.

- Finned Tube Baseboard
- Cast Iron Baseboard
- Radiators
- High Mass Radiant
- Low Mass Radiant
- Fancoil

Integrated Cascade

Joins up to 6 boilers: Master boiler automatically recognizes linked boilers: Meets simultaneous DHW & Space Heating calls: Full Parallel Modulation.

Multiple Zone & Circulator Control

Manages 2 separate reset curves for high and low temperature zones: Controls up to 4 circulators. Manages 2 space heating zones and 1 DHW zone without external zone control panel.

Intelligent Toubleshooting

Describes lockouts in plain english and suggests solultions: Stores last 8 errors. Records sensor readings for 24 hours.

Next Generation Fire Tube Heat Exchanger

High Water Content

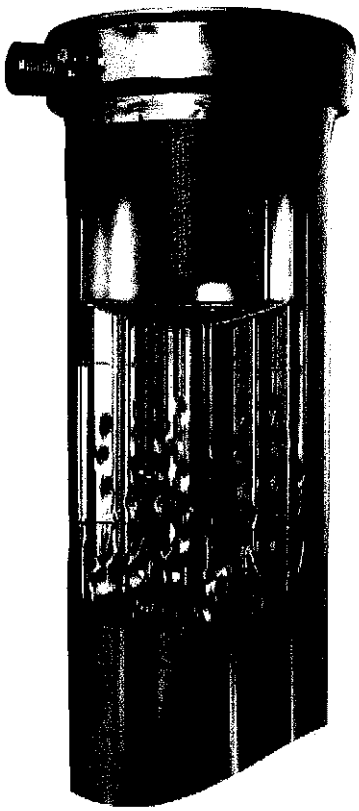
- Provides stable temperature control
- Low sensitivity to water flow
- Reduces short cycling
- Adapts to large or small heating loads

Unique Geometry

- Designed for maximum reliabillity with low thermal stress
- Improved water flow for maximum heat transfer
- 439 Stainless Steel for corrosion resistance
- Polypropylene condensate pan and flue resists corrosion

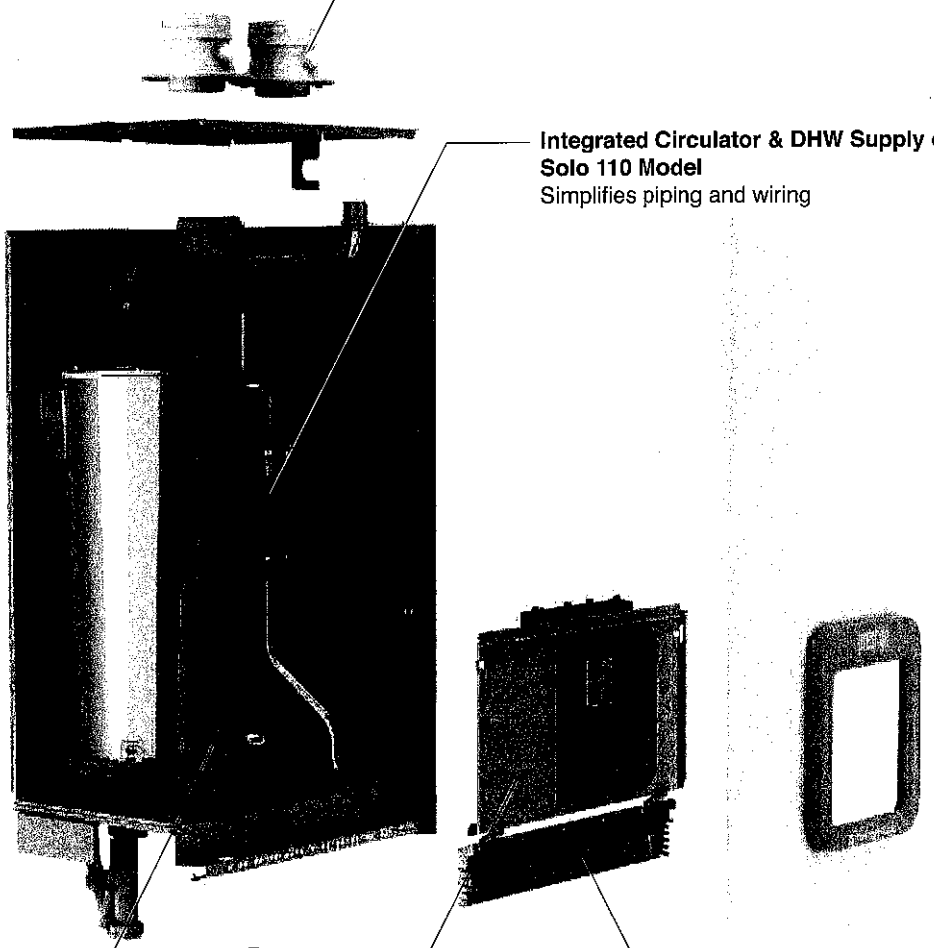
Reliable Low Maintenance Design

- Self cleaning design washes away combustion debris
- 10 year history of reliable performance
- High performance burner design
- Low pressure drop allows piping directly to the system



prestige - Leader in Contractor Friendly Features

Prestige Solo 110 Exploded View



Test Ports in both Flue and Air Connections

Integrated Circulator & DHW Supply on Solo 110 Model
Simplifies piping and wiring

Polypropylene Flue and Condensate Pan
Eliminates corrosion from condensate

Fold Down Control Panel
Permits quick access to boiler internals

Simplified Wiring Connections
Wiring connections are well laid out and clearly marked. Fused high voltage connections makes trouble shooting easy

The Widest Range of Venting and Termination Options

Venting

- 2", 3", and 4" diameters depending on model
- PVC,CPVC, SS and Polypropylene materials
- Flexible Polypropylene for chimney chases
- Concentric or twin pipe
- Extended vent lengths up to 100 feet
-Common Vent for multiple boilers (399 only)

Terminations

- Traditional PVC/CPVC/PP/SS piping elbows
- Flush-mount PVC for twin pipes
- Flush-mount Stainless Steel for twin pipes
- Single hole concentric termination for twin pipes
- Horizontal and vertical common vent terminations (399 only)
- Horizontal & Vertical Concentric Terminations (399 only)

prestige

Performance Specifications

Model	Fuel	Input Modulation MBH	AFUE	DOE Heating Capacity MBH	NET I=B=R MBH	Water Volume Gal.
Solo 60	Natural or Propane	16 to 60	96%	54	47	2.5
Solo 110	Natural Gas	30 to 110	96%	99	86	2.5
Solo 110 LP	Propane Gas	25 to 97	96%	87	76	2.5
Solo 175	Natural or Propane	50 to 170	96%	154	134	4.6
Solo 250	Natural or Propane	65 to 245	96%	223	194	4.1
Solo 399	Natural or Propane	112 to 399	95.1 %*	379	330	7

*Thermal Efficiency

Connections / Dimensions / Data

Model	Supply / Return Connections	Gas Connection	Vent/Air Diameter	Dimensions D x W x H	Weight Lbs
Solo 60	1"	1/2"	3"	16"x 20" x 35 1/2"	95
Solo 110	1"	1/2"	3"	16"x 20" x 35 1/2"	106
Solo 175	1 1/4"	3/4"	3"	16"x 20" x 35 1/2"	131
Solo 250	1 1/4"	3/4"	3"	16"x 20" x 35 1/2"	142
Solo 399	1 1/2"	1"	4"	20 3/4"x 24 3/4" x 37 1/2"	200

TriMax Control Features

- Large Graphic Interface
- 60 Second Set-Up
- 6 Preset & Customizable Reset Curves
- Standard ModBus Interface
- 2 Space Heating Call Inputs
- Controls up to 4 Circulators
- 0-10 VDC Modulation Input
- Outdoor Reset
- Lockout Screens with Error Description and Troubleshooting recommendations:
  Cascade Control for up to 6 Boilers
  - Auto-configure linked boilers
  - Simultaneous space heating & DHW capability
  - Full parallel modulation
  - Boiler rotation
- DHW Priority
- Warm Weather Shutdown
- Low Water Cut Off

Standard Features

- Stainless Steel FireTube Heat Exchanger
- EZ Access Terminal Strips with Individually Fused High VoltageTerminals
- Outdoor Reset Sensor
- Negative Pressure Regulated Gas Valve
- LP Conversion Kit
  (All Models except Solo110)
- Cat IV Venting
- NPT Piping Connections
- Integrated Pressure Gauge
- 30 psi Pressure Relief Valve
- Automatic Air Vent
- Fold-down Control Panel for Easy Access
- Condensate Trap
- 10 Year Non-Prorated Heat Exchanger Warranty

Triangle Tube reserves the right to make product changes or improvements at any time without notice.

TriangleTube

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Tel: (856) 228 8881- Fax: (856) 228 3584
E-mail: info@triangletube.com - http://www.triangletube.com

An ACV Company

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E., LEED AP
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: May 14, 2012

RE: CP 1664 - Energy Conservation @ Various County Facilities
Decentralization of HTHW at Riverhead Criminal Courts (C0338)

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1. Review of Existing Conditions at Riverhead

Riverhead Criminal Courts is a 272,300 square foot building in the Riverhead County Complex. The building is supplied by high temperature hot water (HTHW) heat exchangers in the mechanical room for heating during the winter and supply air reheats during the summer.

Plans to bring gas service to the building have been arranged with National Grid. We may proceed with installation of condensing boilers at the Criminal Court with an expected completion date of September 2012.

The County Center is now operating its heating system independently of the Power Plant. Three AERCO Benchmark 1.5 million Btu per hour (Btu/h) condensing boilers were installed in October 2011. These supply the building's heating system for heating, reheats, and a domestic hot water.

2. Proposed Improvements at Riverhead Criminal Courts

Proposals have been solicited from our term contractors. We have proposals for electrical contracting, plumbing, general contracting, and boiler contracting.

The boiler contractor will provide three (3) AERCO 2 million Btu/h boilers in mechanical room (MER) 1, the most recently constructed portion of the basement mechanical space. The boilers will be provided with three (3) pumps with variable frequency drives (VFD). Piping connections will be installed and heating water supply will continue to operate during construction. The general contractor will install a roll-down door on the outside wall of MER 2 for rigging of equipment. The boilers will be provided with condensate neutralizers, a BMS II controller, and BACnet communication cards. The contractor will perform demolition work to remove the HTHW heat exchangers and HTHW piping. The

335 YAPHANK AVENUE ■ YAPHANK, N.Y. 11980 ■ (631) 852-4225
FAX (631) 852-4246

expansion tanks on the hot water system will remain. Submittals and shop drawings will be reviewed before construction and O&M manuals and as built drawings will be provided upon completion.

The total cost of boiler contracting is not to exceed: $ 395,000

The plumbing contractor will reroute a 5" cold, 3" hot, and 1-1/2" hot water return line for the installation of a roll-down door into MER 1. Final piping connection will be made during off hours. Domestic hot water piping will be connected between the two mechanical rooms to allow continued operation during construction using the heat exchanger in MER 2, the oldest portion of the mechanical room. An 850 gallon tank will be removed and an A.O. Smith BTH-250 will be installed in MER 1. The storage tank in MER 2 will remain as storage for the domestic water system. The plumber will also provide an 11M meter header and 350' of pipe to MER 1.

The total cost of plumber contracting is not to exceed: $ 153,910

The general contractor will provide a 7×7' roll-down door. This requires saw-cutting the wall, pouring a concrete pad, and building a retaining wall. They will also pour the concrete pads for the new equipment and a fire-rated door for enclosing MER 2 as part of the New York State Building Code for boiler rooms.

The total cost of general contracting is not to exceed: $22,139

The electrical contractor will provide wiring for three (3) boilers, three (3) boiler pumps, one (1) circulatory pump, one (1) water heater, and one (1) emergency break glass station.

The total cost of electrical contracting is not to exceed: $ 23,650

3. Energy Use Projections for Recommended Alternatives

The reliability of the HTHW generators has been average. The generators are used all year round. Due to low load conditions in the summer months, the overall thermal efficiency of the boiler plant is low, with large off-cycle and standby losses. In the winter months, the operating efficiency of the boiler plant is from 65% to 70%.

HTHW from the central utility plant is converted to low temperature (180 F) hot water for space heating and domestic hot water in heat exchangers located in the building. According to our energy model, approximately 30% of the boiler fuel is wasted due to boiler off-cycle losses, jacket losses, distribution losses in the utility tunnel, and the heat exchangers.

The condensing boiler and water heater have a thermal efficiency of 95%. The condensing design allows exhaust gasses to cool to near ambient temperature. This allows higher part-load efficiency as oppose to traditional cast-iron boilers or gas-fired water heaters which cycle on and off at part load, losing thermal efficiency. The new equipment will be easier to maintain with far less heat loss than the existing HTHW generators, tunnel piping, and heat exchangers.

According to the energy model of Riverhead Criminal Courts, with the new equipment, approximately 168,500 therms will be used annually for space heating and 2,714 therms for domestic hot water. The estimated usage is shown in the Table 1 below.

Table 1 Energy Savings and Cost Analysis

Existing gas consumption for space heating		447,886	therms	Simple Payback (years)	2.15
Existing gas consumption for domestic hot water		5,402	therms	Estimated Installed Cost (without rebate)	$ 594,699
Total gas consumption by existing boiler plant		**453,288**	therms	Estimated Installed Cost (with rebate)	$ 548,699
Estimated Gas consumption with new boilers		166,068	therms	Annual Cost Savings	$ 275,971
Estimated gas consumption for dhw with proposed boilers		2,714	therms	Annual Energy Savings (mmbtu)	28,451
Total estimated gas consumption with condensing boilers		**168,781**	therms	Savings to investment ratio (w/o rebate)	6.90
Savings		284,507	therms	Savings to investment ratio (wrebate)	7.48
Existing heating pump energy use		275,166	kWh	Life-cycle cost savings (w/o rebate)	$ 3,511,057
Proposed heating pump energy with VFDs		8,299	kWh	Life-cycle cost savings (w/rebate)	$ 3,557,057
Pump Electrical Energy Savings, kWh		266,867	kWh	Discount Rate	3%
Reduction in CO2 emissions		854	tons/yr		
National Grid Energy Efficiency Rebate		$ 46,000		Life of Equipment (years)	20
Estimated Cost savings	$0.97 per therm	$ 275,971	per year		
Estimated Electric savings	$0.15 per kWh	$ 40,030	per year		
Estimated Total savings		$ 316,001	per year		

4. Conclusions and Recommendations

The County will significantly reduce operating and maintenance costs by installing individual boilers in Riverhead Criminal Courts. We can expect to see gas consumption reduce by almost 65%. According to the cost report, the project is expected to have a simple payback of 2.15 years.

Total cost of this beneficial project is not to exceed: $ 594,699
I wish to propose funding as follows: CP 1664.318 $ 594,699
It is requested that the proposed project be approved.

JA/SH
Cc: Gilbert Anderson, P.E., Commisioner
Philip A. Berdolt, Deputy Commissioner
Craig Rhodes, Director, Buildings O&M
Jay Abbott, Special Projects Supervisor, Buildings D&C

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

VINCENT FALKOWSKI, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E.
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: June 26, 2013

RE: CP 1664 - Replace Oil-Fired Boiler with Condensing Boiler at County Building C0354, First Police Precinct, West Babylon, NY

The First Police Precinct in Lindenhurst is 20,000 sq. ft. serving the Town of Babylon and Villages of Lindenhurst and Babylon. The oil-fired boiler in this building is almost 20 years old with high maintenance costs and fuel usage. An energy analysis was performed to determine the feasibility of energy conservation and reduced greenhouse gas emission.

DPW will install the boiler and the contractor will supply the materials. We plan to remove the existing H.B. Smith Boiler and install two (2) Weil McClain Ultra Commercial Model No. 550 Condensing Boilers and an A.O. Smith Model BTX-80 Gas Fired Water Heater. We will switch from No. 2 oil to natural gas fuel. National Grid will pay for the cost of providing gas service along Route 109 from Route 27 to the First Precinct.

It is highly recommended we do this project in-house as it will save the County not only in labor costs but also Operations and Maintenance costs in the foreseeable future. By doing this project in-house we will be saving $48,747.00 in labor and contract cost. Attached are two charts comparing the cost of doing this project in house as opposed to using Boilermatic.

The installation of the new boilers and water heater will save an estimated $41,617 per year with a 2.14/yr. payback period. The annual CO_2 emissions reduction will be 58 tons. Please review and send me your approval at your earliest convenience.

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The estimated overtime of $13,000 for this project will be paid for by Buildings O & M operating funds.

Total cost of this beneficial project is not to exceed: $88,253.00
I wish to propose funding as follows: CP 1664.318: $88,253.00

JA:BD:ba
Attachment
cc: Gilbert Anderson, P.E., Commissioner
Vincent Falkowski, P.E., Chief Deputy Commissioner
Philip A. Berdolt, Deputy Commissioner
Craig Rhodes, Director, Bldgs. O&M
Robert Frevele, Assistant Director, Bldgs. O&M

Annual Table										
Hours										
Avg. Bin Temp. (F)	MCWB (F)	OA Air %	RA %	Tmix Air (F)	Total CFM	Supply Air Temp. (F)	Reheat Required (Btuh)	Boiler Efficiency	Boiler Input (Btuh)	Total Fuel Usage (MMBtu)
57	52.2	20%	80%	62.60	25,400	69	155,961	95%	174,086	132.7
52	47.5	20%	80%	61.60	25,400	69	209,641	95%	220,886	176.7
47	42.7	10%	90%	62.30	25,400	70	207,687	95%	218,597	171.4
42	38.0	10%	90%	61.80	25,400	70	238,411	90%	264,901	214.6
37	33.2	10%	90%	61.30	25,400	71	269,755	90%	299,061	223.4
32	28.7	10%	90%	60.80	25,400	72	299,899	90%	333,221	198.3
27	23.8	10%	90%	60.30	25,400	72	330,643	90%	367,381	143.3
22	19.3	10%	90%	59.80	25,400	73	361,387	88%	410,667	107.6
17	14.8	10%	90%	59.30	25,400	74	392,131	88%	445,603	63.8
12	10.4	10%	90%	58.80	25,400	74	422,874	88%	480,539	32.2
7	5.9	10%	90%	58.30	25,400	75	453,618	88%	515,475	13.4
2	1.1	10%	90%	57.80	25,400	75	484,362	88%	550,412	4.4
-3	-2.9	10%	90%	57.30	25,400	76	515,106	88%	585,348	0.8
										1482

Estd Gas Consumption for Space Heating (mmbtu)		1,482	per year
Estd. Gas Consumption for Domestic Hot Water (mmbtu)		15	per year
Total Estd. Gas Consumption per year (mmbtu)		1,497	per year
Total Cost of gas @	$ 8.50 /mmbtu	$ 12,726	per year
Estimated Maintenance Cost incl. OT		$ 500	per year
Total Cost to Operate Gas Fired Boiler Plant		$ 13,226	per year
Estimated CO2 Emissions		58	tons/year

In House Labor Cost $13,000.00

Proposed Installation Cost	$ 101,253.00	Simple Payback (years)		2.31
Estimated Annual Cost Savings	$ 43,818	Savings to Investment Ratio (SIR)		6.44
Estd Annual Energy Savings (mmbtu	394	Life-cycle Cost Savings (LCS)	$	550,648
Annual CO_2 Emissions Reduction	58	Life of Equipment		20
		Discount Rate		3%

Boilermatic Labor Cost: $48,747.00

Proposed Installation Cost	$ 150,000.00	Simple Payback (years)		3.42
Estimated Annual Cost Savings	$ 43,818	Savings to Investment Ratio (SIR)		4.35
Estd Annual Energy Savings (mmbtu	395	Life-cycle Cost Savings (LCS)	$	501,901
Annual CO_2 Emissions Reduction	58	Life of Equipment		20
		Discount Rate		3%

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

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GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E., Chief Engineer
Facilities Engineering

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: October 22, 2013

RE: CP #1664.320 - Energy Conservation at Various County Building
Boiler Conversion to Natural Gas
Westhampton Truck Garage (C0916), Westhampton, NY

National Grid provided gas service free-of-charge to the above facility with an understanding that the County will convert the oil fired boiler to natural gas. The boiler currently uses approximately 12,000 gallons of fuel oil number 2 which costs the County approximately $42,000 a year. In addition, oil fired systems have high maintenance costs associated with periodic cleaning of tubes, oil filter, and chimney. According to Buildings O&M, the fuel line from the oil tank to the boiler clogs when the ambient temperature drops below 30^{o}F which requires overtime to make necessary repairs if the boiler stops after normal business hours or on weekends. Converting the boiler to natural will improve thermal efficiency, and will almost eliminate overtime. The overall gain in thermal efficiency of the boiler comes from no soot build up on boiler heating surfaces by burning natural gas, and re-gasketing of boiler sections that are leaking at this time. We will also insulate all hot water piping in the boiler room as needed.

Domestic hot water for the building is generated in a tank-less coil located in the boiler. The temperature of the domestic hot water supply is maintained between 130-140° F and is tempered using a mixing valve prior to distribution to the building. Most of the domestic hot water distribution system is properly insulated and appears to be in good condition.

It is proposed to install a separate gas fired water heater. During shoulder months the demand for space heating is very low and during the summer months the demand for heating is zero, the boiler has to operate infrequently to provide domestic hot water to the building. The off-cycle and jacket losses make the boiler operate at low efficiency, which results in higher energy consumption and cost.

Converting the existing boiler to natural gas and installing a high efficiency gas fired domestic water heater the County expects to save approximately $32,000 a year in fuel and maintenance costs.

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The cost for boiler conversion and a new gas fired water heater is $111,541.31 which gives us a simple payback of 3.49 years and return on investment of 28.7%.

It is requested that this purchase requisition be approved as the heating season is coming upon us. We plan to pay for this work from Fund No. 1664.320.

JA:ba
cc: Cliff Mitchel, Highway Maintenance Supervisor
Bob Frevele
Steve Felice
Jay Abbott

Peggy Sutherland

Units replaced for building 158, Civil Service/4th District Court in October and November 2016

Unit number	Location	Old (Trane) model	EER	COP		New (Trane) model	EER	COP
8	C-158 North Side	YCH060A4				YHC060F4RHA		
8A	C-158 North Side	YCH060A4H0AA				YHC060F4RHA		
11	C-158 North Side	BYC170G4H0CC				YHH180G4RHA		
12	C-158 North Side	YCH048A4L0AA				YHC048F4RHA		
15	C-158 North Side	BYC200G4H0CC				YHH210G4RHA		
16	C-158 North Side	BYC200G4H0CC				YHC092F4RHA		
3	C-158 South Side	YCH060A4H0AA				YHC060F4RHA1R		
8B	C-158 South Side	YCH060A4H0AA				YCH060F4RHA1R		
19	C-158 South Side	YCH090AH0AA				YCH092F4RHAO		
20	C-158 South Side	BYC13004H0DC				YHH150G4RHA		
21	C-158 South Side	CH090A4H0AA				YHC092F4RHA		

From Rich Oliver:

model	EER	Cooling Btuh	Heating Btuh	Heating eff
YHC060F4RHA	12.85	61,000	104,000	80
YHC048F4RHA	13.35	49,930	96,000	80
YHC092F4RHA	12.6	92,000	160,000	80
YHC060F4RHA1R	12.85	61,000	104,000	80
YHC092F4RHAO	12.6	92,000	160,000	80
YHH150G4RHA	12.1	144,000	200,000	80%
YHH180G4RHA	12.1	174,000	280,000	80%
YHH210G4RHA	11.8	204,000	280,000	80%

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

` VINCENT FALKOWSKI, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E., Chief Engineer
Facilities Engineering

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: September 13, 2013

RE: CP #1664.320 - Energy Conservation at Various County Building
Boiler Conversion to Natural Gas
Southold Maintenance Yard, Southold, NY

The Highway Dept. purchased a 62kw gas generator for the Southold Maintenance Yard facility two years ago. Currently, there is no gas service to the building.

National Grid has agreed to provide gas service free-of-charge if we convert the oil fired boiler to natural gas. To avoid the cost of bringing gas service to the facility the County has agreed to convert the boiler to natural gas which will improve the efficiency and reduce our operating costs by $8,500/yr. The boiler currently uses approximately $11,200 of boiler fuel. Converting the boiler to natural will improve thermal efficiency by at least 5% and with lower cost of natural gas, the County expects to save $8500 in annual operating cost. The cost for boiler conversion is $38,165 which gives us a simple payback of 4.5 years and return on investment of 22.3%.

It is requested that this purchase requisition be approved as the heating season is coming upon us. We plan to pay for this work from Fund No. 1664.320.

JA:ba
cc: Cliff Mitchel, Highway Maintenance Supervisor
William S. Houck, P.E., Associate Electrical Engineer

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FAX (631) 852-4246

COUNTY OF SUFFOLK

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SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

JAMES PETERMAN, P.E.
ACTING CHIEF DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E.
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: November 10, 2011

RE: CP 1664 – Energy Conservation @ Various County Bldgs.
Fan Coil Units at Police Marine Bureau C0431

The fan-coil units at the Police Marine Bureau have reached the end of their useful lives and need to be replaced. The thermostats have malfunctioned and the units are being switched on and off by hand. The condensate pan has corroded from the caustic sea air. The control valves are in disrepair and do not fully close resulting in leaks and increasing costs. A new roof, ceiling, and lighting have been installed in the building. The old roof was water damaged and the old equipment was inefficient. A purchase requisition was approved to replace the lighting in the high-bay and shop area. Replacement of the fan coil units would complete the renovation of the Marine Bureaus building.

The financial impact of this project is $36,982 (see the attached proposal). The cost will come from CP 1664.318. This proposal covers 10 fan-coil units throughout the building; four (4) in the stair wells, one (1) in a large office, one (1) in the lunch room, and four (4) in the offices.

JA/SH/rc
Cc: James Peterman, P.E., Acting Chief Deputy Commissioner
Craig Rhodes, Director, Buildings O&M
Robert Frevele, Asst. Director, Buildings O&M
Ed Farrell Jr., Maintenance Mechanic IV

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

JAMES PETERMAN, P.E.
ACTING CHIEF DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan P.E.
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: January 3, 2012

RE: CP1664.318 – Energy Conservation @ Various County Buildings
Dept. of Public Works (C0010) 335 Yaphank Ave., Yaphank, NY

As a result of my field inspection at the above site, it has been found that it will be necessary and energy efficient to provide two (2) new AERCO 1.5 Benchmark (1.5 BMK) 1,500 mbh condensing boilers, and one (1) A.O. Smith BTH-120 gas-fired, 120 mbh, 60 gal., condensing water heater. A section in one of the Weil McLain boilers has cracked. Both boilers are sufficiently worn to require replacing. The H.B. Smith boiler will remain but the instant hot-water coils should be disconnected so the boiler can be shut-off and replaced by an efficient water heater.

The DPW building is approximately 90,000 sq. ft. and the ventilation and skin heat loss has been calculated at 1,666,000 Btu/h. The current boiler plant has two (2) Weil McLain boilers rated 2,132 MBH net IBR and one (1) H.B Smith boiler rated 2,636 MBH net IBR. The 1.5 BMK is rated 1,200 MBH net IBR with 95% thermal efficiency at part-load. The Weil McLain boilers are dedicated to the new (1988) two-story portion and the H.B. Smith boiler is dedicated to the old (1971 and 1959) portions. The Weil McLain boilers are 25 years old and one of them is damaged. The H.B. Smith boiler is 15 years old and operating well but it has no back up if it goes down.

The existing system lacks the piping arrangement that is needed to prevent down-time. The existing system lacks the energy efficient operation to prevent energy losses for required heating and reheat during the shoulder seasons and summer. The necessary upgrades shall provide heating to the entire building and communicate with the existing BMS.

I propose that the two Weil McLain boilers be removed and replaced by two AERCO boilers. Piping and appurtenances will be provided so that both the 1959/1971 and 1988 portions of the buildings will be correspondingly tied together and the H.B. Smith will remain as a back-up. The new equipment will be programmed into the existing building management system (BMS). Tankless hot water coils (2 coils, 12 gpm each) in the H.B. Smith will be disconnected and replaced by an A.O. Smith BTH-120 condensing water heater. The existing flue will remain and an AL29-4C stainless steel flue will be run through the breeching.

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The flue was tested for asbestos and testing turned up negative. In addition to the physical plant the BMS will be renovated. It is recommended that the upgraded boiler plant in the BMS include color graphics of the boilers, reports, operating parameters, and fault logging.

The completed upgrade shall include start-up, training, and as-built documentation. The upgrades are expected to generate annual utility cost savings of approximately $37,500.00. The gas costs for Sep. 2010 to Sep. 2011 are $94,871.00. In addition to the utility savings, we will reduce our carbon dioxide emissions by 204 tons annually. The mechanical renovation will improve efficiency and help pay for a much needed revamp of the piping system. The specified AERCO boilers are appropriately sized to continuously heat the building on a design day of 12°F.

This project will allow DPW to continue to reduce its carbon footprint while offering the opportunity to lower ongoing utility costs.

The total proposed cost for the project is $240,000.00 and we anticipate a rebate of $20,650 for the two (2) condensing boilers, one (1) 60 gal., condensing water heater, and a multi-stage boiler reset. The simple payback for this project is 5.8 years.
I recommend SCDPW pay this charge for this project.
The cost for this job will be paid from CP 1664.318.

JA/SH/rc
attachment
Cc: Craig Rhodes, Director, Buildings O & M

Figure 1 – Energy and Cost Analysis of Installing Two (2) AERCO Boilers in Building C0010 DPW Building

Existing gas consumption for space heating		91,359	therms		Estimated Installed Cost (w/rebate	$ 219,350	Simple payback (w/rebate)	5.8
Existing gas consumption for domestic hot water		785	therms		Estimated Installed Cost (w/o reba	$ 240,000	Simple payback (w/o rebate)	6.4
Total gas consumption by existing boiler plant		**92,143**	therms		Annual Cost Savings	$ 37,518	Discount Rate	3%
Estimated Gas consumption with new boilers		56,684	therms		Annual Energy Savings (mmbtu)	3,489	Life of equipment	20
Estimated gas consumption for dhw with proposed boile		570	therms		Savings to investment ratio (w/rebate)			2.54
Total estimated gas consumption with condensing boiler		**57,254**	therms		Savings to investment ratio (w/o rebate)			2.33
Savings		34,889	therms		Life-cycle cost savings (w/rebate)			$ 338,827
National Grid Energy Efficiency Rebate		$ 20,650			Life-cycle cost savings (w/o rebate)			$ 318,177
Estimated Cost savings	$1.08 per therm	$ 37,518	per year		Reduction in CO2 emissions	204 tons/yr		

COUNTY OF SUFFOLK

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DEPARTMENT OF PUBLIC WORKS

THOMAS LAGUARDIA, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

LOUIS CALDERONE
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E.
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Associate Mechanical Engineer

DATE: May 26, 2010

RE: Install Variable Frequency Drivers (VFD) on Air Handlers AHU1-1 thru AHU 4-2 Cohalan Court Complex (CO-802)

Existing Conditions

The Cohalan Court Complex is served by ten air-handlers that provide conditioned air to meet the space heating and cooling requirements. The air-handlers serve the Office building, District Court, Supreme Court and the Family Court. The supply and return fan motor horsepower are shown in the table below.

Cohalan Court Complex

TAG #	Location	Building Served	Motor HP	SF	Volts	RPM	Amps	NEMA Nominal Efficiency	Nominal PF
AHU 1-1	Tower Fan Room	Office Building	50	1.15	460	1760	63	90.2	83
RAF 1-1	Tower Fan Room	Office Building	15	1.15	460	1765	19.5	87.5	83.5
AHU 1-2	Tower Fan Room	Office Building	50	1.15	460	1760	63	90.2	83
RAF 1-2	Tower Fan Room	Office Building	15	1.15	460	1765	19.5	87.5	83.5
AHU 1-3	Tower Fan Room	Office Building	50	1.15	460	1760	63	90.2	83
RAF 1-3	Tower Fan Room	Office Building	15	1.15	460	1765	19.5	87.5	83.5
AHU 2-1	7th Floor Fan Room	District Court	50	1.15	460	1760	63	90.2	83
RAF 2-1	7th Floor Fan Room	District Court	15	1.5	460	1765	19.5	87.5	83.5
AHU 2-2	7th Floor Fan Room	District Court	50	1.5	460	1760	63	90.2	83
RAF 2-2	7th Floor Fan Room	District Court	15	1.5	460	1765	19.5	87.5	83.5
AHU 2-3	7th Floor Fan Room	District Court	50	1.5	460	1760	63	90.2	83
RAF 2-3	7th Floor Fan Room	District Court	15	1.5	460	1765	19.5	87.5	83.5
AHU 3-1	Ground Floor Mech. Room	Supreme Court	40	1.5	460	1765	48	90.2	88
RAF 3-1	Ground Floor Mech. Room	Supreme Court	15	1.5	460	1765	19.5	87.5	83.5
AHU 3-2	Ground Floor Mech. Room	Supreme Court	40	1.5	460	1765	48	90.2	88
RAF 3-2	Ground Floor Mech. Room	Supreme Court	15	1.5	460	1765	19.5	87.5	83.5
AHU 4-1	Ground Floor Mech. Room	Family Court	40	1.5	460	1765	48	90.2	88
RAF 4-1	Ground Floor Mech. Room	Family Court	15	1.5	460	1765	19.5	87.5	83.5
AHU 4-2	Ground Floor Mech. Room	Family Court	40	1.5	460	1765	48	90.2	88
RAF 4-2	Ground Floor Mech. Room	Family Court	15	1.5	460	1765	19.5	87.5	83.5

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According to the Building Operations and Maintenance Staff and from the information obtained from the Building Management System, the air-handlers operate 24-hours a day, seven days a week, all year round.

Proposed Improvements

To improve the operating efficiency and reliability of the air-handlers and reduce operating cost, DPW evaluated the feasibility of installing variable frequency drives on the air-handler fan motors. Installing variable frequency drives (VFD) will allow the building operator to reduce or increase fan speed to follow building load.

This will result in an estimated annual electrical, thermal energy and cost savings of 1,436,796-kWh, 90,323-therms and $354,505.00 respectively. The proposed installation cost for twenty (20) VFD is $228,963.00.

Estimated Savings Calculations

The analysis shows installing variable frequency drives will result in savings of 1,436,796-kWh per year. The simple payback for this project is estimated to be 0.65 years without LIPA incentive.

A fifteen year life-cycle cost analysis (LCS) shows utility cost savings of $2,795,040.

Electrical and Thermal Energy Savings

	Existing (kWh)	Proposed w/VFD on AHU (kWh)	Savings (kWh)	Cost Savings $
				$0.156 /kWh
Chiller Energy	1,232,918	1,032,250	200,668	$ 31,304
Primary Chilled Water Pump Energy Use	233,936	233,936	0	$ 0
Secondary Chilled Water Pump Energy Use	190,364	153,918	36,446	$ 5,686
Condenser Water Pump Energy Use	292,420	292,420	0	$ 0
Cooling Tower Fan Energy Use	174,773	174,773	0	$ 0
Air-handler Fan Energy Use	3,486,420	2,286,739	1,199,681	$ 187,150
Total Electrical Energy	**5,610,831**	**4,174,035**	**1,436,796**	**$ 224,140**
Gas Consumption for space heating (therms)	**248,031**	**157,708**	**90,323**	**$ 130,365**

Proposed Installed Cost	$ 228,964	Simple Payback (years)	0.65
Annual Cost Savings	$ 354,505	Savings to investment ratio	13
Annual Gas Saings (mmbtu)	9,032	Life-cycle Cost Savings (LCS)	$ 2,795,040
Annual Electrical Energy Savings (kWh)	1,436,796	Life of Equipment (years)	10
Annual CO_2 Emissions Reduction (tons)	1,244	Discount Rate	3%

For Scope of Work please see the attached proposal from All Service Electric.

JA/rc
attachment
cc: Louis Calderone, Deputy Commissioner / email
Lew Johnson, R.A., Assistant County Architect / email
Jay Abbott, Special Projects Supervisor / email
Craig Rhodes, Assistant Director of Buildings O & M / email

COUNTY OF SUFFOLK

STEVE LEVY
SUFFOLK COUNTY EXECUTIVE

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COMMISSIONER

LOUIS CALDERONE
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E.
Acting Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Energy Engineer

DATE: May 11, 2009

RE: Proposed Gas Fired Condensing Boilers for Cohalan Court Complex (CO-802)

Existing Conditions

The Cohalan Court Complex is heated by two cast iron sectional hot water boilers with a total heating input capacity of 21.0 million Btu per hour. The boilers are approximately 18 years old and in good physical condition; however, the operational efficiency of the boilers is low. The reliability of these boilers has been good. The boilers are used all year round for space heating and domestic hot water the overall thermal efficiency of the boiler plant was calculated to be around 68.3%. Low operating efficiency is due to low load conditions for eight (8) months out of the year (April to Nov) compared to the capacity of the boiler plant.

Domestic hot water for the buildings is produced by five indirect fired water heaters located in each of the four buildings. Indirect fired water heaters require 180^{o}F water from the boiler plant, which produce domestic water on demand.

The complex used approximately 260,000 therms of gas in a one year period from March 2008 to March 2009. According to our energy model approximately 248,000 therms were used for space heating and 12,000 therms were used for domestic hot water.

Proposed Condition

To improve the operating efficiency and lower the operating cost of the boiler plant, DPW evaluated the feasibility of installing gas fired condensing boilers. The new condensing boilers will be eligible for rebate of approximately $100,000 from National Grid.

The proposed gas-fired condensing boilers are significantly more efficient (91.0% thermal efficiency) than the existing gas/oil-fired modular conventional boilers (68.3%). Furthermore, condensing boilers operate at higher efficiency at part load than at full load. The load profile developed for the complex shows that the condensing boilers will satisfy the heating requirements of the building down to an ambient temperature of 7^{o}F. When the temperature drops below 7^{o}F, the control sequence will be set up to bring the existing boiler online to meet the heating requirements of the building. This arrangement will

allow us to optimize the efficiency of the condensing boiler by operating it at part load most of the time, and operating the second boiler only when needed.

Supplying 190°F water from the boiler plant year round to generate domestic hot water is waste of energy. It is proposed that the indirect fired water heaters should be replaced with Aerco SmartPlate water heater. The packaged heater consists of a counter flow, stainless steel, brazed plate, heat exchanger. The SmartPlate heater utilizes boiler water as little as 5°F above the required potable water temperature, resulting in the highest possible boiler efficiency and minimal radiation losses. To ensure longevity, all water wetted (potable water side) parts are stainless steel, copper or copper alloy materials. Replacing existing indirect fired water heater with

The existing boilers operate all year round with no schedule for occupied and unoccupied hours. The existing boilers supply 190°F water. The new condensing boiler plant will include boiler controls with ability to modulate hot water temperature based on building load and outdoor temperature. In order to conserve energy the boilers will be programmed for occupied and unoccupied hours.

The installation cost for three new Aerco Benchmark 3.0 condensing boilers and five Aerco SmartPlate heat exchangers is $387,303.00 before National Grid rebate. The cost will be paid with CP 1664 construction funds.

Estimated Savings Calculations

Based on the existing conditions, an energy model was prepared to compare the operating cost of the existing and proposed boiler plants. The analysis shows that replacing the existing plant will result in fuel savings of approximately 6,362 MMBtu of natural gas annually. The estimated annual operating cost savings is $91,824. The simple payback for this project is estimated to be 4.2 years without factoring rebate from National Grid. A twenty year life-cycle cost analysis (LCS) shows utility cost savings of over $1,078,805.

Estimated Installed Cost (w/rebate)	$ 387,303	Simple payback (w/o rebate)	4.2
Estimated Installed Cost (w/o rebate	$ 287,303	Simple payback (w/rebate)	3.1
Annual Cost Savings	$ 91,824	Discount Rate	3%
Annual Energy Savings (mmbtu)	6,362	Life of equipment	20
Savings to investment ratio (w/o rebate)			3.53
Savings to investment ratio (wrebate)			4.75
Life-cycle cost savings (w/o rebate)			$ 978,805
Life-cycle cost savings (w/rebate)			$ 1,078,805
Reduction in CO2 emissions	372 tons/yr		

Gas Consumption and Billing History

DATE #	DA	INDEX	CONSUMPT	RD	TH FACT	THERMS	$AMOUNT	$TAX	Total $	USE F	$/therm
3/24/2009	31	44197	29100	A	1.009	29362	$ 40,523	$ -	$ 40,523	947.1	$ 1.3801
2/21/2009	24	41287	24260	S	1.008	24454	$ 34,742	$ -	$ 34,742	1018.9	$ 1.4207
1/28/2009	37	38861	33050	S	1.013	33480	$ 48,779	$ -	$ 48,779	904.8	$ 1.4569
12/22/2008	82	35556	59550	A	1.008	60026	$ 77,440	$ -	$ 77,440	732	$ 1.2901
10/1/2008	30	29601	14890	S	1.009	15024	$ 19,836	$ -	$ 19,836	500.8	$ 1.3203
9/1/2008	31	28112	15850	S	1.005	15929	$ 22,054	$ -	$ 22,054	513.8	$ 1.3845
8/1/2008	31	26527	14630	S	1.005	14703	$ 25,212	$2,143	$ 27,355	474.2	$ 1.8605
7/1/2008	30	25064	14960	S	1.005	15035	$ 23,544	$1,766	$ 25,309	501.1	$ 1.6834
6/1/2008	31	23568	19940	S	1.002	19980	$ 30,444	$2,283	$ 32,727	644.5	$ 1.6380
5/1/2008	30	21574	21970	S	1.003	22036	$ 31,065	$2,330	$ 33,395	734.5	$ 1.5155
4/1/2008	31	19377	28140	S	1.003	28224	$ 36,695	$2,752	$ 39,447	910.4	$ 1.3976
3/1/2008	29	16563	29830	S	1.002	29890	$ 37,622	$2,822	$ 40,444	1030.6	$ 1.3531
2/1/2008	31	13580	29710	S	1.004	29829	$ 38,395	$2,880	$ 41,274	962.2	$ 1.3837
1/1/2008	31	10609	27550	S	1.003	27633	$ 30,835	$2,313	$ 33,147	891.3	$ 1.1996
12/1/2007	30	7854	17500	S	1.003	17553	$ 19,458	$1,459	$ 20,917	585.1	$ 1.1917
11/1/2007	31	6104	22140	S	1.002	22184	$ 21,600	$1,620	$ 23,220	715.6	$ 1.0467
10/1/2007	30	3890	15940	S	1.002	15972	$ 13,957	$1,047	$ 15,004	532.4	$ 0.9394
9/1/2007	31	2296	13980	S	1.003	14022	$ 12,946	$ 971	$ 13,917	452.3	$ 0.9925
8/1/2007	31	898	14720	S	1.005	14794	$ 14,895	$1,117	$ 16,012	477.2	$ 1.0824
7/1/2007	30	99426	16320	S	1.007	16434	$ 17,949	$1,346	$ 19,295	547.8	$ 1.1741
6/1/2007	31	97794	16800	S	1.004	16867	$ 18,225	$1,367	$ 19,592	544	$ 1.1615
5/1/2007	30	96114	22150	S	1.005	22261	$ 25,356	$1,902	$ 27,257	742	$ 1.2244
4/1/2007	31	93899	23120	S	1.004	23212	$ 27,203	$2,040	$ 29,244	748.7	$ 1.2598
3/1/2007	28	91587	22240	S	1.004	22329	$ 24,958	$1,872	$ 26,830	797.4	$ 1.2016
2/1/2007	31	89363	27070	S	1.002	27124	$ 29,947	$2,246	$ 32,193	874.9	$ 1.1869
02-01-	28	93811	22240	CS	1.002	22284	$ 25,349	$1,901	$ 27,250	795.8	$ 1.2229
03-01-	28	91587	22240	CS	1.004	22329	$ 25,349	$1,901	$ 27,250	797.4	$ 1.2204
02-01-	31	89363	27070	CS	1.002	27124	$ 29,947	$2,246	$ 32,193	874.9	$ 1.1869
1/1/2007	31	86656	25870	S	1.003	25948	$ 30,401	$2,280	$ 32,682	837	$ 1.2595
12/1/2006		84069	20330	S	1.003	20411	$ 25,637	$1,923	$ 27,560		$ 1.3503

JA/dk

Cc: Louis Calderone, Deputy Commissioner
Craig Rhodes, Director of Buildings Maintenance and Operations

Totals Summary with specific % boiler efficiency per bin for existing boiler plant

Annual Table														0.80 kW/ton	
A	B	C	D	E	F	G	H	I	J	K	M	N	O	P	
Avg. Bin Temo. (F)	MCWB (F)	Total Obs	Tmix Air (F)	Total CFM	Cooling Coil Discharge Air Temp. (F)	Sensible Cooling Load, Btuh	Total Cooling Coil Load (Btuh)	Total Tons	Supply Air Temperature (F)	Reheat Required (Btuh)	Existing Boiler Efff	Existing Fuel Consumption (Therms)	Total Annual Heating Btus (Output)	Cooling Energy, kWh	Ratio of boiler output to input
97	76.1	2	81.00	322,000	55	8,592,480	15,079,952	1136.48	55	0	60%	0	0	2,011	0%
92	74.1	18	80.00	322,000	55	8,262,000	14,502,496	1092.42	58	991,440	60%	297	17,845,920	17,403	9%
87	72.3	91	79.00	322,000	55	7,931,520	14,020,104	1055.77	58	991,440	60%	1,504	90,221,040	85,055	9%
82	70.2	244	78.00	322,000	55	7,601,040	13,453,528	1012.62	58	991,440	62%	3,902	241,911,360	218,844	9%
77	68.7	521	77.00	322,000	55	7,270,560	13,097,888	985.85	60	1,652,400	62%	13,885	860,900,400	454,933	16%
72	66.2	855	72.00	322,000	55	5,618,160	11,818,944	888.35	60	1,652,400	62%	22,787	1,412,802,000	673,680	16%
67	61.8	833	67.00	322,000	55	3,965,760	7,378,272	554.58	60	1,652,400	62%	22,201	1,376,449,200	409,740	16%
62	57.1	800	62.00	322,000	55	2,313,360	3,083,256	231.75	60	1,652,400	65%	20,337	1,321,920,000	164,440	16%
57	52.2	762	57.00	322,000	55	660,960	660,960	49.68	60	1,704,240	65%	19,979	1,298,630,880	33,577	16%
52	47.5	800	72.00	322,000	55	0	0	0.00	62	3,097,440	65%	38,122	2,477,952,000	0	29%
47	42.7	784	71.00	322,000	55	0	0	0.00	64	470,880	75%	4,922	369,169,920	0	4%
42	38.0	810	70.00	322,000	55	0	0	0.00	66	2,009,880	75%	21,707	1,628,002,800	0	19%
37	33.2	747	69.00	322,000	55	0	0	0.00	68	3,566,160	75%	35,519	2,663,921,520	0	34%
32	28.7	595	68.00	322,000	55	0	0	0.00	72	1,356,480	75%	10,761	807,105,600	0	13%
27	23.8	390	67.00	322,000	55	0	0	0.00	72	1,704,240	75%	8,862	664,653,600	0	16%
22	19.3	262	66.00	322,000	55	0	0	0.00	75	3,043,440	75%	10,632	797,381,280	0	29%
17	14.8	142	65.00	322,000	55	0	0	0.00	75	3,391,200	75%	6,421	481,550,400	0	32%
12	10.4	67	64.00	322,000	55	0	0	0.00	77	4,399,920	75%	3,931	294,794,640	0	42%
7	5.9	26	63.00	322,000	55	0	0	0.00	77	4,747,680	75%	1,646	123,439,680	0	45%
2	1.1	8	62.00	322,000	55	0	0	0.00	77	5,095,440	75%	544	40,763,520	0	49%
-3	-2.9	1	61.00	322,000	55	0	0	0.00	77	5,443,200	75%	73	5,443,200	0	52%
-8	-6.6	0	60.00	322,000	55	0	0	0.00	77	5,790,960	75%	0	0	0	55%
				322,000			0	0.00		5,790,960		**248,031**	16,974,858,960	**2,059,683**	

Existing gas consumption for space heating	248,031 therms
Existing gas consumption for domestic hot water	11,943 therms
Total gas consumption by existing boiler plant	**259,974** therms

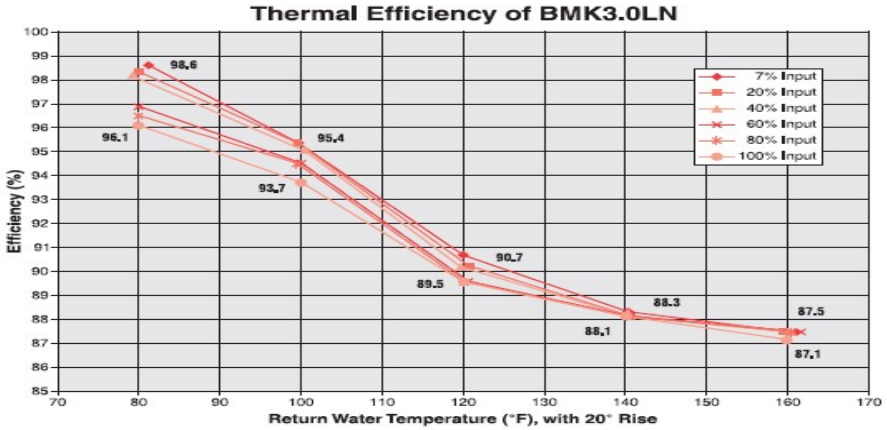
Total Btu required for space heating	16,974,858,960	Btu/year
Total Btu required for domestic hot water	780,937,500	Btu/year
Total Btu required for space heating + DHW)	17,755,796,460	Btu/year
Total Gas Input	25,997,408,833	Btu/year
Overall thermal efficiency of boiler plant	68.3%	

Totals Summary with specific % boiler efficiency per bin for new boiler plant

Boiler input for existing 10500000 Btuh
Maximum output at 82% efficiency 8610000 Btuh

Total Aerco boiler input 8,000,000 Btuh
Maximum output at 87% efficiency 6,960,000 Btuh

A	B	C	D	E	F	G	H	I	J	K	M	N	O	P	
Avg. Bin Temo. (F)	MCWB (F)	Total Obs	Tmix Air (F)	Total CFM	Cooling Coil Discharge Air Temp. (F)	Sensible Cooling Load, Btuh	Total Cooling Coil Load (Btuh)	Total Tons	Supply Air Temperature (F)	Reheat Required (Btuh)	Existing Boiler Efff	Existing Fuel Consumption (Therms)	Total Annual Heating Btus (Output)	Cooling Energy, kWh	Ratio of boiler output to input
97	76.1	2	81	322000	55	8592480	15079952	1136.483	55	0	94%	0	0	2010.660267	0%
92	74.1	18	80	322000	55	8262000	14502496	1092.421	58	991,440	94%	190	17,845,920	17402.9952	12%
87	72.3	91	79	322000	55	7931520	14020104	1055.772	58	991,440	94%	960	90,221,040	85055.2976	12%
82	70.2	244	78	322000	55	7601040	13453528	1012.617	58	991,440	94%	2,574	241,911,360	218844.0555	12%
77	68.7	521	77	322000	55	7270560	13097888	985.8507	60	1,652,400	94%	9,159	860,900,400	454933.3099	21%
72	66.2	855	72	322000	55	5618160	11818944	888.352	60	1,652,400	93%	15,191	1,412,802,000	673679.808	21%
67	61.8	833	67	322000	55	3965760	7378272	554.576	60	1,652,400	92%	14,961	1,376,449,200	409740.0384	21%
62	57.1	800	62	322000	55	2313360	3083256	231.748	60	1,652,400	92%	14,369	1,321,920,000	164440.32	21%
57	52.2	762	57	322000	55	660960	660960	49.68	60	1,704,240	92%	14,116	1,298,630,880	33576.768	21%
52	47.5	800	72	322000	55	0	0	0	62	3,097,440	92%	26,934	2,477,952,000	0	39%
47	42.7	784	71	322000	55	0	0	0	64	470,880	91%	4,057	369,169,920	0	6%
42	38	810	70	322000	55	0	0	0	66	2,009,880	90%	18,089	1,628,002,800	0	25%
37	33.2	747	69	322000	55	0	0	0	68	3,566,160	90%	29,599	2,663,921,520	0	45%
32	28.7	595	68	322000	55	0	0	0	72	1,356,480	90%	8,968	807,105,600	0	17%
27	23.8	390	67	322000	55	0	0	0	72	1,704,240	90%	7,385	664,653,600	0	21%
22	19.3	262	66	322000	55	0	0	0	75	3,043,440	90%	8,860	797,381,280	0	38%
17	14.8	142	65	322000	55	0	0	0	75	3,391,200	87%	5,535	481,550,400	0	42%
12	10.4	67	64	322000	55	0	0	0	80	5,391,360	87%	4,152	361,221,120	0	67%
7	5.9	26	63	322000	55	0	0	0	80	5,739,120	87%	1,715	149,217,120	0	72%
2	1.1	8	62	322000	55	0	0	0	85	7,739,280	81%	764	61,914,240	0	84%
-3	-2.9	1	61	322000	55	0	0	0	85	8,087,040	81%	100	8,087,040	0	87%
-8	-6.6	0	60	322000	55	0	0	0	85	8,434,800	81%	0	0	0	91%
				322000			0	0				187,677	17,090,857,440	2059683.253	



Bin Temp °F	Output Required (Btuh)	Aerco	Existing	Overall Eff
2	7,739,280	87%	75%	81.0%
-3	8,087,040	87%	75%	81.0%
-8	8,434,800	87%	75%	81.0%

Total Btu required for space heating	17,090,857,440	Btu/year
Total Btu required for domestic hot water	780,937,500	Btu/year
Total Btu required for space heating + DHW	17,871,794,940	Btu/year
Total Gas Input	19,635,401,903	Btu/year
Overall thermal efficiency of boiler plant	91.0%	

Existing gas consumption for space heating		248,031	therms
Existing gas consumption for domestic hot water		11,943	therms
Total gas consumption by existing boiler plant		**259,974**	therms
Estimated Gas consumption with new boilers		187,677	therms
Estimated gas consumption for dhw with proposed boilers		8,677	therms
Total estimated gas consumption with condensing boilers		**196,354**	therms
Savings		63,620	therms
National Grid Energy Efficiency Rebate		$ 100,000	
Estimated Cost savings	$1.44 per therm	$ 91,824	per year

Estimated Installed Cost (w/rebate)	$ 350,000	Simple payback (w/o rebate)	3.8
Estimated Installed Cost (w/o rebate	$ 250,000	Simple payback (w/rebate)	2.7
Annual Cost Savings	$ 91,824	Discount Rate	3%
Annual Energy Savings (mmbtu)	6,362	Life of equipment	20
Savings to investment ratio (w/o rebate)			3.90
Savings to investment ratio (wrebate)			5.46
Life-cycle cost savings (w/o rebate)			$ 1,016,108
Life-cycle cost savings (w/rebate)			$ 1,116,108
Reduction in CO2 emissions	372 tons/yr		

MODEL BMK-3.0LN GWB

TECHNICAL DATA SHEET

AERCO Low NOx Benchmark Gas Fired Hot Water Boiler System

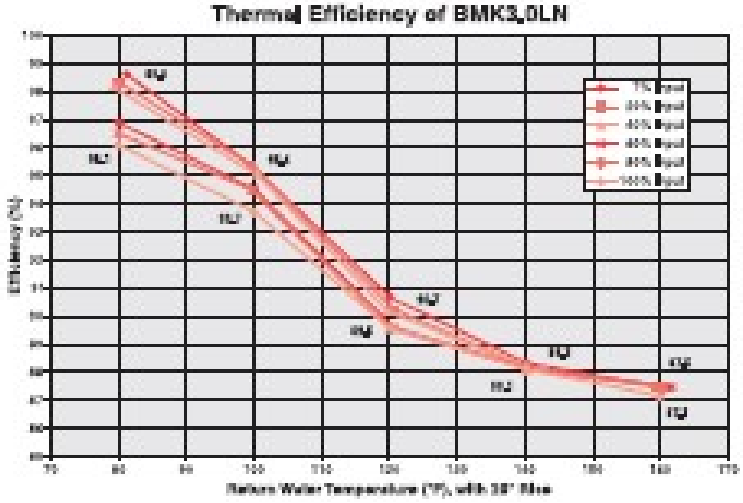
The AERCO Benchmark 3.0 Low NOx (BMK 3.0LN) Water Boiler is designed for condensing application in any closed loop hydronic system. It delivers 15:1 burner turndown to match energy input directly to fluctuating system loads to yield the highest possible seasonal efficiencies. And no other product packs as much capacity into such a small footprint.

To minimize emissions, the BMK 3.0LN is fitted with a low NOx burner whose emissions will consistently measure <30 ppm of NOx corrected to 3% excess oxygen at all firing rates. The fully modulating burner also maintains AERCO standards for energy efficiency, longevity, reliability and construction quality.

The BMK 3.0LN can be used singly or in modular arrangements and offers selectable modes of operation. In addition to controlling the boiler according to a constant set point, indoor/outdoor reset schedule or 4-20mA signal, one or more units can be integrated via Modbus communications protocol to AERCO's multiple boiler management system (BMS) or a facility-wide Energy Management or Building Automation System.

Operating Efficiency

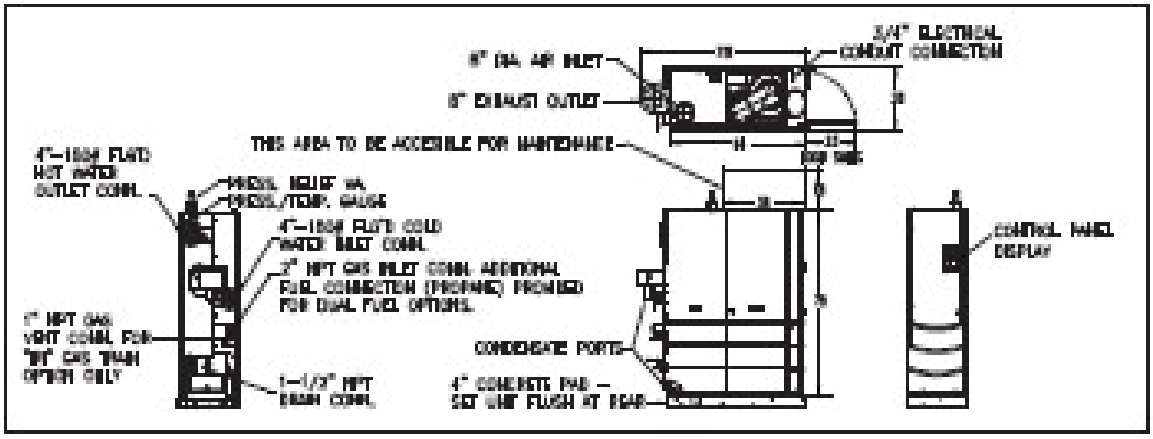
Comprehensive tests were conducted to confirm the unit's efficiency over its entire 200,000 to 3,000,000 BTU/hr. operating range for a variety of operating conditions. These tests indicate that efficiency up to 98.6% can be achieved when the unit operates at its lowest firing rate (7% input) with 80°F inlet water temperature. Even at full fire (100% input), the BMK3.0LN delivers exceptional efficiency.



BMK 3.0LN Features

- Natural Gas
- Optional Dual Fuel (Natural Gas/Propane)
- Separate Fuel Connections Provided with Dual Fuel Option
- 15:1 Turndown Ratio
- <30 ppm NOx Emissions at All Firing Rates
- Direct or Conventional Vent Capabilities
- AL29-4C Vent Materials Required per UL 1738
- Quiet Operation Throughout Firing Range
- Internal Low Water Cutoff (Manual Reset)
- Compact Footprint (79"H x 28"W x 64"D)
- Precise Temperature Control ± 2°F
- Sealed Combustion Capable
- Ventless Supply Gas Regulator
- UL, CUL for Alcove Installation on Combustible Flooring

Dimensions BMK-3.0LN GWB



Ratings and Dimensions

# Units	Model (a)	Mbh Input (b)	Mbh Output (b) (c)	Width (1)	Depth	Height	Weight (wet)
One (1)	BMK-3.0LN	3,000 mbh	2,810mbh – 2,781mbh	24"	54"	67"	2,580 lbs.
Two (2)	BMK-3.0LN-2	6,000 mbh	5,220mbh – 5,562mbh	67"	54"	67"	5,160 lbs.
Three (3)	BMK-3.0LN-3	9,000 mbh	7,830mbh – 8,343mbh	110"	54"	67"	7,740 lbs.
Four (4)	BMK-3.0LN-4	12,000 mbh	10,440mbh – 11,124mbh	154"	54"	67"	10,320 lbs.
Five (5)	BMK-3.0LN-5	15,000 mbh	13,050mbh – 13,905mbh	198"	54"	67"	12,900 lbs.
Six (6)	BMK-3.0LN-6	18,000 mbh	15,660mbh – 16,686mbh	240"	54"	67"	15,480 lbs.
Seven (7)	BMK-3.0LN-7	21,000 mbh	18,270mbh – 19,467mbh	284"	54"	67"	18,060 lbs.
Eight (8)	BMK-3.0LN-8	24,000 mbh	20,880mbh – 22,248mbh	328"	54"	67"	20,640 lbs.

(1) Assume 24" between units. Zero side wall clearance is not provided. Consult local sales representative.
(a) Style to be determined by individual application requirement.
(b) Altitude below 2,000'. Apply altitude correction factor above 2,000'.
(c) Output dependent upon application – see efficiency curves.

BMK-3.0LN Specifications

BTU Input .....3,000,000 BTU/H*
Nat Output @ Full Input.....2,810,000 – 2,983,000 BTU/H**
ASME Working Pressure .....160 PSIG
Electrical Options...208-230/3/60 20 Amp (11 Amp FLA) 5-Wire
460/3/60 15 Amp (5 Amp FLA) 4-Wire
Gas Requirements .....2 psi Maximum
Standard Units–FM Gas Train .....3.5" W.C. Min.@Full Load
Standard Units–IRI Gas Train .....4.0" W.C. Min.@Full Load
Dual Fuel–FM Gas Train–Nat. Gas ..5.7" W.C. Min.@Full Load
Dual Fuel–FM Gas Train–Propane ..3.5" W.C. Min.@Full Load
Dual Fuel–IRI Gas Train–Nat. Gas ..8.5" W.C. Min.@Full Load
Dual Fuel–IRI Gas Train–Propane...3.5" W.C. Min.@Full Load

Vent Size .....8" Diameter
Water Connections.....4" Flanged 150 lb. ANSI
Gas Connection .....2" NPT
Min./Max. Water Flow .....35 GPM/350 GPM
Water Pressure Drop .....5.5 PSIG @ 258 GPM
Water Volume .....49 Gallons
Control Range .....50°F to 190°F
NOx Emissions .....<30 ppm at All Firing Rates
Standard Listings & Approvals.....UL, CUL, CSD-1, ASME
Gas Train Options. .....FM Compliant or Factory Installed IRI
Weight, Installed.....2,170 lbs. (dry) 2,580 lbs. (wet)

* Up to 2000' Altitude
** Output is dependent upon return water temperature and firing rate.

Specifications subject to change.
Consult website or AERCO.
BMK-3.0LN 4/09 5M
New Doc 4/09

AERCO

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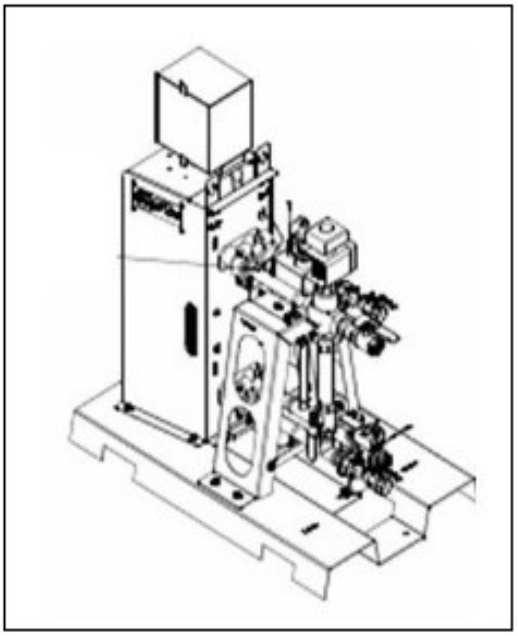
SMARTPLATE SW
TECHNICAL DATA SHEET

SMARTPLATE SINGLE WALL WATER-TO-WATER HEATER

The AERCO SmartPlate water heater is designed to satisfy potable water heating needs in commercial and institutional environments. The packaged system incorporates simple, easy to understand, real-time, load tracking and responsive controls to maintain accurate hot water temperatures under diversified load patterns.



Packaged with a PID temperature controller and a 3-way electronic control valve, the heater maintains outstanding temperature control when operated under constant load conditions with variances held to ±4°F under normal load changes. An integrated load monitoring system and high-turndown electronic control valve deliver accurate temperature control without the need for storage tanks, blending valves or other temperature averaging components. The heater can be remotely monitored and/or fully integrated with BAS software via Modbus Communications Protocol.

The packaged heater consists of a counter flow, stainless steel, brazed plate, heat exchanger — the most efficient water-to-water heat exchanger design available for potable water heating. The SmartPlate heater utilizes boiler water as little as 5°F above the required potable water temperature, resulting in the highest possible boiler efficiency and minimal radiation losses. To ensure longevity, all water wetted (potable water side) parts are stainless steel, copper or copper alloy materials.

The unit's instantaneous design is compatible with low temperature boiler water. And installation is easy because of its small footprint and doorway size. Single point header connections for Domestic Hot Water, Cold Water, Boiler Water Inlet, Boiler Water Outlet, and electrical power supply are all that is required for a fully functional, safe, and efficient system. Tight temperature control, high thermal efficiency, low maintenance, longevity and overall reliability make the SmartPlate heater the most logical choice for any commercial or institutional domestic water-to-water heating installation.

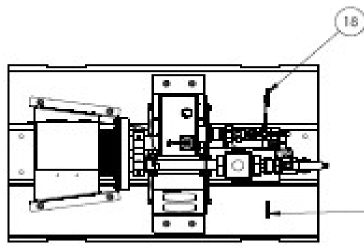
FEATURES

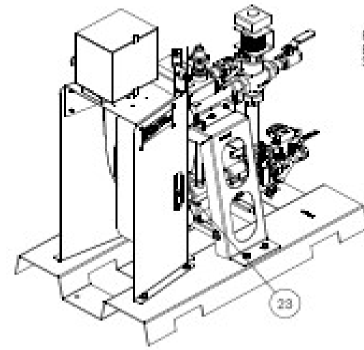
- Accurate Temperature Control ±4°F
- Packaged with 3-Way Electronic Control Valve
- Fully Modulating Variable Primary Input
- Compact Footprint <10 ft^2
- All Stainless Steel, Copper or Copper Alloy Wetted (Potable Water Side) Surfaces
- Integral Constant Speed Domestic Water Recirculation Pump

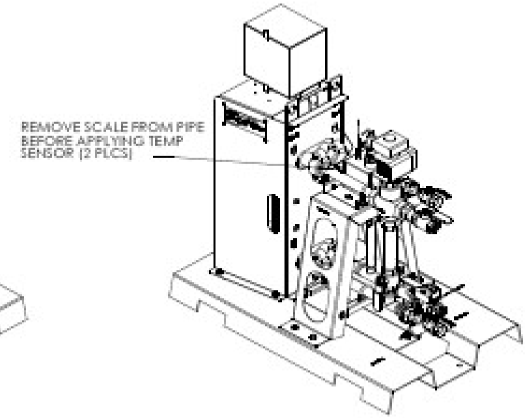
SUPPORTS A VARIETY OF APPLICATIONS

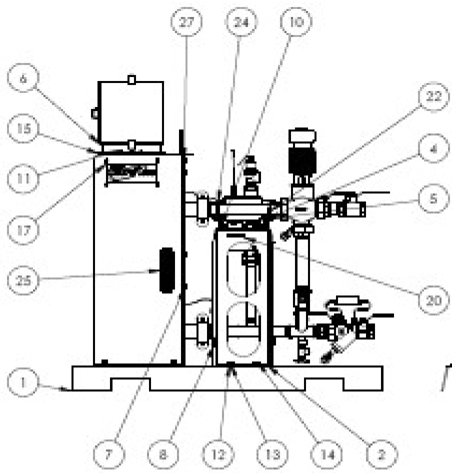
- LTBW; Up to 145 PSIG, 220°F
- Set Point Range 50°F to 180°F
- Single or Multiple Installation
- Supports 2-Way or 3-Way Applications
- Ideal for New or Retrofit

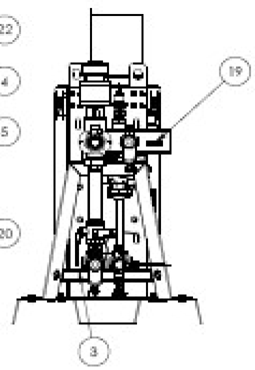
NOTES:
1) TIGHTEN ALL BOLTS TO A TORQUE OF BETWEEN 14 AND 20 FT-LBS

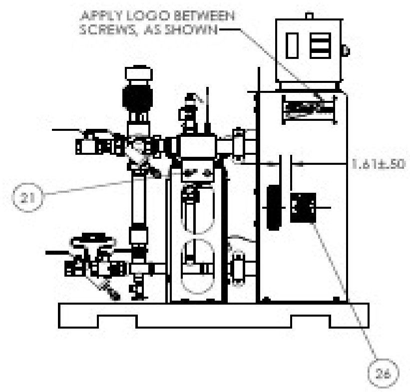












ITEM NO.	QTY.	PART NO.	DESCRIPTION
1	1	34026	BASE, SMARTPLATE
2	1	35015	SUPPORT A-FRAME, SMARTPLATE
3	2	33085	BRACKET LOWER PIPES SUPPORT
4	1	33084-1	BRACKET UPPER PIPES
5	2	33084-2	ADJUSTER PIPE SUPPORT
6	1	69096	CONTROL BOX (ECS)
7	15	123615	SCREW, HEX HD 3/8-16 X .75 LG
8	15	123614	WASHER, FLAT 3/8
9	8	53026	PUSH NUT 1/2"
10	25	56004	NUT, FLANGED SERRATED 3/8-16
11	12	54061	SCREW, PAN HEAD W/INTERNAL WASHER 1/4-2
12	8	124413	1/2 - 13 HEX NUT
13	8	123624	WASHER, FLAT 1/2"
14	8	55044	BOLT, CARRIAGE 1/2-13 X 1.00 LG
15	1	33086	SUPPORT CONTROL BOX
16	1	72046	LABEL, BOILER INLET
17	2	74010	LOGO, SMARTPLATE
18	1	72045	LABEL, DOMESTIC OUTLET
19	1	72044	LABEL, DOMESTIC INLET
20	1	72047	LABEL, BOILER OUTLET
21	1	33083	BRACKET, MIXING BOX
22	6	55033	U-BOLT 1-1/2"
23	1	61018-1	BOILER WATER INLET SENSOR
24	1	61018-2	BOILER WATER OUTLET SENSOR
25	1	22093	PIPING ASSY, SMARTPLATE, SP-23
26	1	73020	PLATE, RATING
27	1	24198	SUPPORT BRACKET ASSEMBLY, BRAZED HX

REV	ECO	REVISIONS	DATE	BY	CKD
1	-	RELEASED FOR PROTOTYPE	4/27/09	PH	

THIRD ANGLE PROJECTION

DRAWN BY: R.H. DATE: 4/20/09

CHECKED BY:

SIZE: C

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ALL DIMENSIONS ARE AFTER FINISH OR PLATING

AERCO INTERNATIONAL INC.
159 PARIS AVE, NORTHVALE, N.J.

TITLE: **SMARTPLATE TOP ASSY, SP-23**

MATL SPEC.:

DWG. NO.: 29116

SHEET 1 OF 1

REV: 1

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

DARNELL TYSON, P.E.
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E.
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: August 12, 2016

RE: CP1664.323 – Energy Conservation for County Buildings
Boiler Plant Optimization at the Supreme Court Building (C0981)
DC0107-16 – Commercial Instrumentation Svc.

Existing Conditions

The Supreme Court Complex is served by three Cleaver Brook 150 HP hot water boilers. These boilers are located in the basement of building C0981 and provided heat to the whole complex. Over the last couple of years, the vacant areas of the Complex are becoming more occupied. This change of vacancy is baring a tremendous load on the boiler that is currently operating. A complex of this size needs at least two fully functional boilers to have the system running efficiently. Currently, the Supreme Court Complex has three boilers, but only one is fully functional. Of the three boilers one is not working properly due to excessive pressure drop in the gas train and the other malfunctioned about five years ago and exploded and the door warped and has to be retrofitted for a new one.

The current system requires the following upgrades to optimize the efficiency of the system:

- HAWK ICS Control System
- Removal of old oil lines as well as controls
- Reconfigure the gas trains to the boilers
- Replacement of the warped doors on the exploded boiler
- Installation of zone valves

The existing control system in place is far too complicated and outdated to meet the needs of the boilers. With the new proposed system in place, the boilers will be simpler to operate and requires the oil controls to be removed. The original design did not allow the water temperature to modulate temperature based on the outside air conditions. On a cold day, the supply hot water temperature will drop tremendously causing the boiler to "sweat".

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FAX (631) 852-4150

The installation of the new zone valves will correct this problem as they will modulate the water temperature based on the outside air conditions.

For Scope of Work please see the attached proposal from CIS and their sub-contractor Miller Proctor Nikolas, Inc.

The cost to implement the proposed upgrade is $173,244.00 and should be funded from CP1664.323.

JA/ba
Attachment
cc: Jay Abbott, Special Projects Supervisor

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E., LEED AP
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: November 7, 2012

RE: CP 1664 - Energy Conservation @ Various County Facilities
Chiller optimization – William H. Rogers Building (C0020)

The legislature building currently has an oversized chiller. Two-88 ton chillers are present for redundancy. In addition, there is no reset on the chiller, allowing the temperature of the chilled water to be based on outdoor conditions. The compressor pumps need to be replaced almost annually, costing $40,000 each year. The chiller frequently breaks down, forcing overtime for workers necessary for emergency repairs. The current configuration lacks a VFD on the chilled water pump, causing inefficiencies. In order to determine an appropriate sized chiller, the cooling load for the building must be calculated.

The required peak cooling load was calculated to be 83.07 tons. This was calculated for the month of August, using design conditions of an outdoor dry bulb temperature of 89 degrees Fahrenheit, outdoor wet bulb temperature of 73 degrees Fahrenheit, and an indoor dry bulb temperature of 72 degrees Fahrenheit.

Air Handler Number	CFM
1	1300
2	4360
3	2590
4	1530
5	6000
6	6330
Total	22110

It is important to note that the south wall and southwest corner of the building has many windows and therefore a large solar heat gain. Employees in this area routinely complain about the resulting high

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temperatures. Reducing the required cooling load would not only lower the amount of tons needed, but also provide a cooler environment for all the residents.

A proposed solution to lower the required cooling load was investigated. It had two components. The first was to paint the roof white, which greatly reduces the heat gain due to the roof absorbing heat. The second component was to use a glass film on all windows facing south or west because these directions witness a large amount of solar heat gain. The glass film is from Hüper Optik, model number Energy Saver Ceramic 45. Applying both of these components simultaneously, the required cooling load is reduced to 73.37 tons. This results in a savings of 9.7 tons, or 11.7% less cooling.

The proposed chiller is Multistack, and composed of two modules; a 50 ton module (MS050XC2H2W2AA-410A) and a 30 ton module (MS030XC2H2W2AA-410A). This chiller has 4 compressors which can operate independently in case one fails. The chilled water pump will be fitted with a VFD. The appropriate cooling tower is from Baltimore Aircoil, model number VLT-092-L. A condenser water pump is also necessary. The total cost shall not exceed $250,000. Attached are the spec sheets for the chiller and cooling tower.

Proposed Installed Cost	$250,000	Simple payback (years)	5.21
		Savings to investment ratio	2.86
Estimated Annual Energy Savings, kWh	46,830	Life-cycle cost savings	$463,889
Estimated Annual Cost Savings $	$7,985	Life of equipment (years)	20.00
Annual Operations & Maintenance savings	$40,000.00	Discount Rate %	3%
Total Annual Savings	$47,985	CO2 Saved (tons)	24.3

JA/GR

COUNTY OF SUFFOLK

STEVE LEVY
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

JAMES PETERMAN, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

LOUIS CALDERONE
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E.
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: February 28, 2011

RE: CP 1664 Energy Conservation – Various County Buildings
Medical Examiner's Building (C0487) North County Complex Hauppauge
Chiller Plant Upgrade - "Optimum Energy's" OptimumLoop Control Technology

Under completion of the analysis of the chilled water plant at the above building it has been determined that the energy performance can be improved upon by upgrading the chiller plant through the implementation of Optimum Energy's OptimumLOOP all-variable-speed chiller plant control technology.

Annual energy and water reduction are expected as follows: Electric – 472,244 kwh/year
Water - 159,782 gal/year

Under full implementation of the system it is expected to generate a combined savings of $76,997.00. Additionally, LIPA rebate incentives are estimated at $71,553.00.

This project will allow the County to continue in its efforts to reduce its carbon footprint while also offering the opportunity to lower monthly utility costs.

The contractor will furnish hardware and labor to connect power to VFD's, sensors, etc. to the control system.

Total cost of this beneficial project is not to exceed $90,000.00
I wish to propose funding as follows: CP 1664.318 $90,000.00
It is requested that the proposed project be approved.

Cc: James Peterman, P.E., Chief Deputy Commissioner
Lou Calderone, Deputy Commissioner
Craig Rhodes, Director, Buildings O & M
Peter Vadax, Maintenance Mechanic IV, Buildings O&M
Harry Swanson, Sr. Energy Coordinator

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FAX (631) 852-4150

COUNTY OF SUFFOLK

STEVE LEVY
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

JAMES PETERMAN, P.E.
ACTING CHIEF DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E.
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: September 6, 2011

RE: Cohalan Court Complex C0802, Chiller Optimization

Equipment Replacement Installation

The Cohalan Court Complex comprises District Court, Family Court, Supreme Court, and an office building. The 500,000 square foot complex is air-conditioned by a central water cooled chiller plant that is located on the roof of the District Court. There are two Variable Frequency Drives (VFD) controlling the chilled water pumps 5 and 6. These VFD's have been in operation for the last 20 years and one of them already has failed. Since the equipment is at the end of its useful life, it is recommended that the VFD's for two chilled water pumps be replaced with two new VFD's. The VFD's will be connected to the Building Management System (BMS) which will allow operators to monitor and control the chilled water pumps.

New equipment Installation

There are two condenser water pumps that currently do not have VFD's (CWP-1, CWP-2). To control the flow of condenser water through the chillers to match building loads, it is recommended to install VFD's. The VFD's model, will be connected to the Building Management System which will allow operators to monitor and control the chilled water pumps.

There are two constant volume constant speed pumps that control the flow of hot water to the boiler, currently there are no VFD's controlling these pumps. In order for the pumps to be more better match the building load profile, it is recommended to install VFD's. The new 20 HP inverted duty motor VFD's will be connected to the Building Management System which will allow operators to monitor and control the hot water pumps.

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FAX (631) 852-4246

Savings and Cost

The estimated cost for this project is $_____. Annual energy and cost savings are estimated to be 94,354 KWh and $16,040 respectively. The CO2 reduction is estimated at 49 tons per year. Simple payback for the project is ___ years.

SR

cc: James Peterman, Acting Chief Deputy Commissioner,
Craig Rhodes, Director, Buildings O & M
Robert Frevele, Asst. Director of Buildings O & M
Ed Farrell Jr, Acting Maintenance Manager

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

DARNELL TYSON, P.E.
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E., Chief Engineer
Facilities Engineering

FROM: Javed Ashraf, P.E., C.E.M., C.B.C.P.
Principal Mechanical Engineer

DATE: December 17, 2015

RE: 1664.322 – Energy Conservation at Various County Buildings
Installation of gas fired infrared space heaters at the Waterways Building, Yaphank, NY (C0504)
DC XXXX-15 – All Service Maintenance

In March 2015 there was a follow up inspection by PESH at the Water ways Building (C0504) and violation was written for not using respirator during welding, sanding and grinding. During PESH inspection it was discovered that the ventilation and heating system may be causing an exasperation of the problem of accumulating dust particles interior of the bldg. while sanding and welding operations are being conducted. Since that time all waterways personnel were trained in respirator use and fit tested, that being said it is the obligation of the employer to engineer out the risk before suppling PPE to reduce the risk of injury and or illness.

According to Buildings Operations and Maintenance the exhaust fan above the main entrance door was repaired and put back in operation.

DPW Facilities Engineering evaluated the existing heating system and has concluded that the replacing the existing system with gas fired infrared heating system will improve space conditions by almost eliminating the accumulation of dust particles caused mainly by the H&V unit blower motor.

The efficiency of the existing heating system is from 70% to 75% compared to 95% efficiency rating for infrared heaters.

The proposed project cost of $30,313.00 is reasonable and fair and should be paid from CP1664.322.

JA:ba
cc: Phil Berdolt, Deputy Commissioner DPW
Keith Larsen, Capital Projects Manager, DPW
Jay Abbott, Special Project Coordinator

Lighting Upgrade - Marine Bureau Phase II - Hi Bay Area

	Discount Rate		3%														
	Cost of Electricity:		0.1600 $/kWh														
			Existing					Recommended									
	Location	Bldg. C0431	Fixt. Type	Watts/ Fixt.	# of Fixt.	Hours/ day	Total kWh	Fixt. Type	Watts/ Fixt.	# of Fixt.	Hours/ day	OS	OS Cost	Fixt. Cost	Savings kWh/year	Savings $/year	Cost $
1	Hi Bay Area	1st Floor	HPS	465	36	16	97,762	4T5HO54	235	36	16	-	-	$184.82	48,355	$7,737	$6,654
2	Wood / Metal shop	1st Floor	2F34T12	74	25	12	8,103	2F28T8	56	25	8	-	-	$53	4,015	$642	$1,325
3	Wood / Metal shop	1st Floor	2F34T12-8'	74	3	12	972	2F28T8	56	3	8	C	$180	$53	482	$77	$339
4	Wood / Metal shop	1st Floor	1F34T12	37	1	12	162	1F28T8	28	1	8	-	-	$53	80	$13	$53
5	Diving Equipment Room	1st Floor	2F34T12	74	2	4	216	2F28T8	56	2	2	-	-	$53	134	$21	$106
6	Gym	1st Floor	2F34T12	74	15	10	4,052	2F28T8	56	15	8	C	$180	$53	1,599	$256	$975
7	Locker Room - Gym	1st Floor	2F34T12	74	5	10	1,351	2F28T8	56	5	8	C	$180	$53	533	$85	$445
8	MER	1st Floor	2F34T12	74	6	8	1,296	2F28T8	56	6	8	-	-	$53	315	$50	$318
9	Small room between Gym & MER	1st Floor	1F34T12	37	1	8	108	1F28T8	28	1	8	-	-	$53	26	$4	$53
10	Stock Room	1st Floor	2F34T12	74	2	8	432	2F28T8	56	2	8	-	-	$53	105	$17	$106
11	Locker Room / Shower	1st Floor	2F34T12	74	6	12	1,945	2F28T8	56	6	12	C	$180	$53	473	$76	$498
12	Observation Deck	1st Floor	2F34T12	74	3	12	972	2F28T8	56	3	12	-	-	$53	237	$38	$159
13	Boiler Room	1st Floor	2F34T12	74	6	4	648	2F28T8	56	6	4	-	-	$53	158	$25	$318
14	Mechanic Desk	1st Floor	2F34T12	74	7	8	1,513	2F28T8	56	7	8	C	$180	$53	368	$59	$551
15	Flood Lights Outside	2nd Floor	HPS	400	4	10	5,840	Induction	200	4	10	-	-	$1,381	2,920	$467	$5,525
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25					122		125,372			122.00		5.00			59,800	$9,568	$17,425

	Fixture costs Retro:	Material	Labor	Total $ / fix		Total	Totals for common areas:
26	4T5HO54	$6,653.52	$6,387.10	$362.24		$13,041	
27	2F28T8	$4,346.00	$14,548.39	$230.42		$18,894	
28	Flood Lights	$5,525.20	$709.68	$1,558.72		$6,235	
29						**$66,900**	

29	Proposed Installed Cost After Rebate	$56,325	Simple payback (years)	5.19
30	Annual Savings $	$9,568	avings to investment ratio	1.64
31	O&M Savings per year	$1,284	Life-cycle cost savings	$ 36,241
32	Annual Cost savings savings $	$10,852	Life of fixtures (years)	10
33	Estimated Annual Energy Savings, kWh	59,800	Discount Rate %	3%
34	Total square feet	14,438		
35	$/sft saved	$ 0.7516		
36	CO2 Saved (tons)	29.5		
37				

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E., LEED AP
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: July 26, 2012

RE: CP 1664 – Energy Conservation at Various County Facilities
High Efficiency Boilers, Water Heaters, and Steam Boiler in Maximum Security

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1. Review of Existing Conditions at Riverhead

Riverhead Jail is a 277,000 square foot building in the Riverhead County Complex. The building is supplied with heating through high temperature hot water (HTHW) from generators at the Power Plant. HTHW piping in the tunnel runs to mechanical room 1 (MER 1), MER 7 and the Maximum Security boiler room. The building requires winter heating, summer reheat and year-round domestic hot water. It is proposed that energy efficient condensing boilers, water heaters and an efficient steam boiler be installed to reduce operating funds spent on energy.

Plans to bring gas service from the Power Plant to the buildings have been arranged with National Grid and they are working now to bring gas to the Criminal Court and Jail buildings. Installation of equipment at the Maximum Security boiler room is expected to be completed in September 2012.

The County Center has been heated independently of the Power Plant since November 2011. Condensing boilers, model AERCO Benchmark 1.5 million Btu per hour (Btu/h), were installed to supply the building.

2. Proposed Improvements at Riverhead Jail

The Facilities Engineering staff has reviewed and approved proposals from our term contractors. We have proposals for electrical, plumbing and boiler contracting.

The boiler contractor will provide three (3) AERCO 3 million Btu/h boilers, (1) 60 horsepower high pressure Cleaver Brooks steam boiler, Model CFV-700-60-150, two (2) SmartPlate SP-150 heat exchangers, one (1) AERCO 1350 Innovation water heater and one (1) 500 gallon water storage tank. The boilers will each be provided with circulating pumps, variable frequency drives, condensate neutralizers, a BMS II controller and BACnet communication cards. The boilers will be separately side-wall vented with AL29-4C double-wall stainless steel pipe. The contractor will provide a rental boiler to operate approximately 10 weeks during construction. The water heaters will be provided with mixing valves and circulating lines to provide 140°F

water to the kitchen and 110°F hot water to the showers and cells. The contractor will demolish and remove the HTHW heat exchangers and HTHW piping. Submittals and shop drawings will be reviewed before construction.

The estimated cost of the boiler contract is: $ 828,040.00

The plumbing contractor will provide a 13 million Btu/h gas meter and a header with (2) 4" lines, one for the kitchen and one for the Maximum Security Boiler Room. The lines will run along the building, drop below grade and the plumber will core drill holes into the boiler room to pick up the three (3) boilers, one (1) steam boiler and one (1) water heater. The old meter and underground gas piping will be abandoned. Shop drawings and as-builts are included in the cost.

The total cost of plumber contract is not to exceed: $ 40,082

The electrical contractor will provide a subpanel to supply the three (3) boilers, three (3) pumps, two (2) heat exchangers, one (1) water heater, and one (1) steam boiler. The contractor will provide wiring, conduit and an Electrical Underwriter's Certificate.

The total cost of the electrical contract is not to exceed: $ 21,650

3. Energy Use Projections for Recommended Alternatives

The reliability of the HTHW generators has been average. The generators are used all year round. Due to low load conditions in the summer months, the boiler plant has low overall thermal efficiency with large off-cycle and standby losses. In the winter months the operating efficiency of the boiler plant is from 65% to 70%. HTHW from the central utility plant is converted to low temperature (180 F) hot water for space heating and domestic hot water. According to our energy model approximately 30% of the boiler fuel is wasted due to boiler off-cycle losses, jacket losses, distribution losses in the tunnel and losses in the heat exchangers.

The condensing boiler and water heater have a seasonal thermal efficiency of 95%. The compact heat exchanger and condensing design has a turn-down ratio of 15:1 and cools exhaust gases to near 200°F. This higher part-load efficiency opposes traditional cast-iron boilers or gas-fired water heaters which cycle on and off at part load and release exhaust gases at 500°F. The equipment is easier to maintain with far less heat loss than the existing HTHW generators, tunnel piping and heat exchangers.

According to the energy model of Riverhead Jail Maximum Security portion of the building, the new equipment will use approximately 93,000 therms annually for space heating and 43,300 therms for domestic hot water. The estimated usage is shown in the Table 1 below:

Table 1 Energy Savings and Cost Analysis of Maximum Security Portion of the Jail

Existing gas consumption for space heating	236,836	therms	Simple Payback (years)		5.45
Existing gas consumption for domestic hot water	68,251	therms	Estimated Installed Cost (without rebate)	$	889,772
Total gas consumption by existing boiler plant	**305,088**	therms	Estimated Installed Cost (with rebate)	$	829,772
Estimated Gas consumption with new boilers	93,560	therms	Annual Cost Savings	$	163,148
Estimated gas consumption for dhw with proposed boilers	43,334	therms	Annual Energy Savings (mmbtu)		16,819
Total estimated gas consumption with condensing boilers	**136,894**	therms	Savings to investment ratio (w/o rebate)		2.73
Savings	168,194	therms	Savings to investment ratio (wrebate)		2.93
Reduction in CO_2 emissions	984	tons/yr	Life-cycle cost savings (w/o rebate)	$	1,537,454
National Grid Energy Efficiency Rebate	$ 60,000		Life-cycle cost savings (w/rebate)	$	1,597,454
Estimated Cost savings $0.97 per therm	$163,148	per year	Discount Rate	3%	
			Life of Equipment (years)	20	

4. Conclusions and Recommendations

The County will significantly reduce operation and maintenance costs by installing individual boilers in Riverhead Jail. We can expect to see gas consumption reduced by 55%. According to the cost analysis, the project is expected to have a simple payback of 5.45 years.

Total cost of this beneficial project is not to exceed:	$ 889,772.00
I wish to propose funding as follows: CP 1664.319	$ 889,772.00

It is requested that the proposed project be approved.

JA/SH/ba
Attachment
Cc: Gilbert Anderson, P.E., Commissioner
Philip Berdolt, Deputy Commissioner
Jay Abbott, Special Projects Supervisor, Buildings D&C
Lt. Wayne Dorsch, SC Sheriff's Office
Craig Rhodes, Director, Buildings O&M
John Driver, Maintenance Mechanic IV

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

DARNELL TYSON, P.E.
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E., Chief Engineer
Facilities Engineering

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: May 11, 2015

RE: 1664.321 – Energy Conservation at Various County Buildings
HVAC Upgrade at the DPW Crew Shop Building, Yaphank, NY (C0382)
DC XXXX-15 – Commercial Instrumentation Services, Inc.

The 3,300 square feet facility includes two individual offices, workshop, storage room, locker room and two toilet rooms. The space heating and domestic hot water requirements are met by one gas fired hot water boiler. The individual offices (Ed's and Dan's offices) and the Shape-up room are air-conditioned by wall/window units. The air-conditioning units installed in the windows leads to uncontrolled infiltration, which leads to occupant discomfort and higher energy consumption and cost.

It is proposed that the window air-conditioning units in the Shape-up room and Dan's office should be replaced with packaged air-conditioning terminal units (PTAC) with DX coils and hot water coils for heating and cooling. The units are provided with fresh air intake grille to bring ventilation air into the space.


Shown above is the non-functional PTAC and window AC in the Shape-up Room. Shown to the right above is window AC unit in Dan's Office

The PTAC units being proposed are as follows:

1. Dan's Office: Make: Evergreen Model EGN 12
2. Shape-up Room: Make: Evergreen Model EGN 18

MODEL			EGN 07		EGN 09		EGN 12		EGN 15	EGN 18
COOLING	TOTAL COOLING	BTUH	7,800	7,800	9,800	9,800	12,900	12,900	15,200	16,800
	VOLTAGE	V	115	208/230	115	208/230	115	208/230	208/230	208/230
	AMPERAGE	A	5.6	2.8	7.2	3.6	9.8	4.9	6.2	7.3
	WATTS	W	640	640	840	840	1120	1120	1420	1680
	EER		12.0	12.0	11.2	11.2	11.0	11.0	10.2	9.9
AIRFLOW	HI	CFM	375	375	375	375	375	375	375	490
	LOW	CFM	325	325	325	325	325	325	325	370
HEATING	HOT WATER HI	BTUH	18,260	18,260	18,260	18,260	18,260	18,260	18,260	21,000
	HOT WATER LOW	BTUH	16,800	16,800	16,800	16,800	16,800	16,800	16,800	18,100
	STEAM HI	BTUH	23,950	23,950	23,950	23,950	23,950	23,950	23,950	28,281
	STEAM LOW	BTUH	21,800	21,800	21,800	21,800	21,800	21,800	21,800	23,736
WEIGHTS	CHASSIS	Lbs.	100		100		100		112	118
	CHASSIS (BOXED)	Lbs.	110		110		110		122	129
	STANDARD SLEEVE (13.75")	Lbs.	31		31		31		31	31
	STANDARD CABINET (10.5")	Lbs.	37		37		37		37	37
WALL SLEEVE SIZE			42" X 16"		42" x 16"		42" x 16"		42" x 16"	42" x 16"
REFRIGERANT			410A		410A		410A		410A	410A

The proposed project cost is $14,473.28 which is reasonable and fair and should be paid from CP1664.321.

The units are direct replacement and are considered alteration level # 1 therefore a building permit is not required.

JA:ba
cc: Phil Berdolt, Deputy Commissioner DPW
Jay Abbott, Special Project Coordinator

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

VINCENT FALKOWSKI, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E., LEED AP
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: August 13, 2013

RE: CP-1664: Energy Conservation at various County Buildings
William H. Rogers Building (C0020)
Replace Electric Chiller with two 40-ton gas fired Yazaki Absorbers

The William H. Rogers Building is a 32,000 square ft. building that is air conditioned by two 88-ton air-cooled York Reciprocating Electric Chillers. The electric chillers are almost 14 years old with a history of frequent breakdowns and very high maintenance costs. The frequent maintenance required forces overtime for the workers necessary for repairs. According to Buildings O&M the average annual maintenance cost is approximately $40,000.00. The chillers are old and at a point that the reliability of these machines cannot be improved further.

The proposed chiller is Yazaki Gas Fired Absorbers, Model CH-K40, composed of two 40-ton modules. The chilled water pumps will be fitted with variable frequency drives (VFD). The appropriate cooling tower is from Delta Cooling Towers, Model Number 75. A condenser water pump is also necessary. The total proposed project cost for the mechanical is $342,516.20. The total cost for the electrical work for this project is $41,700.00.

The cost to prepare shop drawings for this project is $4,675.00 and shall be paid from CP1664.319. It is requested that the attached purchase requisition for the amount of $4,675.00 be approved.

JA:ba
cc: Gilbert Anderson, P.E., Commissioner
Vincent Falkowski, P.E., Chief Deputy Commissioner
Craig Rhodes, Director of Buildings O&M
Bob Frevele, Asst. Director of Buildings O&M

335 YAPHANK AVENUE

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COUNTY OF SUFFOLK

STEVE BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

DARNELL TYSON, P.E.
DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

ERIC M. HOFMEISTER
DEPUTY COMMISSIONER

MEMORANDUM

To: Michael J. Monaghan, P.E.
Chief Engineer, Facilities Engineering

From: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

Date: June 06, 2018

Re: Capital Program No. 1664.324 – Energy Conservation at Various County Facilities
Replace Existing Hot Water Boiler at the Police Garage (C0152)
DC0069-18-All Systems Maintenance @ Police Garage – Boilers & Gas Meter

---

The Police Garage located in the North County Complex is single story building with 11,566 square feet of usable space. In 2015, the radiant heating system in the workshop area was damaged beyond repair when the vehicular lifts were being replaced. A new heating system was installed in the workshop area that comprised eleven 50,000 Btuh gas fired infrared heaters. In addition to the infrared heaters there are three make-up air units in the workshop area that provided ventilation to the space.

The existing H. B. Smith hot water boiler is equipped with 1,800 MBH PowerFlame burner. There is one 40,000 Btuh domestic water heater with 50 gallon storage capacity. Since the workshop area is no longer served from the existing boiler, the boiler is now oversized for the spaces it currently serves which results in off-cycle losses and lower thermal efficiency. The existing boiler is over 30 years old and has exceeded the life expectancy.

The building's heating system has four zones which are as follows:

1. Zone 1 – office and custody
2. Zone 2 – Parts (coils 10 and 11)
3. Zone 3 – Radio and LR (coils 8 and 9)
4. Zone 4 – Workshop (coils 2, 3, 4, 5, 6 and 7)

Zone 4 is no longer served by the boiler as the heating pipes embedded in the floor were damaged during the removal of vehicle lifts. The workshop area is now served by eleven 50,000 Btuh each infrared heaters.

To improve operating efficiency and reduce operating cost, DPW is proposing to install two 550,000 Btuh high efficiency hot water condensing boilers with thermal efficiency 93.9% compared to 70% for the existing boiler. The existing water heater will be replaced with a 40-gallon indirect hot water storage tank connected to the new boilers. The new boilers come equipped with hot water reset control which will adjust the temperature of hot water based on the ambient temperature.

The following circulators will be replaced:
a. One 0.5 hp pump (1725 RPM)
b. One 1.0 hp pump (1725 RPM)

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c. Two 0.125 hp pumps (3250 RPM)

Natural gas to this building is fed from a master meter that serves most of the buildings in the North County Complex. To make the buildings more energy efficient it is important to monitor actual gas consumption in real time. There are a number of benefits for sub-metering the buildings, chief among them:

a. Identification of unnecessary equipment running at night, off shift, or during the weekend;
b. Ability to get information back to operators and facility managers the same day and to provide operators with feedback the next day about implemented changes;
c. Comparison and benchmarking of usage across similar facilities (stores, warehouses, or buildings) and over time;
d. Detection of utility bill errors by comparing sub-meter usage with the actual utility bill; and,
e. Better management of energy usage when a facility faces demand limited or peak usage pricing from the utility.

The total connected gas load for this building is approximately 1,650,000 Btuh (input). It is proposed that a 3M gas meter should be installed with pulse output feather.

Buildings O&M staff will be working with the contractor to install the boilers. The scope of work for each is as noted below.

Scope of work for the Buildings O&M Staff includes the following:

- Demolish and remove existing boiler, water heater, expansion tank, piping and circulators.
- Pour 4 inch thick concrete pad with wire mesh to house two Weil McLain Slim Fit Model 550 boilers.
- Install one 40-gallon indirect fired water heater.
- Install floor mounted expansion tank.
- All piping and circulators.
- Insulate all pipes with 2 inch fiberglass insulation complete with labels and direction of flow.
- Electrical power and control wiring.

Scope of work for the contractor includes the following:

- Supply two Weil McLain 550 boilers and one 40 gallon indirect water heater.
- Supply all circulators.
- Supply all pipe insulation.
- Supply and install one 3 M gas meter with pulse output suitable for remote monitoring.
- Disconnect and remove all existing flue.
- Supply and install CPVC flue for the new boilers.

The proposed cost for this project is $64,300.00 which is reasonable and fair and should be funded from CP1664.324.

JA/ba
Enclosure
cc: Gilbert Anderson, P.E., Commissioner
Jay Abbott, Special Projects Supervisor
Craig Rhodes, Director of Buildings Operations and Maintenance

Date: October 8, 2015

Site: District Attorney's Building (C0077)

Project: Replace existing domestic water heater

Scope of work:

1. Disconnect and remove existing steam to hot water heat exchanger and support located underneath the tank. Cap steam and condensate lines as required.
2. Disconnect and remove existing 40-gallon electric water heater located in the basement.
3. Pour housekeeping pad as required.
4. Provide and install one Rheem Platinum Hybrid Heat Pump Model XE80T12EH45UO
5. Provide and install one 50 gallon indirect hot water storage tank and connect it to the new water heater.
6. Provide and install one recirculation pump, aqua-stat, and temperature gages as required.
7. Insulate all exposed hot water and cold water pipes in the mechanical room.
8. Investigate the recirculation domestic hot water loop throughout the building and repair any deficiencies noted.
9. All electrical wiring will be by others.

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The new degree of comfort.™

PERFORMANCE **PLATINUM**™ Hybrid Heat Pump is our most advanced, energy-efficient water heater – with over $4,000 in lifetime savings with less than 2 years payback*

Efficiency

- High 2.45 EF reduces operating cost $340 annually compared to a standard 50-gallon electric model
- ENERGY STAR® rated

Performance

- Delivers hot water faster than most standard electric water heaters – 73 gallons first-hour delivery for 50-gallon model and 86 gallons FHD for 80-gallon model
- 8700 Btu/h compressor – the most powerful in its class for quick recovery of hot water
- Ambient operating range: 37-120° F is widest in class, offering more days of HP operation annually; designed to meet Northern Climate Spec (Tier 1)

Easy Installation

- Easy access side connections
- Quick access to electrical junction box
- Designed to be installed as easily as a standard electric water heater

Integration

- LCD Screen with built-in water sensor alert with audible alarm and service notifications

EcoNet™

- EcoNet™ enabled WiFi-connected† technology gives users control over water systems, allowing for customizable temperature, energy savings and system monitoring at home or away. Visit Rheem.com/EcoNetConnect

Operation Modes

- Energy Saver
- Heat Pump Only
- High Demand
- Electric Heat Only
- Vacation: 2-28 days (or placed on hold indefinitely)

Plus...

- Premium grade anode rod with resistor extends the life of the tank
- 3/4" NPT water inlet and outlet; 3/8" condensate drain connections
- Incoloy stainless steel resistor elements
- Dry-fire protection
- Easy access, top mounted washable air filter
- 2-1/2" Non-CFC foam insulation
- Enhanced flow brass drain valve
- Temperature and pressure relief valve included
- Low lead compliant

Warranty

- 12-Year limited warranty for tank and parts, 1-year full in-home labor warranty
  See Residential Warranty Certificate for complete information

Units meet or exceed ANSI requirements and have been tested according to D.O.E. procedures. Units meet or exceed the energy efficiency requirements of NAECA, ASHRAE standard 90, ICC Code and all state energy efficiency performance criteria.

*Compared to a 50-gallon standard electric water heater with a .95 EF.

† WiFi broadband internet connection required, EcoNet WiFi Kit sold separately

PERFORMANCE **PLATINUM**
Hybrid
50 and 80-Gallon Capacities
208-240 Volt / 1 PH / 24 Amps

LEED Points = 2

See specifications chart on back.

08/15 FORM NO. THD-PPEH

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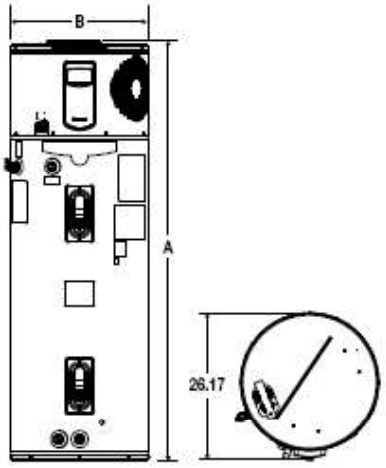
PERFORMANCE PLATINUM™ Hybrid Specifications

Fuel Type	Description	Gallon Capacity	Model Number	Recovery in G.P.H. 90° Rise	First Hour Rating G.P.H.	Tank Height A	Diameter B	Unit Weight (LBS)	Ship Weight (LBS)	Energy Saver
Electric	Tall	50	XE50T12EH45U0	26	73	61	22-1/4	185	204	2.45 EF
Electric	Tall	80	XE80T12EH45U0	26	86	74-1/2	24-1/4	220	245	2.45 EF

Energy Factor based on D.O.E. (Department of Energy) test procedures.



In keeping with its policy of continuous progress and product improvement, Rheem reserves the right to make changes without notice.

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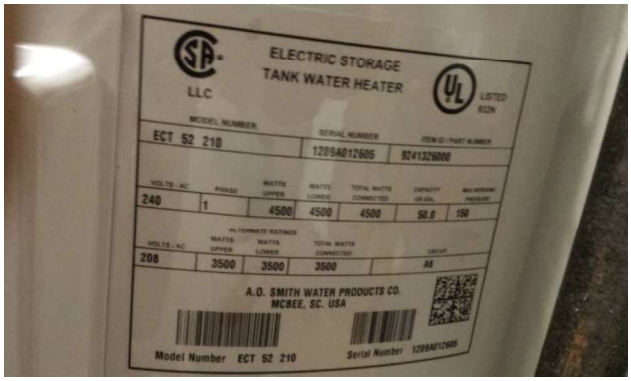
09/15 FORM NO. THD-PPEH

Photos above show existing electric water heater and steam to hot water heat exchanger



Nameplate for existing electric water heater

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

DARNELL TYSON, P.E.
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E., LEED AP
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: August 14, 2014

RE: CP 1664.321 - Energy Conservation @ Various County Facilities
Install High-efficiency Boiler at the C203
DC0084-14

The existing hot water propane fired boiler is over 25 years old and in very poor condition with cracked sections causing the water to leak. The existing boiler is beyond repair and should be replaced before the next heating season. The propane tank needs to be repaired and or replaced as the legs have rotted out and the tank is sitting at an angle and almost on its side, it also needs to be moved closer to the building so that the new piping isn't an issue.

The contractor cost to replace the existing boiler is approximately $25,000, which could increase if some of the work needs to be performed during off hours.

The County has decided to replace this standard efficiency (80%) boiler, which is in poor condition with a high efficiency (90%) hot water propane fired boiler utilizing in-house labor from Buildings O&M. The total cost to do this project in house is $11,400.00; please see the cost breakdown below:

Material for boiler and piping:	$10,000.00
In House Labor to Install:	$3,400.00
Total:	$13,400.00

It is requested the overtime for the in-house labor be approved as the County will save $13,600.00 in project costs by utilizing in-house labor.

JA:ba
cc: Gilbert Anderson, P.E., Commissioner
Craig Rhodes, Director, Buildings O&M
Robert Frevele, Asst. Director, Buildings O&M
Judd Classie, Building Maintenance Manager
Steve Felice, Maintenance Mechanic V

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EPI 2399

COUNTY OF SUFFOLK

STEVE BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

To: Michael J. Monaghan, P.E.
Chief Engineer, Facilities Engineering

From: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

Date: January 28, 2014

Re: Capital Program No. 1664 – Energy Conservation at Various County Facilities
Replace Medium Pressure Steam Boilers with High Efficiency Hot Water Boilers

A. Existing Conditions

There are two medium pressure steam boilers located in the old section of Yaphank Jail that provide steam to the kitchen, generate hot water through a shell and tube heat exchanger for space heating, and produce domestic hot water. The 150-hp Kewanee boilers, installed approximately fifteen years ago, are inefficient and require high maintenance to keep it operational.


Kewanee 150-hp boilers

Nameplate Data for Boiler

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FAX (631) 852-4246

Primary Heating Pumps

Zone Heating Pumps

On average, the County expends approximately $100,000.00 per year to maintain the boilers, burners, circulation pumps, distribution systems and exhaust flues. The maintenance cost will increase over the years as the equipment approaches the end of its useful life.

The reliability of the Kewanee steam boilers has been average. The boilers are used all year round for space heating, domestic hot water and to produce cooking steam for the Jail. Due to low load conditions in the summer months, the overall thermal efficiency of the boiler plant is low, with large off-cycle and standby losses. In the winter months, the operating efficiency of the boiler plant is from 65% to 70%. According to our energy model, approximately 25% to 30% of the boiler fuel is wasted due to boiler off-cycle losses, jacket losses, distribution losses, and the heat exchangers.

The gas consumption for the old section is shown in the Table 1 below.

Table 1 Energy Model Data by Year for Yaphank Jail (Old Section)

Year	Months	Period	# of days	HDD	Therms	Cost	$/therm	therms/day
2012	Jan to Dec	2/14/12 to 2/13 13	365	4784	160,969	$ 127,672	$ 0.7931	441
2011	Jan to Dec	12/13/10 to 11/30/11	352	5199	157,264	$ 152,371	$ 0.9689	447
2010	Jan to Dec	12/15/09 to 12/13/10	363	5226	141,160	$ 156,141	$ 1.1061	389
2009	Jan to Dec	12/9/08 to 12/15/09	367	5623	152,794	$ 184,429	$ 1.2070	416
2008	Jan to Dec	12/1/07 to 12/9/08	374	5297	174,772	$ 220,132	$ 1.2595	467
2007	Jan to Dec	1/1/07 to 12/1/07	326	5532	150,430	$ 175,425	$ 1.1662	461

B. Proposed Improvements

To improve the operating efficiency and lower the operating cost, DPW evaluated the feasibility of installing gas fired condensing boilers, high efficiency water heater and gas fired medium pressure steam boilers for the kitchen.

The proposed gas-fired condensing boilers are significantly more efficient (98.0% thermal efficiency) than the existing gas/oil-fired steam boilers (70% in winter and 55% in summer). Furthermore, condensing boilers operate at higher efficiency at part load than at full load.

The scope of work for the proposed project would include the following:

- Demolish and remove both Kewanee Steam Boilers.
- Remove and safe off the air shaft gratings to rig equipment through, replace upon completion.
- Remove CMU block knock out panel, replace upon completion.
- Provide and install two new 20hp steam boilers for the kitchen complete including breeching.
- Provide and install three new Aerco Benchmark 1500 hot water boilers complete including breeching.
- Provide and install one new AERCO Innovation 1350 high efficiency water heater complete including breeching. Reroute the existing domestic cold water, domestic hot water, and recirculation piping as required through the new boiler to utilize both of the existing storage tanks.
- Install a new tempering valve to reduce the 140F water from the tank to 110F for lower temperature service lines.
- All pipe valves and fittings included.
- All electrical power and control wiring.
- Integrate to new BMS.

Budget for mechanical and electrical work is $1,000,000.00

C. Energy Use Projections for Proposed Improvements

Based on existing conditions, energy models were prepared to compare the operating cost of existing and proposed boiler plants.

The analysis shown in Table below indicates that replacing the existing boiler plant with high efficiency condensing boilers will result in annual fuel savings of approximately 4,829 MMBtu of natural gas. The estimated annual utility and maintenance cost savings is $125,704. The simple payback for this project is estimated to be 7.96 years without factoring rebate from National Grid. A twenty year life-cycle cost analysis (LCS) without escalation in fuel and maintenance cost shows savings of over $870,000.

Energy Analysis Summary of Yaphank Jail (Old Section)

Existing gas consumption for space heating		122,640	therms	Simple Payback (years)		7.96
Existing gas consumption for domestic hot water		38,325	therms	Estimated Installed Cost (without rebate)	$	1,000,000
Total gas consumption by existing boiler plant		**160,965**	therms	Estimated Installed Cost (with rebate)	$	900,000
Estimated Gas consumption with new boilers for heating		85,848	therms	Annual Cost Savings	$	125,704
Estimated gas consumption for dhw with proposed boilers		26,828	therms	Annual Energy Savings (mmbtu)		4,829
Total estimated gas consumption with condensing boilers		**112,676**	therms	Savings to investment ratio (w/o rebate)		1.870
Savings		**48,290**	therms	Savings to investment ratio (w rebate)		2.078
Reduction in CO2 emissions		903	tons/yr	Life-cycle cost savings (w/o rebate)	$	870,158
National Grid Energy Efficiency Rebate (estimated)	$	100,000		Life-cycle cost savings (w/rebate)	$	970,158
Estimated Cost savings (utility + O&M)	**$**	**125,704**	per year	Discount Rate		3%
				Life of Equipment (years)		20

Conclusions and Recommendations

The County will significantly reduce operating and maintenance costs by replacing steam boilers with high efficiency boilers and water heater. We can expect to see gas consumption reduce by almost 30%. According to the information provided by the Buildings Operation and Maintenance (O&M) the average annual cost for boiler repair and maintenance is approximately $100,000.00.

Assuming equipment life of twenty years for the existing and proposed systems, 2% annual escalation for the cost of natural gas, and 3% annual escalation for the annual maintenance costs, the life-cycle cost for the existing and proposed systems over a twenty-year period are as follows:

a. <u>Existing Plant</u>

Cost of natural gas	$ 4,188,821.00
Maintenance cost	$ 2,767,649.00
Total operating cost (20 years) (A)	**$ 6,956,469.00**

b. <u>High Efficiency Boiler Plant – Recommended Alternative</u>

Cost of natural gas	$ 2,932,096.00
Debt payment	$ 1,407,222.00
Boiler maintenance cost	$ 691,912.00
Total operating cost (20 years) (B)	**$ 5,031,230.00**
Estimated life-cycle cost savings (A - B)	**$ 1,925,239.00**

It is recommended that we move forward with the first phase by getting shop drawings made for the project.

JA/dk
Enclosure
cc: Gilbert Anderson, P.E., Commissioner
Philip Berdolt, Deputy Commissioner
Craig Rhodes, Director of Buildings Operations and Maintenance

Life-cycle Cost Analysis: Existing Boiler Plant versus High Efficiency Condensing Boilers

Yaphank Jail

Multi-year Economics for High Efficiency Boiler Plant

All $ in millions		2014	1 2015	2 2016	3 2017	4 2018	5 2019	6 2020	7 2021	8 2022	9 2023	10 2024	11 2025	12 2026	13 2027	14 2028	15 2029	16 2030	17 2031	18 2032	19 2033	20 2034	20-yr LCC	NPV(11$) 3%	Annualized 20 years
Existing - Power Plant																									
Boiler Fuel - Gas	$M	0.169	0.172	0.176	0.179	0.183	0.187	0.190	0.194	0.198	0.202	0.206	0.210	0.214	0.219	0.223	0.227	0.232	0.237	0.241	0.246	0.251	4.189	3.056	0.205
Boiler Maintenance Cost	$M	0.100	0.103	0.106	0.109	0.113	0.116	0.119	0.123	0.127	0.130	0.134	0.138	0.143	0.147	0.151	0.156	0.160	0.165	0.170	0.175	0.181	2.768	2.000	0.134
Total Operating Cost	$M	0.269	0.275	0.282	0.289	0.296	0.303	0.310	0.317	0.325	0.332	0.340	0.349	0.357	0.365	0.374	0.383	0.392	0.402	0.412	0.422	0.432	6.956	5.056	0.340
High Efficiency Boiler Plant																									
Boiler Fuel - Gas	$M	0.118	0.121	0.123	0.126	0.128	0.131	0.133	0.136	0.139	0.141	0.144	0.147	0.150	0.153	0.156	0.159	0.162	0.166	0.169	0.172	0.176	2.932	2.139	0.144
Debt Payment	$M		0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	1.407	1.047	0.070
Boiler Maintenance Cost	$M	0.025	0.026	0.027	0.027	0.028	0.029	0.030	0.031	0.032	0.033	0.034	0.035	0.036	0.037	0.038	0.039	0.040	0.041	0.043	0.044	0.045	0.692	0.500	0.034
Boiler Plant Staff (1FTE)	$M	0.200	0.206	0.212	0.219	0.225	0.232	0.239	0.246	0.253	0.261	0.269	0.277	0.285	0.294	0.303	0.312	0.321	0.331	0.340	0.351	0.361	5.535	4.000	0.269
Total Energy Cost	$M	0.343	0.423	0.432	0.442	0.452	0.462	0.472	0.483	0.494	0.505	0.517	0.529	0.541	0.554	0.567	0.580	0.594	0.608	0.622	0.637	0.653	10.567	7.686	0.517
Operating Costs Savings																									
Boiler Fuel - Gas	$M	0.051	0.052	0.053	0.054	0.055	0.056	0.057	0.058	0.059	0.061	0.062	0.063	0.064	0.066	0.067	0.068	0.070	0.071	0.072	0.074	0.075	1.257	0.917	0.062
Boiler Maintenance Cost	$M	0.075	0.077	0.080	0.082	0.084	0.087	0.090	0.092	0.095	0.098	0.101	0.104	0.107	0.110	0.113	0.117	0.120	0.124	0.128	0.132	0.135	2.076	1.500	0.101
Total Operating Cost	$M	0.126	0.129	0.132	0.136	0.139	0.143	0.147	0.150	0.154	0.158	0.163	0.167	0.171	0.176	0.180	0.185	0.190	0.195	0.200	0.205	0.211	3.332	2.417	0.162
Operating Cash Flow		0.126	0.129	0.132	0.136	0.139	0.143	0.147	0.150	0.154	0.158	0.163	0.167	0.171	0.176	0.180	0.185	0.190	0.195	0.200	0.205	0.211	3.332	2.417	0.162
Financing			Principal:	1.000	million		Term:	20.000	years		Interest Rate:		3.5%												
Debt Payment	$M		0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070		1.047	0.070
Interest Paid	$M		0.035	0.034	0.032	0.031	0.030	0.028	0.027	0.025	0.024	0.022	0.020	0.019	0.017	0.015	0.013	0.011	0.009	0.007	0.005	0.002			0.000
Principal Paid	$M		0.035	0.037	0.038	0.039	0.041	0.042	0.043	0.045	0.047	0.048	0.050	0.052	0.053	0.055	0.057	0.059	0.061	0.063	0.066	0.068			0.000
Balance	$M	1.000	0.965	0.928	0.890	0.851	0.810	0.768	0.725	0.680	0.633	0.585	0.535	0.484	0.430	0.375	0.318	0.258	0.197	0.134	0.068	0.000			0.000
Depreciation																									
Tax Life (15 years)																									
Depreciation	$M		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
Cumulative Depreciation	$M		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
Depreciation Balance	$M	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000								
Income Tax			Federal Tax Rate:		0%																				
Taxable Income	$M		0.129	0.132	0.136	0.139	0.143	0.147	0.150	0.154	0.158	0.163	0.167	0.171	0.176	0.180	0.185	0.190	0.195	0.200	0.205	0.211		1.829	0.153
Tax Payment	$M		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
Summary																									
Total Operating Cash Flow	$M		0.129	0.132	0.136	0.139	0.143	0.147	0.150	0.154	0.158	0.163	0.167	0.171	0.176	0.180	0.185	0.190	0.195	0.200	0.205	0.211		1.829	0.153
Plus: Depreciation	$M		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
less: Debt Payment	$M		(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)	(0.070)		(0.840)	(0.070)
less: Tax Payment	$M		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
Total After Tax Cash Flow	$M		0.059	0.062	0.065	0.069	0.073	0.076	0.080	0.084	0.088	0.092	0.097	0.101	0.105	0.110	0.115	0.120	0.125	0.130	0.135	0.140		0.989	0.083
Escalation																									
Salary	%/yr.		3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3%	3%	3%	3%	3%			
Thermal Savings	%/yr.		3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3%	3%	3%	3%	3%			
Boiler fuel - Gas	%/yr.		2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2%	2%	2%	2%	2%			
Cogen fuel - Oil	%/yr.		3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3%	3%	3%	3%	3%			
O&M costs	%/yr.		3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3%	3%	3%	3%	3%			
Boiler Maintenance Cost	%/yr.		3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3%	3%	3%	3%	3%			
Boiler Plant Staff (salary escalation)	%/yr.		2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2%	2%	2%	2%	2%			
Average gas. rate escalation	%/yr.		3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%			

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DARNELL TYSON, P.E.
ACTING COMMISSIONER

ERIC M. HOFMEISTER
DEPUTY COMMISSIONER

TO: Michael J. Monaghan, P.E., Chief Engineer
Facilities Engineering

FROM: Javed Ashraf, P.E., C.E.M.
principal Mechanical Engineer

DATE: March 4, 2019

RE: CP1664.325 - Labor to Install AC Light Fixtures in Sanitation/Personnel/2nd Fl. Corridor (C0010)
DC0049-19 – DPW Office Building, 335 Yaphank Avenue

Interior lighting in Building C0010 (DPW Office Building) is predominantly T8 fluorescent fixtures that was installed in 2004/2005 under the Energy Performance Contract with NYPA. According to the survey that was conducted in 2016, there are almost 1,700 light fixtures in the building. As the building is occupied during the day, we plan to upgrade lighting in this building in phases.

The following areas have been upgraded by replacing or retrofitting T8 fixtures with LED fixtures and lamps:

a. Room 208 (BD&C Office) – all T8 lamps were replaced with LED lamps.
b. Room 109 – all DC LED fixtures were replaced with AC LED fixtures
c. Room 110 – all DC LED fixtures were replaced with AC LED fixtures
d. Room 113/113A – all fixtures were replaced with AC LED fixtures

Under this phase we plan to replace lighting in the following areas with LED fixtures:

Space	Existing Fixture	Qty	Watts	Total Watts	Proposed Solution	Qty	Watts	Total Watts	Burn Hours
Xen Office	Troffer/T8 Fluorescent/17.0W/3 Lamp	6	43.1	259	Lithonia Part No: EPANL 22 34L 40K Troffer/2x2ft/4000K	6	30.8	185	3,650
Mens Restroom	Troffer/Light Emiting Diode/35.0W/1 Lamp	1	35.0	35	Lithonia Part No: EPANL 22 34L 40K Troffer/2x2ft/4000K	1	30.8	31	3,650
Mens Restroom	Troffer/T8 Fluorescent/17.0W/3 Lamp	1	48.1	48	Lithonia Part No: EPANL 22 34L 40K Troffer/2x2ft/4000K	1	30.8	31	3,650
Room 201	Troffer/T8 Fluorescent/17.0W/3 Lamp	21	48.1	1,010	Lithonia Part No: EPANL 22 34L 40K Troffer/2x2ft/4000K	21	30.8	647	3,650
Room 201	Troffer/T8 Fluorescent/32.0W/2 Lamp	2	62.0	124	Lithonia Part No: EPANL 24 40L 40K Troffer/2x4ft/4000K	2	38.9	39	3,650
Room 201	Wrap/T8 Fluorescent/32.0W/2 Lamp	3	62.0	186	Lithonia Part No: EPANL 22 34L 40K Troffer/2x2ft/4000K	3	30.8	92	3,650
Sanitation Main Area	Troffer/Light Emiting Diode/35.0W/1 Lamp	38	35.0	1,330	Lithonia Part No: EPANL 22 34L 40K Troffer/2x2ft/4000K	38	30.8	1,170	3,650
Sanitation Main Area	Troffer/T8 Fluorescent/17.0W/3 Lamp	48	48.1	2,309	Lithonia Part No: EPANL 22 34L 40K Troffer/2x2ft/4000K	48	30.8	1,478	3,650
Sanitation Offices	Troffer/T8 Fluorescent/17.0W/3 Lamp	40	48.1	1,924	Lithonia Part No: EPANL 22 34L 40K Troffer/2x2ft/4000K	40	30.8	1,232	3,650
Womens Restroom	Troffer/T8 Fluorescent/17.0W/3 Lamp	4	48.1	192	Lithonia Part No: EPANL 22 34L 40K Troffer/2x2ft/4000K	4	30.8	123	3,650
Total			482.6	7,447			316.1	5,028	

335 YAPHANK AVENUE YAPHANK, N.Y. 11980 (631) 852-4010 FAX (631) 852-4150

COUNTY OF SUFFOLK

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DARNELL TYSON, P.E.
ACTING COMMISSIONER

ERIC M. HOFMEISTER
DEPUTY COMMISSIONER

The cost of the proposed LED fixtures is $9,794.82 which is available on County contract. The estimated PSEG rebate for this project is $3,300. The estimated energy and cost savings is shown below.

Energy Usage

The following set of information evaluates your current energy usages and costs and compares that to the projected energy usage and costs your facility will see after the proposed lighting upgrade.

Annual Energy Usage

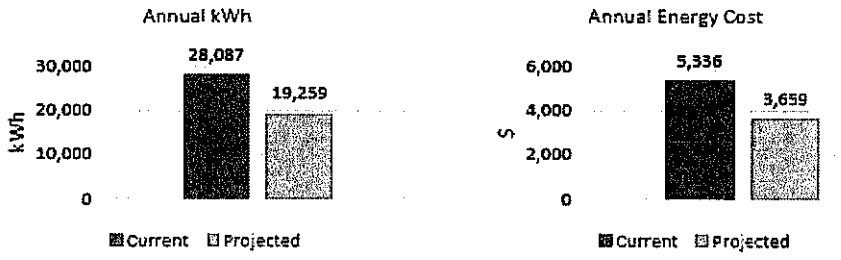
Current Usage (kWh)	Projected Usage (kWh)	Reduction	Current Cost	Projected Cost	Financial Savings	Percent Saved
28,087	19,259	31%	$5,336	$3,659	$1,677	31%

1. *Energy cost = $0.1900/kWh; Annual energy cost escalation = 0.00%*
2. *Energy costs are averaged over 10 year analysis period*
3. *Projected Usage (kWh) includes savings from controls if applicable*

Annual Energy Usage Reduction

Current Usage (kWh)	Projected Usage (kWh)	Reduction (kWh)	Reduction
28,087	19,259	8,828	31%

Energy Comparison



1. *Energy Cost = $0.1900/kWh; Annual energy cost escalation = 0.00%*
2. *Energy costs are averaged over 10 year analysis period*

JA:ba
cc: John Donovan, P.E., Chief Engineer, Sanitation
Craig Rhodes, Director of Buildings O&M
Jay Abbott, Special Projects Supervisor
Scott Sinckson, Special Projects Supervisor
Peggy Sutherland, Senior Energy Coordinator

335 YAPHANK AVENUE YAPHANK, N.Y. 11980 (631) 852-4010 FAX (631) 852-4150

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E., Chief Engineer
Facilities Engineering

FROM: Thomas Szumczyk
Assistant Mechanical Engineer

DATE: October 17, 2012

RE: CP 1664 – Energy Conservation – Various County Facilities
Truck Garage (C0342) New High Efficiency Roof Top Unit

This memo is to inform you that we are proceeding with the above referenced project.

Fleet Services is scheduled to move into the subject building as part of the consolidation effort to maximize space. As a result we are providing a high efficiency gas fired roof top unit for this area of the building. The unit will reduce the existing boiler load and will supply both heat and cooling throughout the year. The unit is effectively eligible for LIPA rebates because of its high efficiency which we would expect to see once the work is complete.

Attached for your signature is a requisition for Commercial Instrumentation Services and their proposal totaling the amount of $42.253.00. Should you have any questions please contact me.

TS/ba
Attachment
cc: James J. Ingenito, R.A., County Architect
Craig Rhodes, Director of Buildings Operations
Javed Ashraf, P.E., C.E.M., Principal Mechanical Engineer
Lew Johnson, R.A., Assistant County Architect
Thomas Szumczyk, Assistant Mechanical Engineer

335 YAPHANK AVENUE ■ YAPHANK, N.Y. 11980 ■ (631) 852-4225
FAX (631) 852-4246

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

VINCENT FALKOWSKI, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Keith Larsen, R.A.
Martin V. McMorrow, P.E.

FROM: Javed Ashraf, P.E., C.E.M., Principal Mechanical Engineer
Gilbert Hegermiller, Intern

DATE: August 7, 2013

RE: CP 1133 - Renovations to the Surrogate's Court Building Located in the Riverhead County Center, Riverhead, NY

Located at the northeastern corner of the Suffolk County Center Complex, the Surrogate's Court is a two floor 18,000 square foot building, constructed in 1955, that requires renovations including, but not limited to, improvements to the air conditioning and lighting systems. The Surrogate's Court building provides essential services to the County, handling all issues regarding wills and estates of the deceased, property of the deceased who had no will, guardianships and adoptions. In addition to housing the Courts the building also contains office space and the judges' chambers. As mentioned earlier, to keep this vital building's systems and interior current, an upgrade of the air conditioning systems and various other improvements are required. With regards to heating and cooling, the building is currently served by a hot water heating system in the winter and a chilled water system from the Power Plant in the summer.

Along with the changes in the air systems that will be made, the Surrogate's Court will also be undergoing extensive renovations to the interior of the building. The courtroom will have its ceiling redone and the building will receive new lighting throughout to further reduce energy consumption. Additionally, a new enclosed area will be added to the entryway on the north side of the building to create more space for people waiting to pass through security. The bathrooms will also be given a full renovation and a new unisex bathroom will be added. Another important update is that the building will have a fire sprinkler system and ADA doors installed. Other updates will also be made to remove asbestos that remains above several ceiling areas.

The renovations to the air conditioning systems are required because the old system is both inefficient and oversized wasting energy and money. The Surrogate's Court already has had one modern air system installed which serves the courtroom; however, two zones of the building are still served by older systems. In order to solve the problem of oversizing for the other two zones, a new cooling and heating load analysis was done for the entire building.

The analysis was based on dividing the building into the existing HVAC zones; One zone included the first floor combined with about 40% of the second floor, and the other zone included 60% of the second floor (see attached highlighted layout).

Recommendations:

From the load analysis performed it was found that the first zone, which is much larger and takes the brunt of the solar heat load, would require a forty ton AHU that operates at 20,000 CFM and the smaller zone could be ducted in to either the new 40 ton unit or the courtroom unit. Emtec Consultants suggested two units; however, we recommend that the judges' chambers (the smaller zone) are ducted into one of these units to meet the peak load for heating and cooling that the environment places on the buildings. The older unit that served the judges' chambers shall be removed, as it is no longer needed. The main factor behind these cooling loads is that the exterior of the building is mostly composed of glass, a large portion of which faces south causing the building to be exposed to direct sunlight most of the year. This large southerly facing glass exterior is entirely included in the first floor air zone which is what causes the large discrepancy in load size.

The installation of a new air conditioning system will greatly increase the overall efficiency of the building and will provide a solution to the current problem of oversizing. From the heating requirements outlined by the load analysis, we have found that the building will require reheat coils. Emtec has recommended that only the outer spaces should have reheat coils in the ducts; however, we advise that all of the spaces, both perimeter and interior, receive reheat due to the fact that the inner spaces also have the potential to become quite cold in the winter.

It is recommended that variable frequency drives be installed for the for the air conditioning unit that is to be put in place. The installation of variable frequency drives will reduce the energy consumption of the Surrogate Court. The savings in energy will eventually compensate for the initial cost of installing the drives. The replacement of the old systems will also save the County money annually due to the increased electrical efficiency of the AC systems.

The control systems for the units to be installed should be taken out of the scope of work because consistent control systems with the currently installed system are desired. Although the control systems will not be in the scope of work, Emtec should provide a layout of the control systems showing which are necessary and where they are to be installed. Along with the replacement of the HVAC system the ductwork will also be cleaned and replaced where necessary.

It is recommended that the improvements to the Surrogate's Court building are made as they will improve the building as a whole making it a more efficient and modern structure.

JA:GH:ba
Attachment
cc: Michael J. Monaghan, P.E., Chief Engineer
James J. Ingenito, R.A., County Architect

PART 5 - MECHANICAL SYSTEMS

A. Summary

The Surrogates Court is a section of the larger County Center building in Riverhead, New York. Originally designed in 1955, the Surrogates Court section consists of two above grade floors with approximately 17,000 square feet total floor area. The wall construction is curtain wall with vision and spandrel panels on three of the four sides of the building. The southwest exterior wall is masonry construction and the roof is a built up system. The existing mechanical system consists of a 25-ton rooftop unit (RTU) serving the courtroom, a 7.5-ton RTU serving the judge's chambers and a large constant volume chilled water modular air handling unit (AHU) located in the north wing penthouse serving the remainder of Surrogates Court.

There are energy code implications related to the existing rooftop unit systems which is described in detail in section C2. The bottom line being that if one or both of the rooftop units remain, controls would be required to prevent simultaneous heating and cooling of the same air stream. Adding these controls is an imperfect solution and would likely cause occupant discomfort in the judge's chambers. That is part of the reason why it is recommended to change out the judge's chambers rooftop unit.

The three system options investigated for replacement are as follows. A detailed description is in section D1.

- Base Option - Replace the existing AHU with a variable air volume (VAV) AHU and add VAV boxes with reheat for zone temperature control. The 25-ton RTU serving the courtroom will remain and the 7.5-ton RTU serving the judge's chamber will be replaced with a VAV RTU with VAV boxes for zone temperature control. All new and existing equipment will be controlled through direct digital controls (DDC) and connected to the existing building management system.

- Option #1 - Remove the existing two RTU's and AHU. Replace them with an AHU capable of serving the entire Surrogate's Court. Add VAV boxes with reheat for zone temperature control. All new and existing equipment will be DDC controlled and connected to the existing building management system.

- Option #2 - Remove the existing two RTU's and AHU. Replace them with a variable refrigerant flow (VRF) system and a dedicated outdoor air (DOAS) system. The VRF system will provide heating or cooling to zones through multiple indoor units serving multiple zones connected with refrigerant piping and control wiring to an outdoor unit mounted on the roof. Two outdoor systems would be provided, one serving each floor. This option will also consist of a perimeter heating system with concealed fan coil units and hot water coils to supplement the VRF heating. All new and existing equipment will be DDC controlled and connected to the existing building management system.

All of the options include a temporary air conditioning component as well as Mechanical installation cost estimates for the options. Detailed cost estimate breakouts can be found in Appendix D.

Estimated annual energy costs are as follows. Detailed energy cost breakouts can be found in Appendix C.

- Base Option - $25,114
- Option #1 - $23,657
- Option #2 - $24,695

Our recommendation is to implement the base option. This option has the lowest initial cost due to the reuse of the courtroom RTU. Further, the energy savings realized under option #1 does not make up for its increased first cost although there are maintenance benefits with option #1. Detailed analysis can be found in section D2.

B. Base Design Criteria

1. Applicable Codes, Guidelines and Standards.
   a. The mechanical systems will be designed in accordance with the following codes, guidelines, and standards:
   b. Building Code of New York State - 2010 (2006 IBC)
   c. Mechanical Code of New York State – 2010 (2006 IMC)
   d. Energy Conservation Construction Code of New York State - 2010 (2006 IEC)
   e. National Fire Protection Association (NFPA) guidelines and standards
   f. Energy Standard for Buildings Except Low-rise Residential Buildings (ANSI/ASHRAE/IESNA 90.1-2007)
   g. Ventilation for Acceptable Indoor Air Quality – ASHRAE 62.1 2007

2. Outdoor Design Conditions
   a. Summer:
      1) Dry-Bulb Temperature: 88.4°F
      2) Wet-Bulb Temperature: 73.4°F
         a) Based on 0.4% dry-bulb and mean coincident wet-bulb temperature for Islip long Island MacArthur Airport, NY as published by 2009 ASHRAE Fundamentals.

   b. Winter:
      1) Dry-Bulb Temperature: 10.6°F
         a) Based on 99.6% dry-bulb conditions for Islip long Island MacArthur Airport, NY as published by 2009 ASHRAE Fundamentals.

3. Indoor Design Conditions
   a. Cooling:
      1) 75°F
         a) Based on Energy Conservation Construction Code minimum design temperature for cooling.
   b. Heating:
      1) 72°F
         a) Based on Energy Conservation Construction Code maximum design temperature for heating.

4. Heating and Cooling Loads
   a. Electrical Heat Gain
      1) Offices:
         a) Lighting: 1.1 watts per sq ft
         b) Equipment: 1.0 watts per sq ft

2) Corridors & Storage:
   a) Lighting: 0.5 watts per sq ft
   b) Equipment: 0.25 watts per sq ft

3) Courtroom:
   a) Lighting: 1.9 watts per sq ft
   b) Equipment: 0.25 watts per sq ft

4) Judges Chambers:
   a) Lighting: 1.3 watts per sq ft
   b) Equipment: 0.5 watts per sq ft

b. Occupancy

1) The occupancy based on Ashrae 62.1 2007:
   a) Offices: 5 people per 1000 square feet
   b) Conference Rooms: 50 people per 1000 square feet
   c) Courtroom: 70 people per 1000 square feet
   d) Judge's Chambers: 50 people per 1000 square feet

2) The occupancy heat rejection will be based on 2009 ASHRAE Handbook of Fundamentals, Chapter 18, page 18.4, Table 1.
   a) Offices, Conference Rooms, Courtrooms & Judge's Chambers
      Sensible: 245 Btuh/person
      Latent: 155 Btuh/person

c. Infiltration

1) The building shall be positively pressurized relative to exterior ambient conditions.

5. Ventilation Rates
   a. The minimum ventilation (outdoor air) rates to be in compliance with ASHRAE 62.1 2007, will be as follows:

1) Offices: 5 cfm/person + 0.06 cfm/sf.
2) Conference Rooms: 5 cfm/person + 0.06 cfm/sf.
3) Courtrooms: 5 cfm/person + 0.06 cfm/sf.
4) Judge's Chambers: 5 cfm/person + 0.06 cfm/sf.
5) Storage: 0.12 cfm/sf.
6) Corridor: 0.06 cfm/sf.

a. Building Envelope

a. Building Envelope U factors and SHGCs based on existing architectural drawings and 2010 Energy Conservation Construction Code.

1) Roofs: U = 0.064 Btu/FT²-°F
2) Curtain Wall: U = 0.049 Btu/FT²-°F
3) Mass Wall: U = 0.272 Btu/ FT²-°F
4) Vision Glass: U = 0.50 Btu/FT²-°F; SHGC = 0.6

C. Existing Systems Descriptions

1. Existing Systems:
   a. Air Handler:
      1) Type - Constant volume modular air handler with hot water pre-heat coil, mixing section, filter section, chilled water coil, supply fan and hot water re-heat coil. Hot water re-heat coils are in ductwork for individual zone control. Return air is with return fan through ceiling plenum.
      2) Location - North wing penthouse
      3) Service - HVAC for Surrogate Court Building less the Courtroom and Judges Chambers.
      4) Age - Original to building
      5) Capacity - 28,400 CFM
      6) Controls - Pneumatic actuators on dampers and valves. Two way valve controls flow to chilled water coil. Three way valve and circulator pump controls flow to each pre-heat and re-heat coil.
      7) Condition - Working
      8) Planned Use - Demolish

   b. Return Fan:
      1) Make/Model/Type - Twin City Fan and Blower inline vaneaxial fan model TCVS size 36B4 arrangement 9.
      2) Age - approximately two years old
      3) Capacity - 18,445 at 0.5" ESP
      4) Electrical - 7.5 HP motor w/ VFD
      5) Condition - Excellent, however it is in a poor duct configuration with excessive system effect at the fan inlet.
      6) Planned Use - See proposed options.

   c. Courtroom Rooftop Unit:
      1) Make/Model/Type - Carrier model 50PG-M28-D-50-M cooling only package rooftop unit. Two hot water re-heat coils are in ductwork each with individual control. Return air is through ceiling plenum.

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

DARNELL TYSON, P.E.
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E., Chief Engineer
Facilities Engineering

FROM: Javed Ashraf, P.E., C.E.M., C.B.C.P.
Principal Mechanical Engineer

DATE: February 1, 2016

RE: 1664.322 – Energy Conservation at Various County Buildings
Installation of gas fired high efficiency hot water condensing boilers at the Old Infirmary Building, Yaphank, NY (C0014)
DC XXXX-16 – All Service Maintenance

The Old Infirmary Building is heated by two 2.0 million Btuh cast iron sectional boilers. These boilers were installed in 2005. Both boilers were designed to handle the peak design load of the building and are way over-sized and inefficient under part load conditions. These boilers are 70% efficient and because of the size have tremendous off-cycle losses.

One of the boilers recently cracked and is out of service. The repair cost to replace four cracked sections of the boiler is estimated at $40,000.00.

DPW Facilities Engineering evaluated the existing heating system and has concluded that the replacing the existing cracked boiler with two 1.0 million Btuh high efficiency gas fired condensing boilers with efficiency of over 92% will improve operating efficiency and reduce energy and operating costs.

The cost/benefit analysis is shown in the table below.

Existing Gas Consumption		53152	therms
Existing Boiler Efficiency		70%	
Total thermal output		3,720,640,000	Btu/year
New Boiler Efficiency		92%	
Estimated gas usage		40,442	therms
Estimated gas savings		12,710	therms
Estimated gas cost savings	$	10,309	per year
Repair Cost for the existing boiler	$	40,000	
Total first year cost savings	$	50,309	
Estimated Project Cost	$	195,867	
National Grid Rebate	$	16,000	
Project Cost After Rebate	$	179,867	
Simple Payback		3.58	years

The proposed project cost of $195,867.00 is reasonable and fair and should be paid from CP1664.322.

JA:ba
cc: Phil Berdolt, Deputy Commissioner DPW
Craig Rhodes, Director of Buildings O&M
Bob Frevele, Assistant Director of Buildings O&M
Jay Abbott, Special Project Coordinator

COUNTY OF SUFFOLK

STEVE LEVY
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

JAMES PETERMAN, P.E.
CHIEF DEPUTY COMMISSIONER

August 15, 2011

Re: Installation of two AERCO Modulex MLX-909 boilers at Board of Elections in Yaphank

Project shall replace existing 3,791,000 Btu/h Weil McLain boiler and tankless heater (9 gpm at 100°F rise) with two (2) AERCO Modulex 909,000 Btu/h boilers and one (1) A.O. Smith BTH-80 gas-fired water heater. Project shall use existing three (3) pumps and 8 in. supply and return headers.

Contractor to supply and install two (2) AERCO Modulex 909 cast aluminum condensing boilers with a 173 gpm hydraulic separator.
Contractor to supply and install one of the three following boiler connections to achieve decoupling of the boilers from the building loop. Refer to AERCO manual GF-115-P-H: either primary-secondary loop, hydraulic separators, or high-efficiency plate-to-frame heat exchanger.
Contractor to install boiler with CSD-1 assembly from manufacturer and a secondary low-water cut-off.
Contractor to supply and install 120 gallon, floor mounted, diaphragm expansion tank.
Contractor to supply and install two (2) primary circulator pumps specified by AERCO supplier.

Contractor to use existing pumps for system operation. (option: supply and install new hot water pumps; reheat 1 hp, 110 gpm, and 23 ft.; preheat 1/4 hp, 54 gpm, and 11 ft.; storage 10 hp, 300 gpm, and 70 ft.).

Contractor to connect existing 4" natural gas line to 1-1/2" boiler inlets and ½" water heater inlet. Gas connection shall be on right side of the boilers. Contractor to supply and install three (2) 7" w.c. gas regulators vented outside. The regulators shall be installed within 2 feet of each boiler or water heater inlet. Contractor shall supply and install gas meter set to equipment.

Hot water piping shall be on left side connections of boilers. Piping shall be installed for water heater. New hot water piping shall be insulated.

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FAX (631) 852-4150

Contractor to supply and install 8” CPVC common air intake with 6” connectors to each boiler. Contractor to run 10” CPVC through existing louvre for common exhaust of all equipment. Contractor to supply and install CPVC to common exhaust from 6” boiler outlets and 2” water heater outlet. The exhaust shall be schedule 40 or thicker, single-wall, and uninsulated CPVC. Piping from outdoors to boiler inlet or from equipment to stack shall each be less than 100 equivalent feet of pipe. Air intake and exhaust shall be from rear of Modulex boilers.

Contractor to supply and install condensate neutralizer sized for all equipment with 3/8” pitch per foot of run to floor drain.

Contractor shall supply and install AERCO E8 boiler control. Power wiring to be done by County.

Contractor to supply shop drawings for mark-up before beginning any work. Contractor to supply all welders’ certifications and welding methods before any welding on pipes. Contractor to obtain a hot working permit from the County before beginning and welding work. Contractor to supply as-built drawings upon completion of work. Contractor to supply O&M manuals and training to building operations staff.

SH

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

VINCENT FALKOWSKI, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E., LEED AP
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: December 23, 2013

RE: CP 1664.320 - Energy Conservation at Various County Buildings
H. Lee Dennison Building (C0140)
Replace 450-ton Electric Chiller with Three 200-ton Gas Fired Yazaki Absorbers

The H. Lee Dennison Building is a 238,000 square ft. building whose air conditioning needs are satisfied by a chilled water plant consisting of three York Centrifugal Electric Chillers. The 450-ton electric chiller, the largest of the three chilled water producing equipment, is almost 25 years old, at the end of its useful life and needs to be replaced before it fails entirely. The Department of Public Works considered various options and concluded that replacing the electric chiller with three 200 ton gas-fired absorbers will reduce our operating cost by approximately $106,000 a year based on current occupancy and use. Installing the gas absorbers will help offset 400-kW in electrical demand thus reducing the size of the emergency generator required for the building.

The design documents for the emergency generator replacement are currently being prepared by a consultant. The proposed Capital cost savings by installing a 1000-kW generator instead of a 1600-kW generator is approximately $400,000.

The proposed installation cost for the absorbers, including the capital cost reduction for the emergency generator and utility rebate, is $841,522. The proposed project will have a life cycle cost savings (LCS) of approximately $1,005,875 over 25-years.

Installed Cost $	$	1,491,522	Simple Payback (years)		7.93
Cost Savings from Generator $	$	(400,000)	Savings to investment ratio (SIR)		2.20
National Grid Rebate $	$	(250,000)	Life-cycle Cost Savings (LCS)	$	1,005,875
Net Project Cost $	$	841,522	Life Expectency (yrs)		25
Annual Energy Cost Savings	$	106,092	Discount rate		3%

The cost for power wiring new chillers shall be paid from CP 1664.320. It is requested that the attached purchase requisition for the amount of $51,000.00 be approved.

JA:ba
Attachments
cc: Craig Rhodes, Director of Buildings O&M
Jay Abbott, Special Projects Supervisor
Bob Frevele, Asst. Director of Buildings O&M
Judd Classie, Maintenance Mechanic IV

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

DARNELL TYSON, P.E.
DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

THOMAS G. VAUGHN
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E., LEED AP
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: June 12, 2017

RE: CP 1664.320 - Energy Conservation @ Various County Facilities
Install High-efficiency Boiler at the C0050
DCXXXX-17

The existing hot water gas fired boilers is over 30 years old and in very poor condition with two of the seven modules out of service. The cost to repair two modules is estimated to be approximately $10,000.00. The units are past the life expectancy and should be replaced before the next heating season.

The contractor cost to replace existing boilers is approximately $126,171, which could increase if some of the work needs to be performed during off hours.

The County has decided to replace standard efficiency (80%) boilers, which is in poor condition with a high efficiency (95%) hot water gas fired boilers utilizing in-house labor from Buildings O&M. The total cost to do this project in house is $89,444.00; please see the cost breakdown below:

Material & Contractor Labor for boilers:	$69,444.00
In House Labor to Install:	$20,000.00
Total:	$89,444.00

It is requested the overtime for the in-house labor be approved as the County will save $36,727.00 in project costs by utilizing in-house labor. The estimated annual energy and maintenance cost savings is $10,306.

Cost	$	89,444	Simple Payback (years)		8.7
Annual Energy Savings (therms)		4,316	Savings to investment ratio (SIR)		1.6
Net Energy Savings (mmbtu)		432	Life-cycle Cost Savings (LCS)	$	50,612.95
Maintenance Cost Savings	$	7,500.00	Equipment Life (Years)		20
Annual Energy Cost Savings $	$	10,306	Discount Rate (%)		4%

JA:ba
cc: Gilbert Anderson, P.E., Commissioner
Craig Rhodes, Director, Buildings O&M
Robert Frevele, Asst. Director, Buildings O&M
Judd Classie, Building Maintenance Manager

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FAX (631) 852-4150

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

GILBERT ANDERSON, P.E.
COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, LEED, P.E.
Chief Engineer, Facilities Engineering

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: January 13, 2012

RE: CP 1664 – Energy Conservation at Various County Facilities
Replace Condensing Boiler – Dept. of Labor (C0015), Hauppauge NY

Building 15 in North County Complex is a 12,000 square foot facility used as office space for the Department of Labor. It is proposed that a boiler replacement be done in-house by County term contractors with a scope of work proposed below.

The building has a cast-iron sectional boiler. The boiler must fire intermittently with a cycling time of 2 minutes during peak heating season. Due to age and cycling the plant operates at low efficiency. A hot water coil circulates keeping the boiler firing year-long. The scope of this project is to renovate the boiler plant and reduce operating cost of the buildings. Replacing the boiler with an AERCO Benchmark 1000 condensing boiler will reduce fuel consumption. Replacing the water heater with a 40 gallon electric domestic water heater will further reduce costs because the boiler will be turned off during the cooling season. A timer will also be installed to allow the water heater to turn off during the night.

The design heating demand of the building is 507 MBH and the current boiler is sized at 1,595 MBH. The BMK 1.0 has a net output of 870-960 MBH. The cast-iron sectional boiler will be abandoned in place because the rope gasket contains asbestos, abatement of which will be done at a later date. All valves, fittings, pipes, and flue connections will be disconnected from the existing boiler. The existing hot water pump and fuel burner will be returned to Buildings O&M for parts. The boiler plant will be provided with new equipment. Two inline centrifugal pumps putting out 50GPM at 45TDH will be installed. A floor-mounted expansion tank and new valves will be installed. The existing stand-by pump will remain dedicated to the chiller. All new piping shall be insulated.

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The energy cost savings in Table 1 is approximately $12,509 annually 70% of an estimated bill of $17,870. The savings potential is high because not only do we save energy on the efficiency of a condensing boiler, we also save money on the reduced price per Btu of natural gas. The total proposed cost of the project is $138,000 in a proposal from Boilermatic.

The building life-cycle cost in Table 2 was analyzed. The boiler can last perhaps another seven years but with higher O&M cost and at least one major overhaul, at which time it would have to be replaced. The 20 year life-cycle cost with repair and replacement is $674,722. Replacing the boiler now will reduce that cost to $393,386 with a simple payback of 6 years. The life-cycle emissions reduction would be approximately 1,060,000 kg of CO2 or 1,190 tons. The project is cost efficient and green. It should be carried out with the available funds in CP 1664.318.

JA/SH/rc
attachment
Cc: Gilbert Anderson, P.E., Commissioner
Craig Rhodes, Director, Buildings O&M
Robert Frevele, Assistant Director, Buildings O&M
Jay Abbott, Special Projects Supervisor
Peter Vadax, Maintenance Mechanic IV, Buildings O&M

Table 1 - Building 15 Boiler Cost Analysis – Switching from Cast-iron Sectional to High-efficiency Condensing Saves $9,170 or 51% of Fuel Cost on Efficiency. Switching from Oil to Gas Saves $3,339 or an additional 19% of Fuel Cost on Utility Price.

	Heating Consum. (MMBtu)	Gallons of Oil Used by Cast-iron Boiler	Equivalent Gallons of Oil Used by Condensing Boiler	Therms of Natural Gas Used by Condensing Boiler	Cast-iron Boiler Cost at $2.50 per gallon	Equivalent Cost of Oil for Condensing Boiler	Condensing Boiler Cost at $1.10 per Therm Natural Gas
Jan	80	1,173	736	1,031	$ 2,931.37	$ 1,840.31	$ 1,133.63
Feb	70	1,022	647	905	$ 2,555.57	$ 1,616.59	$ 995.82
Mar	57	948	552	773	$ 2,369.93	$ 1,379.65	$ 849.87
Apr	29	567	0	0	$ 1,417.34	$ -	$ -
May	14	361	0	0	$ 902.03	$ -	$ -
Jun	0	161	0	0	$ 401.52	$ -	$ -
Jul	0	159	0	0	$ 398.57	$ -	$ -
Aug	0	166	0	0	$ 415.37	$ -	$ -
Sep	3	197	112	157	$ 493.05	$ 280.14	$ 172.57
Oct	24	507	288	403	$ 1,266.51	$ 719.61	$ 443.28
Nov	49	800	482	674	$ 1,999.35	$ 1,204.43	$ 741.93
Dec	70	1,086	662	927	$ 2,715.86	$ 1,655.54	$ 1,019.81
	396	7,147	3,479	4,870	$17,866.47	$ 8,696.28	$ 5,356.91

Building 15 Weather Data Analysis

Max sensible heat gain [Btuh]	379	09/Jun/2008 14	Date occurred
Max heat loss [Btuh]	-359	04/Jan/2008 01	Date occurred
Minimum outside air [cfm]	**250**		
Design supply [cfm]	**11,071**		

Table 2 – NIST BLCC 5.3-10: Comparative Analysis – Life-cycle Cost Analysis

Using Escalation Rates from BLCC5 Program and Estimated O&M Costs

Consistent with Federal Life Cycle Cost Methodology and Procedures, 10 CFR, Part 436, Subpart A

Base Case: Conventional Boiler

Alternative: Condensing Boiler

General Information

File Name:	C:\Program Files (x86)\BLCC5\projects\Building 15.xml
Date of Study:	Wed Jan 11 15:39:36 EST 2012
Project Name:	Building 15
Project Location:	New York
Analysis Type:	FEMP Analysis, Energy Project
Analyst:	Sean Heaney
Comment	Conversion to Gas and condensing Boiler
Base Date:	April 1, 2010
Service Date:	April 1, 2010
Study Period:	20 years 0 months(April 1, 2010 through March 31, 2030)
Discount Rate:	3%
Discounting Convention:	End-of-Year

Comparison of Present-Value Costs

PV Life-Cycle Cost

	Base Case	Alternative	Savings from Alternative
Initial Investment Costs:			
Capital Requirements as of Base Date	$0	$138,000	-$138,000
Future Costs:			
Energy Consumption Costs	$359,595	$91,551	$268,045
Energy Demand Charges	$0	$0	$0
Energy Utility Rebates	$0	$0	$0
Water Costs	$0	$0	$0
Recurring and Non-Recurring OM&R Costs	$227,953	$163,835	$64,118
Capital Replacements	$87,173	$0	$87,173
Residual Value at End of Study Period	$0	$0	$0
Subtotal (for Future Cost Items)	$674,722	$255,386	$419,336
Total PV Life-Cycle Cost	$674,722	$393,386	$281,336

Net Savings from Alternative Compared with Base Case

PV of Non-Investment Savings	$332,163
- Increased Total Investment	$50,827
Net Savings	$281,336

Savings-to-Investment Ratio (SIR)

SIR = 6.54

Adjusted Internal Rate of Return

AIRR = 13.14%

Payback Period

Estimated Years to Payback (from beginning of Service Period)

Simple Payback occurs in year 6

Discounted Payback occurs in year 6

Energy Savings Summary

Energy Savings Summary (in stated units)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Distillate Fuel Oil (#1, #2)	7,147.0 Gal	0.0 Gal	7,147.0 Gal	142,920.4 Gal
Natural Gas	0.0 Therm	4,870.0 Therm	-4,870.0 Therm	-97,386.7 Therm

Energy Savings Summary (in MBtu)

Energy Type	-----Average Base Case	Annual Alternative	Consumption----- Savings	Life-Cycle Savings
Distillate Fuel Oil (#1, #2)	1,084.7 MBtu	0.0 MBtu	1,084.7 MBtu	21,690.6 MBtu
Natural Gas	0.0 MBtu	487.0 MBtu	-487.0 MBtu	-9,738.7 MBtu

Emissions Reduction Summary

Energy Type	-----Average Base Case	Annual Alternative	Emissions----- Reduction	Life-Cycle Reduction
Distillate Fuel Oil (#1, #2)				
CO2	78,722.49 kg	0.00 kg	78,722.49 kg	1,574,234.29 kg
SO2	563.12 kg	0.00 kg	563.12 kg	11,260.88 kg
NOx	70.96 kg	0.00 kg	70.96 kg	1,419.05 kg
Natural Gas				
CO2	0.00 kg	25,725.06 kg	-25,725.06 kg	-514,430.83 kg
SO2	0.00 kg	207.61 kg	-207.61 kg	-4,151.62 kg
NOx	0.00 kg	3.60 kg	-3.60 kg	-71.93 kg
Total:				
CO2	78,722.49 kg	25,725.06 kg	52,997.43 kg	1,059,803.46 kg
SO2	563.12 kg	207.61 kg	355.51 kg	7,109.26 kg
NOx	70.96 kg	3.60 kg	67.37 kg	1,347.12 kg

COUNTY OF SUFFOLK

STEVE LEVY
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

JAMES PETERMAN, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

LOUIS CALDERONE
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E.
Chief Engineer

FROM: Sean Heaney
Engineering Intern ARRA

DATE: January 10, 2011

RE: Supply Labor and Materials to Remove and Replace Oil Boiler with Gas-Fired Condensing Boiler and Gas-Fired Equipment at C0017

A. Existing conditions

A field survey was taken on December 30th at the Department of Labor, Building 17 in Hauppauge, to evaluate the condition of the boiler plant after one of the boilers failed. Building 17 consists of the original Children's Court building and subsequent additions to it. It is a single-floor 25,000 square foot facility with a cellar. The first floor is used as office space and the cellar is used to keep storage. The facility is connected to Buildings 15 and 803 but each is heated and cooled independently. A back up boiler is now in operation to heat the office area in Building 17.

The boiler plant consists of two Power Flame burners running on #2 oil heating water in H.B Smith boilers capable of transferring 2.3 MMBtu each. The hot water pumps, one in operation and one serving as a back-up, circulate 195 gpm to 114 Nesbitt unit ventilators and two Trane air handlers. The total heating capacity of the ventilators and the air handlers is approximately 1.5 MMBtu. The estimated heat loss from the building envelope is 1.0 MMBtu.

The existing boiler is 26 years old and in average condition. There is no longer a back-up boiler because one boiler has failed. The H.B. Smith boiler is oversized for this application and operates inefficiently at part-load because of on/off cycling and heat dissipation.

B. Proposed Improvements

It is proposed that the failed boiler be replaced with an AERCO Benchmark 1.5 MMBtu condensing boiler. The AERCO boiler is sized appropriately for the 1.5 MMBtu heating capacity of the ventilators

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and air handlers. A gas burner and gas-fired water heater, supplied by the County from C0016, can be used to replace the oil burner on the existing boiler and supplement the indirect-fired water heater. If the gas-fired water heater from C0016 is not serviceable, the contractor will supply at cost to the County an A.O Smith 40 gallon 40 MBtu gas-fired water heater.

The AERCO boiler operates more efficiently at part-load and savings will be greater on days of mild weather and it has the available capacity to deal with design days. The indirect-fired water heater requires the boiler to be running intermittently. Installing a separate gas-fired water heater will allow the burner to be off during the summer months. Finally, using gas in the existing boiler will convert all the boiler room equipment to gas service which is less costly and cleaner burning.

C. Estimated Savings Calculations

An energy model was prepared to compare the operating cost of the existing plant to the proposed plant. The model is shown in Tables 1 through 4 in the Appendix. The existing plant uses 2892 MMBtu annually. The proposed plant will use 1890 MMBtu saving $21,679 in operating costs.

The total cost of the labor and materials is $108,000.

The simple payback of the project is 5 years. Assuming a twenty-five (25) year equipment life, and 3% discount rate, life-cycle cost savings (LCS) is estimated to be $269,494.

The labor and materials will be covered in part by the Department of Buildings Design and Construction, $78,000 from CP 1664, and in part by Buildings Maintenance and Operations, $30,000 from CP 1737.

cc: Lou Calderone, Deputy Commissioner
Craig Rhodes, Director of Buildings Operations and Maintenence
Javed Ashraf, P.E., C.E.M., Principal Mechanical Engineer
Jay Abbot, Special Projects Supervisor
Harry Swanson, Senior Energy Coordinator

Appendix – Estimated Savings Calculation Model

Table 1 - Existing Boiler Plant

Annual Table									
Hours									
Avg. Bin Temo. (F)	MCWB (F)	OA Air %	RA %	Tmix Air (F)	Total CFM	Supply Air Temp. (F)	Reheat Required (Btuh)	Boiler Efficiency	Total Fuel Usage (MMBtu)
57	52.2	20%	80%	73.00	16,226	82	157,538	70%	171.5
52	47.5	20%	80%	72.00	16,226	85	233,416	70%	266.8
47	42.7	20%	80%	71.00	16,226	89	309,294	70%	346.4
42	38.0	20%	80%	70.00	16,226	92	385,172	75%	416.0
37	33.2	20%	80%	69.00	16,226	95	461,050	75%	459.2
32	28.7	20%	80%	68.00	16,226	99	536,928	75%	426.0
27	23.8	20%	80%	67.00	16,226	102	612,806	75%	318.7
22	19.3	20%	80%	66.00	16,226	105	688,684	75%	240.6
17	14.8	20%	80%	65.00	16,226	109	764,562	80%	135.7
12	10.4	20%	80%	64.00	16,226	112	840,440	80%	70.4
7	5.9	20%	80%	63.00	16,226	115	916,318	80%	29.8
2	1.1	20%	80%	62.00	16,226	119	992,196	80%	9.9
-3	-2.9	20%	80%	61.00	16,226	122	1,068,074	80%	1.3
-8	-6.6	20%	80%	60.00	16,226	125	1,143,952	80%	0.0
Total									2892

Table 2 - Proposed During Occupied Hours

Annual Table									
Hours									
Avg. Bin Temo. (F)	MCWB (F)	OA Air %	RA %	Tmix Air (F)	Total CFM	Supply Air Temp. (F)	Reheat Required (Btuh)	Condensing Boiler Efficiency	Total Fuel Usage (MMBtu)
57	52.2	20%	80%	73.00	16,226	82	157,538	93%	75.3
52	47.5	20%	80%	72.00	16,226	85	233,416	93%	117.1
47	42.7	20%	80%	71.00	16,226	89	309,294	92%	153.8
42	38.0	20%	80%	70.00	16,226	92	385,172	90%	202.2
37	33.2	20%	80%	69.00	16,226	95	461,050	90%	223.2
32	28.7	20%	80%	68.00	16,226	99	536,928	90%	207.1
27	23.8	20%	80%	67.00	16,226	102	612,806	88%	158.4
22	19.3	20%	80%	66.00	16,226	105	688,684	88%	119.6
17	14.8	20%	80%	65.00	16,226	109	764,562	88%	72.0
12	10.4	20%	80%	64.00	16,226	112	840,440	88%	37.3
7	5.9	20%	80%	63.00	16,226	115	916,318	86%	16.2
2	1.1	20%	80%	62.00	16,226	119	992,196	86%	5.4
-3	-2.9	20%	80%	61.00	16,226	122	1,068,074	86%	0.7
-8	-6.6	20%	80%	60.00	16,226	125	1,143,952	86%	0.0
									1388

Table 3 - Proposed During Unoccupied Hours

Annual Table									
Hours									
Avg. Bin Temo. (F)	MCWB (F)	OA Air %	RA %	Tmix Air (F)	Total CFM	Supply Air Temp. (F)	Reheat Required (Btuh)	Condensing Boiler Efficiency	Total Fuel Usage (MMBtu)
57	52.2	20%	80%	73.00	16,226	70	0	93%	0.0
52	47.5	20%	80%	72.00	16,226	74	29,052	93%	10.4
47	42.7	20%	80%	71.00	16,226	77	104,930	92%	37.3
42	38.0	20%	80%	70.00	16,226	80	180,808	90%	67.8
37	33.2	20%	80%	69.00	16,226	84	256,686	90%	88.8
32	28.7	20%	80%	68.00	16,226	87	332,564	90%	91.6
27	23.8	20%	80%	67.00	16,226	90	408,442	88%	75.4
22	19.3	20%	80%	66.00	16,226	94	484,320	88%	60.1
17	14.8	20%	80%	65.00	16,226	97	560,198	88%	37.7
12	10.4	20%	80%	64.00	16,226	100	636,076	88%	20.2
7	5.9	20%	80%	63.00	16,226	104	711,954	86%	9.0
2	1.1	20%	80%	62.00	16,226	107	787,832	86%	3.1
-3	-2.9	20%	80%	61.00	16,226	110	863,710	86%	0.4
-8	-6.6	20%	80%	60.00	16,226	114	939,588	86%	0.0
									502

Table 4 - Proposed Savings Calculations

Installed Cost $	$108,000	Simple Payback (years)	5.0
Annual Cost Savings $	$21,679	Savings to investment ratio (SIR)	3.50
Annual Energy Savings (mmbtu)	1,002	Life Cycle Cost Savings (LCS)	$ 269,494
Annual Maintenance Cost Svgs $	1,000	Life of Equipment (years)	25
		Discount rate %	3%

Replace existing boiler with condensing gas fired boiler at Bldg. CO-57

Area Served - Bldg. CO-57 (proposed case)	Proposed				
Min % Outside Air	20%	Uwall	0.1392	Btu/hr.sq.ft.F	
Min % Outside Air in Winter	20%	Uglass dp	0.58	Btu/hr.sq.ft.F	
Min Outside Air Flow	8335	Uglass sp	0.8	Btu/hr.sq.ft.F	
Min Outside Air Flow in Winter	8335	Uroof	0.100	Btu/hr.sq.ft.F	
Room Temperature (occupied)	72	Lighting	1.75	watt/sq. ft	
Room Relative Humidity (RH %)	50%	Office Eqpt.	0.5	watt/sq. ft	
Room Temperature (unoccupied)	85	Sen. Gain	250	Btu/hr/people	
Room Enthalpy (Hr) Btu/lb	25.6	Lat. Gain	200	Btu/hr/people	
Room Humidity Ratio (grains/lb)	53.3	# of people	83		
Design Supply Air Temperature	55	Infiltration	0.10	cfm/sq. ft	354
Design Air Enthalpy (Hs) Btu/lb	23.4	Misc. Eqpt.	0.5	W/sq.ft.	
Occupied Hours per week	168	Wall Area	11,979	sq. ft	
Unoccupied Hours per week	0	D.P Glass	2620	sq. ft	
Total CFM	41,673	S.P. Glass	0	sq.ft	
Distribution Efficiency	90%	Roof Area	16,534	sq. ft	
Boiler Efficiency		Floor Area	3,477	sq. ft	

Return Air Temperature 77 Average Room Conditions 72 50% RH
Relative Humidity RA 60%

Annual Table												$ 1.90
Hours												per therm
Avg. Bin Temo. (F)	MCWB (F)	Total obs hours	OA Air %	RA %	Tmix Air (F)	Total CFM	Supply Air Temp. (F)	Reheat Required (Btuh)	Boiler Efficiency	Total Fuel Usage (MMBtu)	Total Fuel Usage for heating (therms)	Total Fuel Cost $
52	47.5	800	20%	80%	72.00	3,477	74	7,510	67%	9.0	89.7	$ 170
47	42.7	784	20%	80%	71.00	3,477	74	11,265	67%	13.2	131.8	$ 250
42	38.0	810	20%	80%	70.00	3,477	76	22,531	70%	26.1	260.7	$ 495
37	33.2	747	20%	80%	69.00	3,477	76	26,286	70%	28.1	280.5	$ 533
32	28.7	595	20%	80%	68.00	3,477	78	37,552	70%	31.9	319.2	$ 606
27	23.8	390	20%	80%	67.00	3,477	80	48,817	72%	26.4	264.4	$ 502
22	19.3	262	20%	80%	66.00	3,477	82	60,083	72%	21.9	218.6	$ 415
17	14.8	142	20%	80%	65.00	3,477	82	63,838	72%	12.6	125.9	$ 239
12	10.4	67	20%	80%	64.00	3,477	82	67,593	72%	6.3	62.9	$ 120
7	5.9	26	20%	80%	63.00	3,477	84	78,858	72%	2.8	28.5	$ 54
2	1.1	8	20%	80%	62.00	3,477	84	82,614	72%	0.9	9.2	$ 17
-3	-2.9	1	20%	80%	61.00	3,477	84	86,369	72%	0.1	1.2	$ 2
-8	-6.6	0	20%	80%	60.00	3,477	84	90,124	72%	0.0	0.0	$ -
Total										179	1793	$ 3,406

Month	# of days	HDD	Heating (therms)	DHW (therms	Total therms	Cost $
Jan	31	927	302	65	367	$ 697
Feb	28	1032	336	58	395	$ 750
Mar	31	837	273	65	337	$ 641
Apr	30	559	182	63	245	$ 465
May	31	211	69	65	133	$ 254
Jun	30	41	13	63	76	$ 144
Jul	31	2	1	65	65	$ 124
Aug	31	13	4	65	69	$ 131
Sep	30	66	21	63	84	$ 160
Oct	31	189	62	65	126	$ 240
Nov	30	679	221	63	284	$ 539
Dec	31	948	309	65	373	$ 710
Total	365	5,504	1,793	762	2,554	$ 4,853

Total for space heating 1793 therms
Total for domestic hot water 762 therms
Total Usage 2554 therms 255 mmbtu

Installed Cost $	$ 10,287	Simple payback (yrs)	3.36
Annual Cost Savings $	$ 3,059	Savings to investment ratio	4.42
Annual Energy Savings (MMBtu)	19	Life cycle Cost Savings (LCS)	$ 35,221
Equipment Life (years)	20	Discount rate (%)	3%

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

VINCENT FALKOWSKI, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E., LEED AP
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Principal Mechanical Engineer

DATE: November 8, 2013

RE: CP 1664.320 - Energy Conservation @ Various County Facilities
Install High-efficiency Condensing Boiler at the Third Precinct (C068)
DC0186-13

The existing hot water cast iron sectional boiler is approximately 20 years old and has cracked causing the water to leak. Repairing the existing boiler will be expensive as we will need a temporary boiler while the existing one is disassembled for repair work.

The preliminary estimate for repairing the existing boiler is $50,000, which could increase depending on the extent of the internal damage and repair work required. The cost of replacing the existing boiler in kind using an outside contractor is estimated to be $150,000.

The County has decided to replace this standard efficiency (80%) boiler, which is in poor condition, with a high efficiency (95.1%) condensing hot water modular boilers utilizing in-house labor from Buildings O&M. The total cost to do this project in house is $96,875.00; please see the cost breakdown below:

Material and Contractor Labor:	$71,875.00
Electrical Connection:	$10,000.00
In House Labor to Install:	$15,000.00
Total:	$96,875.00

It is requested the overtime for the in-house labor be approved as the County will save $53,125.00 in project costs by utilizing in-house labor.

JA:ba
cc: Gilbert Anderson, P.E., Commissioner
Vincent Falkowski, P.E., Chief Deputy Commissioner
Craig Rhodes, Director, Buildings O&M
Robert Frevele, Asst. Director, Buildings O&M
Judd Classie, Building Maintenance Manager
Ed. Farrell, Jr, Maintenance Mechanic V

335 YAPHANK AVENUE ■ **YAPHANK, N.Y. 11980** ■ **(631) 852-4010**
FAX (631) 852-4150

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

VINCENT FALKOWSKI, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

PHILIP A. BERDOLT
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael J. Monaghan, P.E.

FROM: Javed Ashraf, P.E.

DATE: December 16, 2013

RE: CP #1664.320 – Chiller Optimization at Riverhead Power Plant
DC0206-13 – Independent Temperature Control

The site validation study of the chilled water plant at the above facility has determined that the energy performance can be improved upon by upgrading the chiller plant through the implementation of Optimum Energy's Optimum LOOP all-variable-speed chiller plant control technology.

Annual energy and water reduction are expected as follows:

- Electric - 924,824 kwh/year
- Water - 264,848 gal/year

Under full implementation of the system it is expected to generate a combined savings of $164,228.00. Additionally, LIPA rebate incentives are estimated at $168,839.00.

This project will allow the County to continue in its efforts to reduce its carbon footprint while also offering the opportunity to lower monthly utility costs.

Total cost of this beneficial project is as follows:

- Independent Temperature Control $270,000.00
- Optimum Energy $218,350.00
- All Systems Maintenance $62,550.00
- Total Project Cost $550,900.00

I wish to propose funding as follows:

- CP 1664.320 - $550,900.00

It is requested that the proposed project be approved.

JA:ba
cc: Gilbert Anderson, P.E., Commissioner
Philip A. Berdolt, Deputy Commissioner
Craig Rhodes, Director of Buildings O&M
Steve Felice, Maintenance Mechanic V, Bldgs. O&M

\\dpwserver\HOME\BDC\Projects\Energy Projects\Building Specific Energy Projects\C0126 County Center Power Plant - Riverhead\Riverhead Power Plant\Chiller Optimization\13-12-13-M-1664.320-DC0206-13-Chiller Optimization @ Riverhead P. Plant-ITC.doc-ITC

Jeff Finkel, Maintenance Mechanic V, Bldgs. O&M

COUNTY OF SUFFOLK

STEVE LEVY
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF PUBLIC WORKS

THOMAS LAGUARDIA, P.E.
CHIEF DEPUTY COMMISSIONER

GILBERT ANDERSON, P.E.
COMMISSIONER

LOUIS CALDERONE
DEPUTY COMMISSIONER

MEMORANDUM

TO: Michael Monaghan, P.E.
Chief Engineer

FROM: Javed Ashraf, P.E., C.E.M.
Associate Mechanical Engineer

DATE: March 16, 2010

RE: Install Variable Frequency Drivers (VFD) on Air Handlers 1 thru 7 Dennison Building (CO-140)

Existing Conditions

The Building is served by seven air-handlers (AHU 1 thru 7) that provide conditioned air to meet the space heating and cooling requirements. The air-handlers 1 thru 6 each have a 60-hp supply fan motor and a 20-hp return fan motor; air-handler no. 7 has a 40-hp supply fan motor and a 15-hp return fan motor. The basement thru 3rd floor of the building is served by air-handlers 1 thru 3 and 4th through 12th floors are served by air-handlers 4 thru 6. The media room and the Plaza are served by air-handler 7.

According to the Building Operations and Maintenance Staff, one set of fan motors for air-handlers 1 thru 3, and 4 thru 6 are usually not used. The rest of the air-handlers operate 24-hours a day, seven days a week, all year round.

The estimated annual electrical energy consumed by the operation of the air-handlers is 2,222,884-kWh with an estimated annual operating cost of $346,770.00.

Proposed Improvements

To improve the operating efficiency and reliability of the air-handlers and reduce operating cost, DPW evaluated the feasibility of installing variable frequency drives on the air-handler fan motors and also shutting down the air-handlers when the building is unoccupied. Installing variable frequency drives (VFD) will allow the building operator to reduce or increase fan speed to follow building load. The VFD in conjunction with upgraded Building Management System (BMS) will allow the operator to shut down the units for 10 hours a day from Monday thru Saturday and 24-hours a day on Sundays and holidays.

This will result in an estimated annual electrical energy and cost savings of 1,323,461-kWh and $206,460.00 respectively. The proposed installation cost for fourteen (14) VFD and BMS programming is $164,800.00.

335 YAPHANK AVENUE ■ **YAPHANK, N.Y. 11980** ■ **(631) 852-4220**
FAX (631) 852-4246

Estimated Savings Calculations

The analysis shows that shutting down the air-handlers when the building is unoccupied and installing the variable frequency drives will result in savings of 1,323,461-kWh per year. The simple payback for this project is estimated to be 0.8 years without LIPA incentive.

A fifteen year life-cycle cost analysis (LCS) shows utility cost savings of $1,596,345.

Proposed Installation Cost	$ 164,800	Simple Payback (years)	0.8
Annual Energy Savings	1,323,461	Savings to Investment Ratio (SIR)	10.7
Annual Cost Savings	$ 206,460	Life cycle Cost Savings (LCS)	$ 1,596,345
CO_2 Reduction (tons/year)	686	Life of equipment (years)	10
		Discount rate %	3%

For Scope of Work please see the attached proposal from ITC and All Service Electric.

JA/rc
attachment
cc: Louis Calderone, Deputy Commissioner / email
Lew Johnson, R.A., Assistant County Architect / email
Jay Abbott, Special Projects Supervisor / email
Craig Rhodes, Assistant Director of Buildings O & M / email

Appendix A – Savings Calculations

ECM: Install Variable Frequency Drive on Fan Motors

H. Lee Dennison Building
Base Case: (All air-handlers run 24 hours a day)

	1	2	3	4	5	6	7	8	9	10	11	12	
						Run Hours							
Unit	HP	LF	BHP	kW	Existing Efficiency	Period 1	Period 2	Period 3	Period 1 (kWh)	Period 2 (kWh)	Period 3 (kWh)	Total (kWh)	
AHU - 1 (Supply Fan)	60	85.0%	51	38.05	94.5%	2,555	1,260	4,945	102,865	50,728	199,087	352,680	
AHU - 1 (Return Fan)	20	85.0%	17	12.68	93.0%	2,555	1,260	4,945	34,841	17,182	67,433	119,456	
AHU - 2 (Supply Fan)	60	85.0%	51	38.05	94.5%	2,555	1,260	4,945	102,865	50,728	199,087	352,680	
AHU - 2 (Return Fan)	20	85.0%	17	12.68	93.0%	2,555	1,260	4,945	34,841	17,182	67,433	119,456	
AHU - 3 (Supply Fan)	60	85.0%	51	38.05	94.5%	0	0	0	0	0	0	0	OFF
AHU - 3 (Return Fan)	20	85.0%	17	12.68	93.0%	0	0	0	0	0	0	0	OFF
AHU - 4 (Supply Fan)	60	85.0%	51	38.05	93.6%	2,555	1,260	4,945	103,854	51,216	201,002	356,072	
AHU - 4 (Return Fan)	20	85.0%	17	12.68	93.0%	2,555	1,260	4,945	34,841	17,182	67,433	119,456	
AHU - 5 (Supply Fan)	60	85.0%	51	38.05	93.6%	0	0	0	0	0	0	0	OFF
AHU - 5 (Return Fan)	20	85.0%	17	12.68	93.0%	0	0	0	0	0	0	0	OFF
AHU - 6 (Supply Fan)	60	85.0%	51	38.05	93.6%	2,555	1,260	4,945	103,854	51,216	201,002	356,072	
AHU - 6 (Return Fan)	20	85.0%	17	12.68	93.0%	2,555	1,260	4,945	34,841	17,182	67,433	119,456	
AHU - 7 (Supply Fan)	40	85.0%	34	25.36	93.6%	2,555	1,260	4,945	69,236	34,144	134,001	237,381	
AHU - 7 (Return Fan)	15	85.0%	12.75	9.51	92.4%	2,555	1,260	4,945	26,301	12,970	50,903	90,174	
TOTAL									**648,341**	**319,730**	**1,254,813**	**2,222,884**	

H. Lee Dennison Building
Proposed Case (Install VFD and operate all air-handlers for 14 hours a day, six days a week)

	1	2	3	4	5	6	7	8	9	10	11	12	
						Run Hours							
Unit	HP	LF	BHP	kW	Existing Efficiency	Period 1	Period 2	Period 3	Period 1 (kWh)	Period 2 (kWh)	Period 3 (kWh)	Total (kWh)	
AHU - 1 (Supply Fan)	60	70.0%	42	31.33	94.5%	254	1,050	3,000	8,422	34,813	99,467	142,702	
AHU - 1 (Return Fan)	20	70.0%	14	10.44	93.0%	254	1,050	3,000	2,852	11,792	33,690	48,334	
AHU - 2 (Supply Fan)	60	70.0%	42	31.33	94.5%	254	1,050	3,000	8,422	34,813	99,467	142,702	
AHU - 2 (Return Fan)	20	70.0%	14	10.44	93.0%	254	1,050	3,000	2,852	11,792	33,690	48,334	
AHU - 3 (Supply Fan)	60	70.0%	42	31.33	94.5%	0	0	0	0	0	0	0	OFF
AHU - 3 (Return Fan)	20	70.0%	14	10.44	93.0%	0	0	0	0	0	0	0	OFF
AHU - 4 (Supply Fan)	60	70.0%	42	31.33	93.6%	254	1,050	3,000	8,502	35,148	100,423	144,074	
AHU - 4 (Return Fan)	20	70.0%	14	10.44	93.0%	254	1,050	3,000	2,852	11,792	33,690	48,334	
AHU - 5 (Supply Fan)	60	70.0%	42	31.33	93.6%	0	0	0	0	0	0	0	OFF
AHU - 5 (Return Fan)	20	70.0%	14	10.44	93.0%	0	0	0	0	0	0	0	OFF
AHU - 6 (Supply Fan)	60	70.0%	42	31.33	93.6%	254	1,050	3,000	8,502	35,148	100,423	144,074	
AHU - 6 (Return Fan)	20	70.0%	14	10.44	93.0%	254	1,050	3,000	2,852	11,792	33,690	48,334	
AHU - 7 (Supply Fan)	40	70.0%	28	20.89	93.6%	254	1,050	3,000	5,668	23,432	66,949	96,049	
AHU - 7 (Return Fan)	15	70.0%	10.5	7.83	92.4%	254	1,050	3,000	2,153	8,901	25,432	36,486	
TOTAL							**5,250**	**15,000**	**22,029**	**91,064**	**260,184**	**899,423**	

Notes:

1. AHU-3 and AHU-5 are never used.
2. AHUs 1, 2 & 3 serve the basement, 1st, 2nd and 3rd floors.
3. AHUs 4, 5 and 6 serve 4th thru 12th floors.
4. AHU-7 serve the Plaza and Media Room.
5. There are 7 VAV boxes located on 1st floor.
6. VAV 1 thru 4 are served by AHU 1, 2 and 3.
7. VAV 5, 6, and 7 are served by AHU-7.
8. VAV 5, 6 and 7 are in fixed position and don't modulate.

Proposed Installation Cost	$ 180,000	Simple Payback (years)	0.9
Annual Energy Savings	1,323,461	Savings to Investment Ratio (SIR)	9.8
Annual Cost Savings	$ 206,460	Life cycle Cost Savings (LCS)	$ 1,581,145
CO_2 Reduction (tons/year)	686	Life of equipment (years)	10
		Discount rate %	3%

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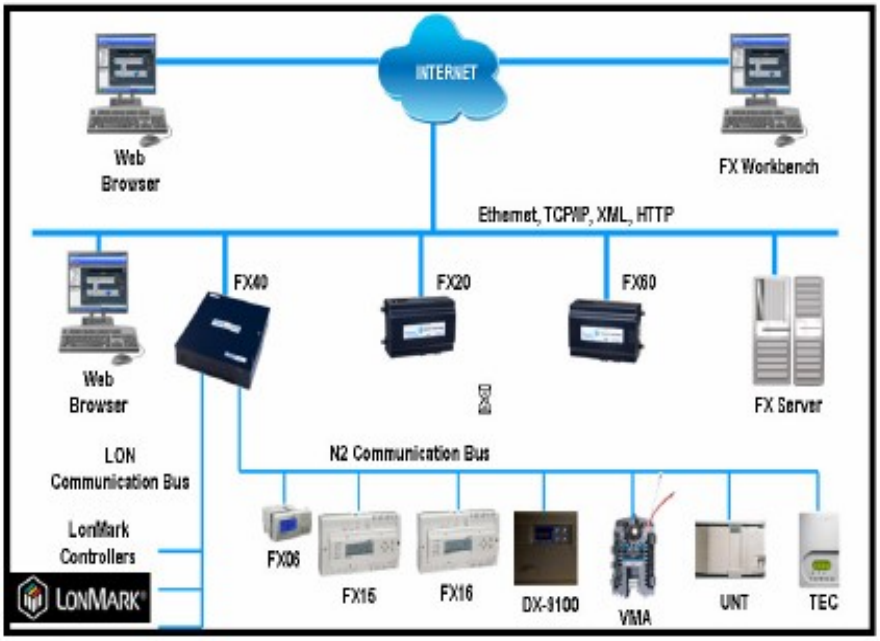
INTRODUCTION

Advances in Microelectronics and control technology have become one of the most efficient and reliable means to optimize buildings and reduce the "Carbon Footprint". Through Variable Frequency Drives (VFD), a Building Management Systems can adjust a motor's speed to match actual building loads reducing electrical energy consumption, decrease maintenance costs while prolonging equipment life and improve process precision.

A VFD eliminates the need for expensive upgrades and when used with complete control strategies, provide the solution to address today's energy challenges and future demands for environmental efficient facilities. A motor without a VFD operates at constant speed, without regard to building continuous load changes or unnecessary wear placed on equipment. A VFD, by gradually ramping the speed of a motor at startup, reduces stress on components and minimizes electrical surges that can reach up to 10 times the full current load of a motor.

Additionally, a VFD in conjunction with the Building Management System improve occupant comfort by reducing fan noise, duct rumble and air velocity while maintaining required operating parameters to meet required Indoor Air Quality standards.



SCOPE OF THIS PROJECT

1. Install Variable Frequency Drives for Supply and Return Fans for the following system:

- AHU-1
- AHU-2
- AHU-3
- AHU-4
- AHU-5
- AHU-6
- AHU-7

2. Extend Building Management System Communication Bus to each VFD.

3. Rewire all mechanical safety devices.

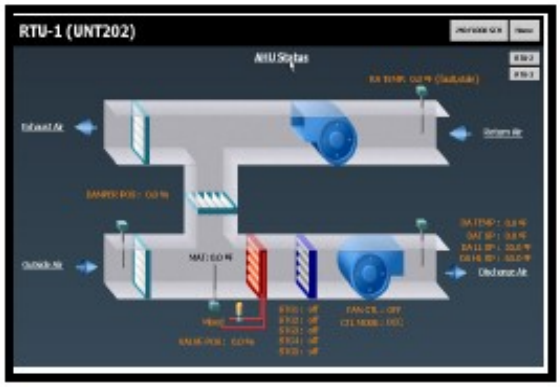
4. Rewire life safety interlocks.

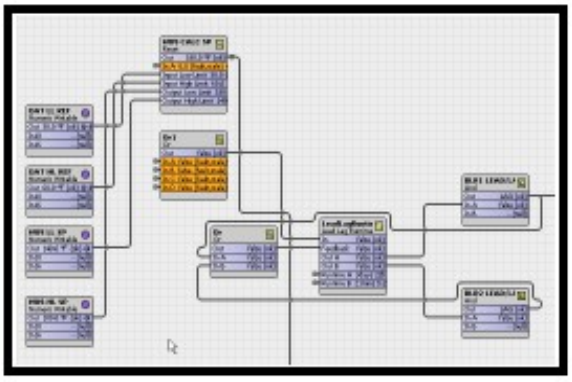
5. Program Building Management System with strategies to maximize building efficiency and comfort.

6. Customize Building Management System interface.

7. Commission, validate and provide necessary training.

8. Provide user friendly Web based remote access to the system, in order to monitor and adjust operating parameters to achieve desired results.





ESTIMATED COST OF VFD UPGRADE

1. VARIABLE SPEED DRIVES	**$62,000.00**
2. VFD INSTALLATION & WIRING	**$0.00 (FBO)**
3. COMMUNICATION & SAFETY WIRING	**$25,000.00**
4. ENGINEERING AND COORDINATION	**$15,000.00**
4. PROGRAMMING & COMMISSIONING	**$18,000.00**
ESTIMATED COST	**$120,000.00**

IMPLEMENTATION DETAILS

VFD INSTALLATION

- Extend all Fire Alarm and Mechanical interlock wiring from existing Motor Control Center to location where VFD is to be installed. Basement Fan VFDs will be installed where existing local disconnect is installed. Re-enforce structural support as needed. Roof fan VFDs will replace existing starter.

- Run N2 communication bus in daisy fashion from one of the existing control panels back to same panel.

- At Motor Control Center, bypass existing contactor by splicing existing feed with load wires. New VFDs are provided with local disconnect.

- Install and connect one system at a time. Two fan systems in the basement and two fans on the tower MER shall remain running during occupied periods. AHU-7 VFD installation shall be coordinated with Building Operating Engineer to avoid conflict with meetings held in the auditorium.

VFD STARTUP AND COMMISSIONING

- Drives for each system shall be programmed and verified prior to starting the next system installation.

- Drives shall be set to run at 70% of speed or 42HZ.

- Two(2) hr training session will be provided after commissioning of first system. After training session, Building Operating Engineers shall be capable of manually start/ stop, change speed and run fan in bypass.

IMPLEMENTATION DETAILS

SEQUENCE OF OPERATION

The air handling units will operate in Occupied, Unoccupied, Night Heating and Cooling modes. All suggested set points and settings are adjustable from the Building Management System Operator Interface or remotely using the latest version of Internet Explorer.

The air handling units will be scheduled for automatic operation on a time of day basis for Occupied and Unoccupied modes. Any time a fan is started/ stopped or speed is changed, VFD will gradually ramp up/down to desired speed.

OCCUPIED

When in occupied mode, each of the fan systems can operate in three modes that are Operator selectable. When in "AUTO" mode, the fan speed will be modulated automatically between Speed Low Limit setpoint (default= 40%) and maximum speed to maintain desired space temperature setpoint. During the summer, the control variable will be the calculated average of the high temperatures from each floor served by the unit During the winter, the control variable will be the calculated average of the low temperatures from each floor served by the unit. Summer/ Winter switchover will take place automatically based on Outside Air Temperature and "AHU SUM/WIN SWITCHOVER SETPOINT" (default= 60 Deg F).

When in "AUTO CLG" mode, the fan speed will be modulated automatically between Speed Low Limit setpoint (default= 40%) and maximum speed to maintain desired space temperature setpoint. The control variable will be the calculated average of the high temperatures from each floor served by the unit.

When in "AUTO HTG" mode, the fan speed will be modulated automatically between Speed Low Limit setpoint (default= 40%) and maximum speed to maintain desired space temperature setpoint. The control variable will be the calculated average of the low temperatures from each floor served by the unit.

When in "MANUAL SPD" mode, the fan will maintain the operator selectable speed (default= 70%).

UNOCCUPIED/ NORMAL OFF

The fans are off.

NIGHT HEATING

The fans will automatically cycle on/off to maintain a minimum unoccupied heating setpoint (default=64 Deg F). A deadband of 4 Deg F (adjustable) will be established to minimize excessive start/ stop of units.

NIGHT COOLING

The fans will automatically cycle on/off to maintain a maximum unoccupied cooling setpoint (default=85 Deg F). A deadband of 4 Deg F (adjustable) will be established to minimize excessive start/ stop of units.

Code No. LIT-1900252
Issued December 03, 2007

VSD Series

Variable Speed IntelliPass/IntelliDisconnect Drives

Description

VSD Series variable speed IntelliPass/IntelliDisconnect drives, powered by Eaton®/Cutler-Hammer® technology, provide a premier intelligent drive integrated with a reliable bypass configuration. The IntelliDisconnect variable speed drive combines a premier quality drive with an integrated circuit breaker disconnect (no bypass). The IntelliPass bypass is a two- or three-contactor design using the Eaton/Cutler-Hammer 24 VDC Series of contactors and power supplies. The features, function, and form allow the drive and bypass to become an integrated design, the world's smallest drive and bypass package. The IntelliPass drives come standard with an Eaton/Cutler-Hammer circuit breaker integrated into the drive and bypass design.

Features

- true full network connectivity for both drive and bypass N2, XT, SA Bus, LON, and BACnet® protocol
- software parameters utilize engineering units common to the Heating, Ventilating, and Air Conditioning (HVAC) industry
- quick and easy startup using the onboard startup wizard
- hinged cover enables easy access to cabling and components
- removable top and bottom conduit plates for ease of installation
- engineering units transmitted over communications bus
- compatibility with current and future Johnson Controls® network architecture
- standard Johnson Controls support includes ordering, estimating, and project management tools: Advanced Order Management System (AOMS), Advanced Installation Management (AIM) Tools — Catalog, PRESTO, STORE, and QuickLIT
- closed-loop control programmed with engineering units for specific Heating, Ventilating, and Air Conditioning (HVAC) applications: duct static, building static, pressure control, and temperature control
- run permissive damper control in drive or bypass mode
- up to six user-defined skip frequencies
- user-selectable s-shaped acceleration/deceleration curve
- selectable Analog Input (AI) Min/Max/Averaging feature
- digital inputs can be defined for normal-open or normal-closed operation
- quick and easy non-HVAC specific standard application to get the drive up and running
- automatic fault display captures 16 drive operating parameters at time of fault
- solid-state motor overload relay provides motor protection while in bypass
- HAND/OFF/AUTO and DRIVE/BYPASS selector on keypad simplifies control
- two power sources for control ensure redundancy and provide additional ride-through capability
- plenum rated
- top and bottom conduit entry for installation ease

VSD Series Variable Speed IntelliPass Drive

- serial communication interface can control both the drive and all bypass features so that the remote operator can fully control the motor whether it is operated by the drive or bypass
- standard 3% line reactors for enhanced transient and harmonic distortion protection
- Electromagnetic Interference (EMI)/Radio Frequency Interference (RFI) filters standard up to frame 8 (200 A) (Level H)
- standard drive current rating of 100 kAIC, assembly rating of 65 kAIC
- pass-through Input/Output (I/O) capability
- lockable disconnect in OFF position
- I/O and communication cards provide plug-and-play functionality
- Copy/Paste keyboard function allows transfer of parameter settings from one drive to the next
- keypad can display up to three monitored parameters simultaneously
- standard TYPE 12 keypad on all drives
- drive programming capability using auxiliary 24 V power supply (VS-AUX24V)
- standard option board configuration includes an A9 I/O board, an A2 relay output board, and a B5 output board, which are installed in slots A, B, and C, respectively

Selection Chart

	Code Number	V	S	0				1	1	A	—					
Base Product	VS = Variable Speed Drive prefix															
Horsepower (VT)[1]	001 = 1.0 hp to 075 = 75 hp[2]															
Voltage	1 = 208 V 2 = 230 V 4 = 480 V															
Enclosure Rating	1 = NEMA TYPE 1															
Enclosure Style	1 = IntelliPass (with 2 or 3 count bypass) 4 = IntelliDisconnect (no bypass includes circuit breaker)															
Revision #	A = Rev. 1															
Separator (—)																
Communications[3]	0 = None N = N2/XT/SA Bus Communication (N2 by default) L = LonWorks® Network															
Option 1	See Options List[4].															
Option 2	See Options List[4].															

1. All horsepower ratings are Variable Torque (VT).
2. 1 to 30 hp at 208/230 V; 1 to 75 hp at 480 V
3. N2/XT/SA Bus Communications selectable on drive keypad
4. All VSD Series IntelliPass Drives incorporate two factory-installed Auxiliary Contacts (formerly the K9 option).

Options List

00 = none
P6 = Third Contactor Drive Isolation

Repair Information

If the Variable Speed IntelliPass Drive fails to operate within its specifications, contact the nearest Johnson Controls representative.

Variable Speed IntelliPass/IntelliDisconnect Drives (Continued)

Technical Specifications

VSD Series Variable Speed IntelliPass Drives (Part 1 of 2)	
Input Voltage (V_{in})	10%/-15%
Input Frequency (f_{in})	50/60 Hz (variation up to 45 - 66 Hz)
Connection to Power	Once per minute or less (typical operation)
Current Withstand Rating	65 kA/C
Output Voltage	0 to V_{in}
Continuous Output Current	Ambient temperature maximum 40°C (104°F), overload 1.1 x I_L (1 min./10 min.)
Starting Current	110%
Output Frequency	0 to 320 Hz
Frequency Resolution	0.01 Hz
Control Method	Frequency Control (V/f) Open Loop Sensorless Vector Control
Switching Frequency	Adjustable Parameter 1 to 40 hp: 1 to 16 kHz; default 10 kHz 50 to 75 hp: 1 to 10 kHz; default 3.6 kHz
Frequency Reference	Analog Input: Resolution 0.1% (10 bit), accuracy ± 1% Panel Reference: Resolution 0.01 Hz
Field Weakening Point	30 to 320 Hz
Acceleration Time	0 to 3,000 s
Deceleration Time	0 to 3,000 s
Braking Torque	DC brake: 30% x T_n (without brake option)
Ambient Operating Temperature	-10, no frost to 40°C, (14 to 104°F)
Storage Temperature	-40 to 70°C (-40 to 158°F)
Relative Humidity	0 to 95% RH, noncondensing, noncorrosive, no dripping water
Air Quality	Chemical vapors: IEC 721-3-3, unit in operation, Class 3C2; Mechanical particles: IEC 721-3-3, unit in operation, Class 3S2
Altitude	100% load capacity (no derating) up to 1,000 m (3,280 ft); 1% derating for each 100 m (328 ft) above 1,000 m (3,280 ft); maximum 3,000 m (9,842 ft)
Enclosure Class	TYPE 1/IP21
EMC (at default settings)	Immunity: Fulfils all Exhaust Motor Contactor (EMC) immunity requirements; Emissions: EN 61800-3, LEVEL H

VSD Series Variable Speed IntelliPass Drives (Part 2 of 2)	
Safety	UL 508C; CSA C22.2 No. 14
Product	IEC 61800-2; Plenum Rated
Air Quality Chemical Vapors	IEC721-3-3, unit in operation, class 3C2
Mechanical Particles	IEC721-3-3, unit in operation, class 3S2
Analog Input Voltage	0 to 10 V, R = 200 ohms differential (-10 to 10 V joystick control) Resolution 0.1%; accuracy ± 1%
Analog Input Current	0 (4) to 20 mA; R_i - 250 ohms differential
Digital Inputs (6)	Positive or negative logic; 18 to 24 VDC
Auxilliary Voltage	24 V ± 15%, maximum 250 mA
Output Reference Voltage	10 V 3%, maximum load 10 mA
Analog Output	0 (4) to 20 mA; R_L maximum 500 ohms; Resolution 10 bit; Accuracy ± 2%
Digital Outputs	Open collector output, 50 mA/48 V
Relay Outputs	Two programmable Form C relay outputs Switching capacity: 24 VDC/8 A, 250 VAC/8 A, 125 VDC/0.4 A
Overcurrent Protection	Trip limit 4.0 x I_H instantaneously
Overvoltage Protection	Yes
Undervoltage Protection	Yes
Earth Fault Protection	In case of earth fault in motor or motor cable, only the frequency converter is protected.
Input Phase Supervision	Trips if any of the input phases are missing.
Motor Phase Supervision	Trips if any of the output phases are missing.
Overtemperature Protection	Yes
Motor Overload Protection	Yes
Motor Stall Protection	Yes
Motor Underload Protection	Yes
Short Circuit Protection	Yes (of the 24 V and 10 V Reference Voltages)
Line Voltage	208/230/480 V
Drive Efficiency	>95%
Reliability	500,000 Hours Mean Time Between Failures (MTBF)
Power Factor (Displacement)	0.96
Ratings	UL Listed, File No. E244421; cUL Listed
Warranty	2 Years Standard Terms; 3 Years with Certified Startup

VSD Series Quick Reference Guide

IMPORTANT: This guide is intended to provide a quick reference to the VSD Series drive's Application Software features for start-up, programming and service. It does not replace the need to thoroughly read and understand the User Manual.

Shipped from the factory the VSD Series drive has six Ready Applications, with the drive default set to Remote Application.

Applications:

- Remote Input used for Remote Frequency Contact without PI
- Duct Static used to control fans with pressure transducer and provide WC/PA units to keypad
- Building Static used to control fans with pressure transducer and provide WC/PA units to keypad
- Pressure PSI used to control pumps or fans with pressure transducer and provide PSI/kPa units to keypad
- Temperature °F, °C used to control pumps or fans with pressure transducer and provide °F/°C units to keypad
- Generic PI used to control pumps or fans with a pressure transducer

Inspection

General

Upon receipt of the unit, verify that the catalog number and unit options stated on the shipping container match those stated on the order/purchase form.

Inspect the equipment upon delivery. Report any carton damage to the carrier prior to accepting the delivery. Have this information noted on the freight bill. Johnson Controls is not responsible for damage incurred in shipping.

Unpacking

Remove all packing material from the unit. Be sure to remove all packing material from lug location. Also, make sure no packing material is left behind that would block the airflow to the fan.

Check the unit for any signs of shipping damage. If damage to the product is found after unpacking, report it to the freight company. Retain the packing materials for the carrier to review.

Verify that the unit's catalog number and options match those stated on the order/purchase form.

Storage

It is recommended that the unit be stored in its original shipping box/crate until it is to be installed.

The unit should be stored in a location where:

- The ambient temperature is between -58°F and 158°F (-50°C and 70°C)
- The relative humidity is between 0% and 95%, non-condensing
- The environment is dry, clean, and non-corrosive
- The unit will not be subjected to high shock or vibration conditions

Power Wiring — Open Chassis Drives and Enclosed Drives

FR: 7, 8, 9

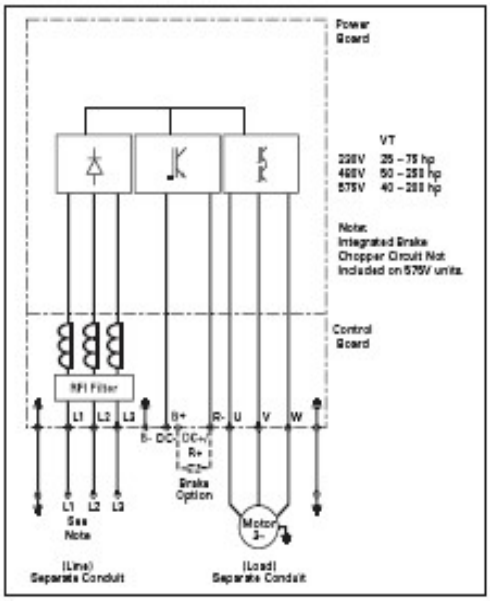


Figure 1: Power and Motor Wiring Diagram for Large hp Drives

FR: 4, 5, 6

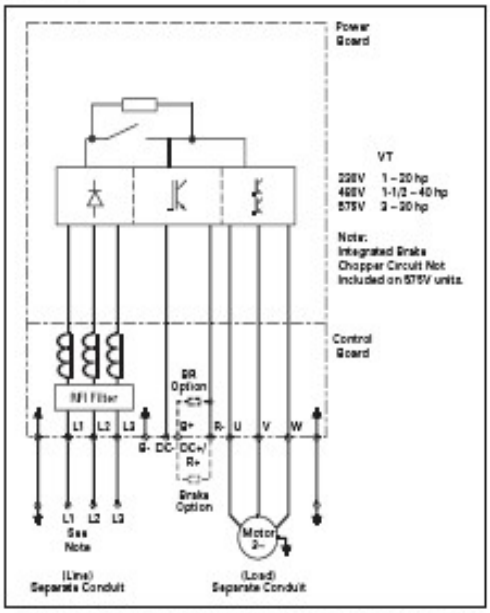


Figure 2: Power and Motor Wiring Diagram for Small hp Drives

Control Wiring

General Information

The control unit of the VSD Series drive consists of the control board and various option boards that plug into the five slot connectors (A to E) of the control board.

Galvanic isolation of the control terminals is provided as follows:

- Control connections are isolated from power, and the GND terminals are permanently connected to ground.
- Digital inputs are galvanically isolated from the I/O ground.
- Relay outputs are double-isolated from each other at 300V AC.

Option Board General Information

The VSD Series drives can accommodate a wide selection of *expander* and *adapter boards* to customize the drive for your application needs.

The drive's control unit is designed to accept a total of five option boards. Option boards are available for normal analog and digital inputs and outputs, for communication and for additional application-specific hardware.

The VSD Series factory installed standard option board configuration includes an A9 I/O board and an A2 relay output board, which are installed in slots A and B. For information on additional option boards, see the VSD Series drives option board manuals.

Note: If your VSD Series drive has been shipped with a factory installed IntelliPass bypass, the B5 option board is installed in slot C.

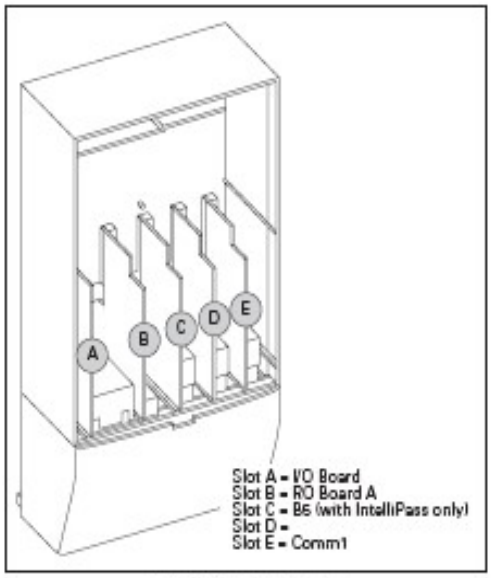


Figure 3: Option Board Slots

Main Control Board Wiring Default in Slot A and B

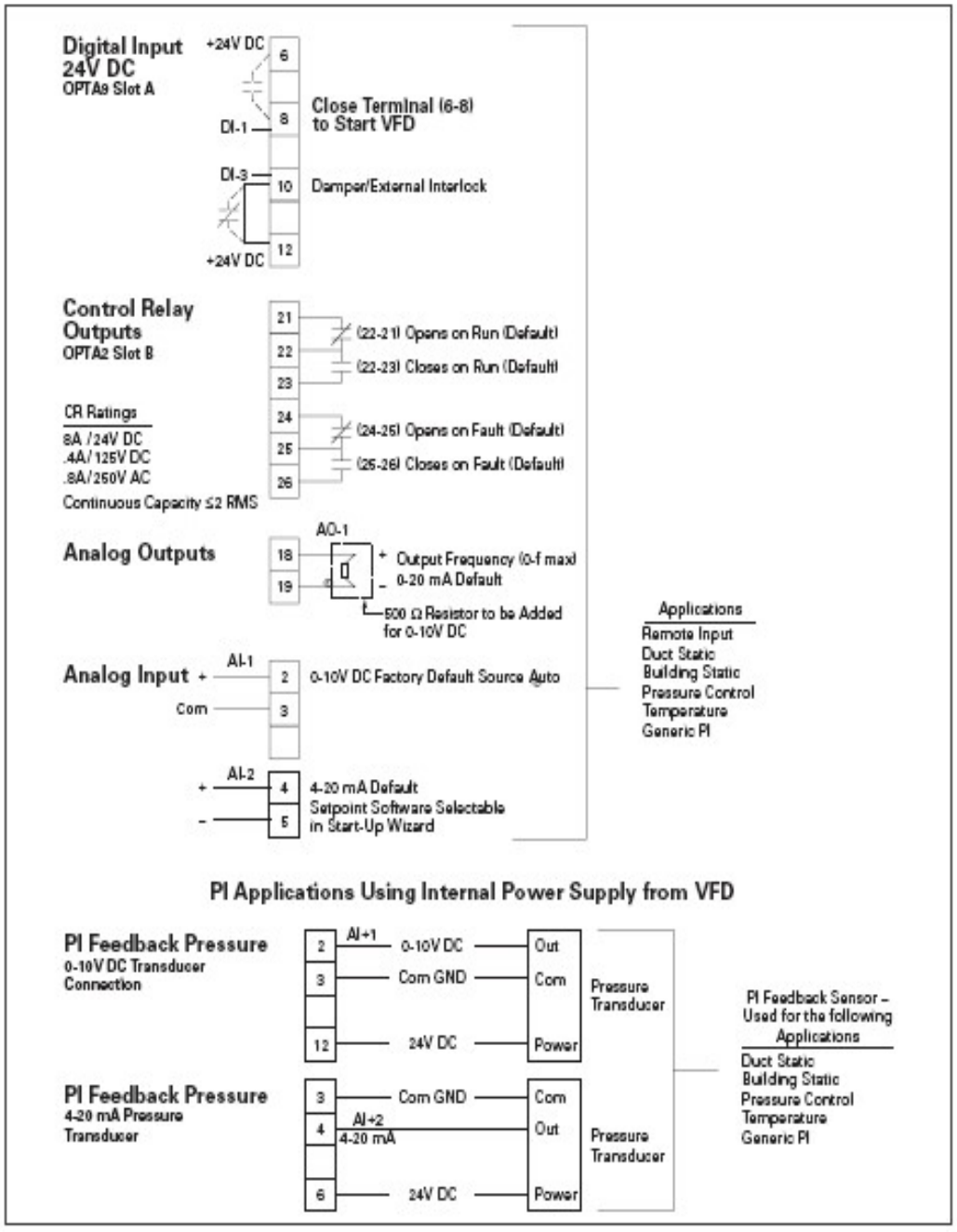


Figure 4: Wiring Diagrams (Default)

Card is programmable for a 0 – 10VDC with change in jumper. Add X6 jumper on Board A6 from A-B to C-D.

Start-Up Wizard — Duct Static, Building Static, Pressure Control, Temperature, Generic PI

Upon initial power up, the Start-Up Wizard guides the commissioner through the basic VSD Series setup. The Start-Up Wizard may be set to function upon power up by setting parameter P5.5.3, or by pressing the STOP button for 5 seconds while in the "Operate Menu". The display will read "Startup Wizard" ACTIVATED after 5 seconds.

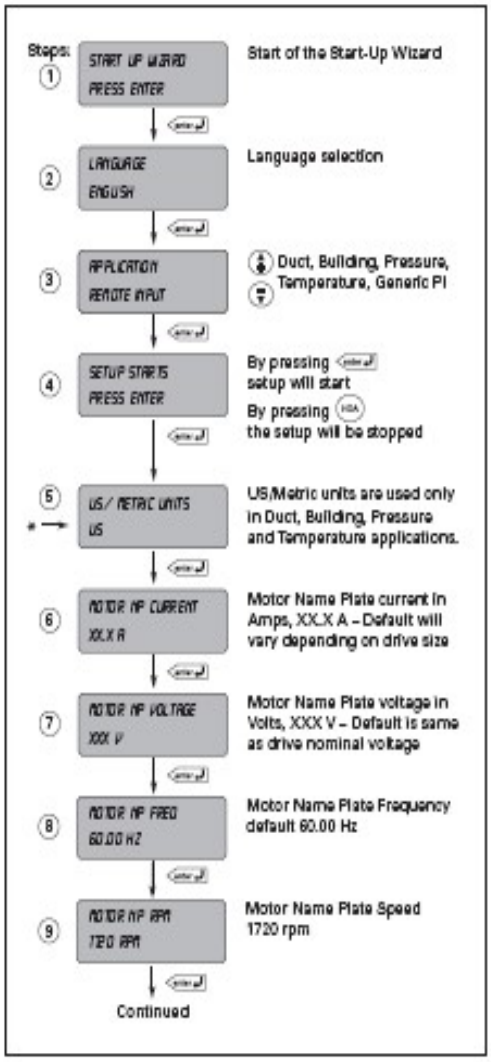


Figure 5: Start-Up Wizard Navigation (1 of 3)

Note: Use ↑↓ for changing parameter. Then press ENTER to save and move forward.

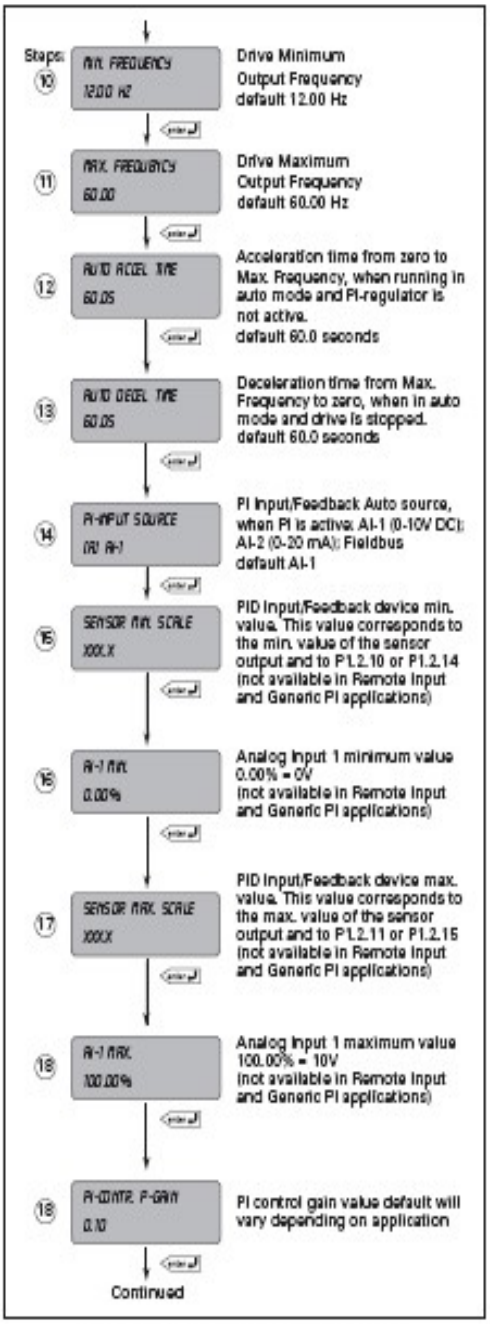


Figure 6: Start-Up Wizard Navigation (2 of 3)

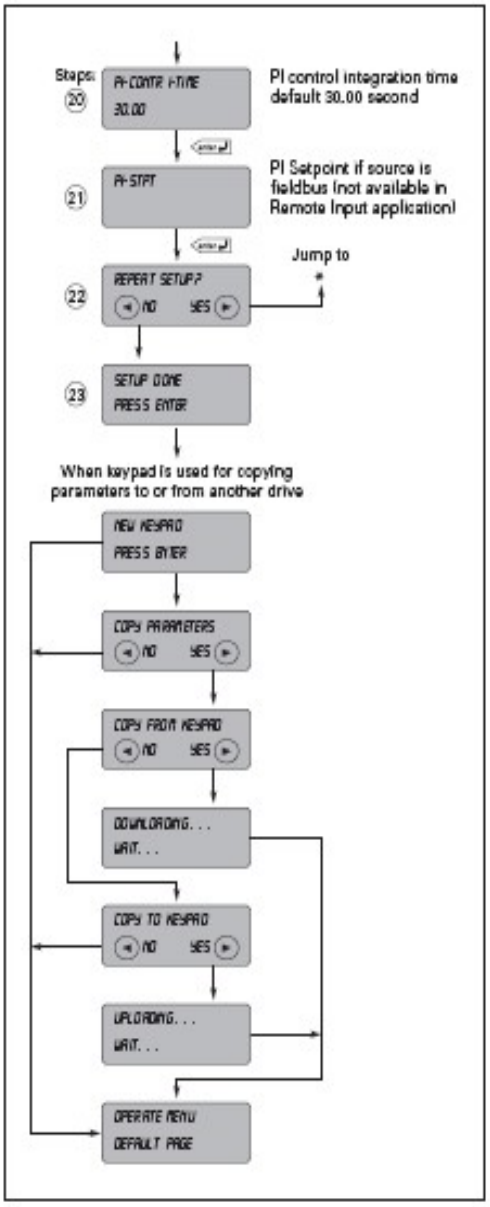


Figure 7: Start-Up Wizard Navigation (3 of 3)

Note: Start-Up Wizard can be cancelled with the STOP/RESET button. If pressed, the text "EXIT?" is shown on the display along with "No" and "Yes".

Note: In pressure applications Inverse Selection is an option.

Start-Up Wizard — Remote Input Application

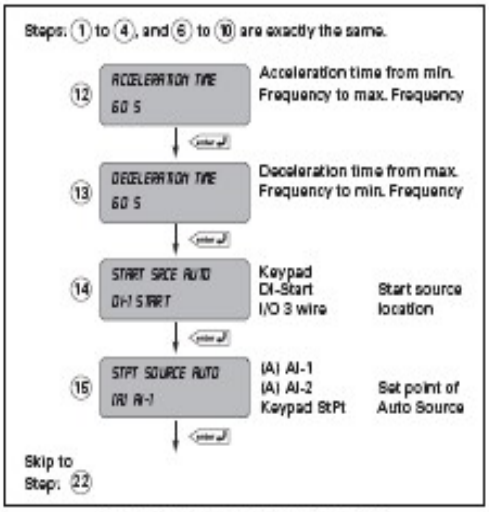


Figure 8: Remote Input Start-Up Wizard

System Menu Copy Parameter Options (S5.3)

The parameter copy function is used when the operator wants to copy one or all parameter groups from one drive to another. All the parameter groups are first uploaded to the keypad, then the keypad is connected to another drive and then the parameter groups are downloaded to it (or possibly back to the same drive).

Note: Before any parameters can successfully be copied from one drive to another, the drive must be stopped when the parameters are downloaded to it.

S5.3.1 Parameter Sets — Range: 0 – 4

PARAMETER SETS

This parameter allows you to reload the factory default parameter values, and to store and load two customized parameter sets.

0 Load Factory defaults
1 Store Set 1
2 Load Set 1
3 Store Set 2
4 Load Set 2

S5.3.2 Upload to Keypad

UP TO KEYPAD

This function uploads all existing parameter groups to the keypad.

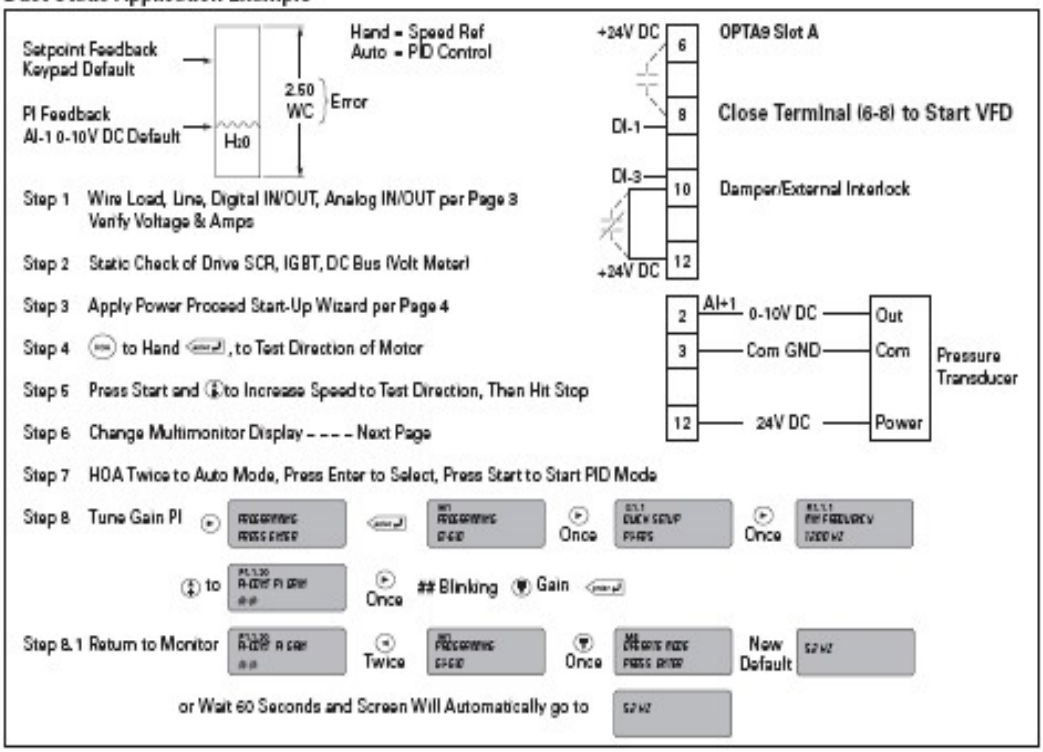
S5.3.3 Download from Keypad — Range: 0 – 3 — Default: 0 (All parameters)

DOWN FROM KEYPAD

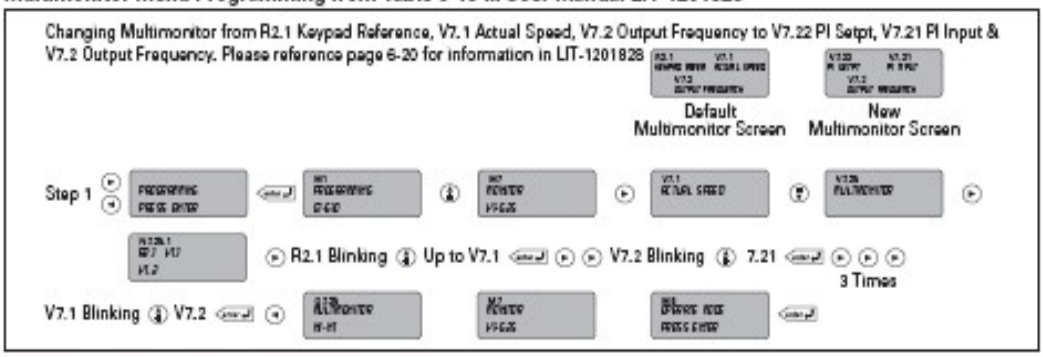
This function downloads one or all parameter groups from the keypad to the drive.

0 All parameters
1 All, no motor
2 Application parameters

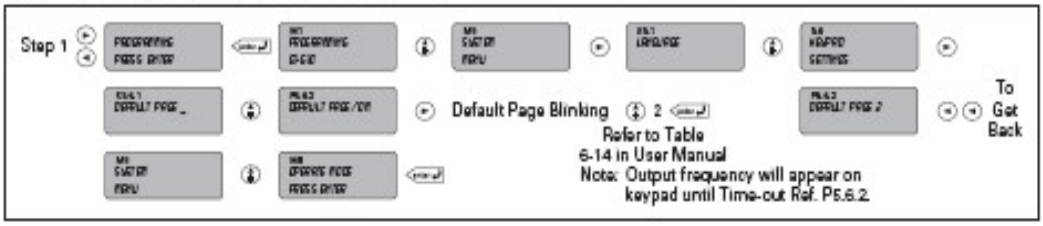
Duct Static Application Example



Multimonitor Menu Programming from Table 6-13 in *User Manual LIT-1201828*



Change Monitor Default Page to Actual Speed



Main Menu Navigation

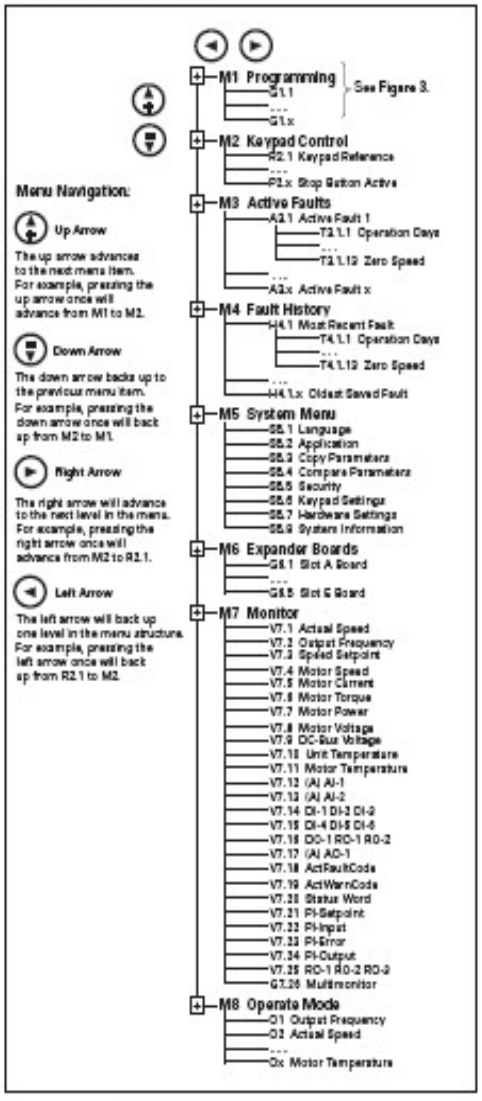


Figure 9: Main Menu Navigation

Parameter Menu Structure Example

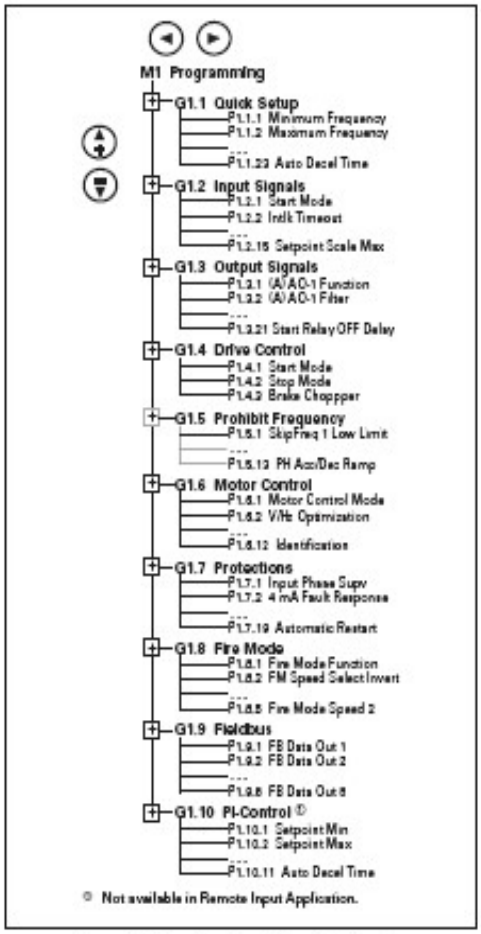


Figure 10: Parameter Menu Structure Example

Keypad Operation

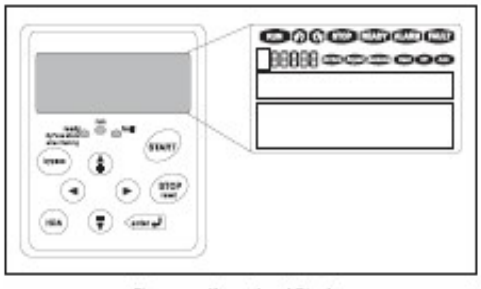


Figure 11: Keypad and Display

Power Ratings (Open Drives)

Table 1: 208/230V VT Output Power Ratings — Open Drive

Catalog Number ①	Frame Size	Three-Phase Input	
		Horsepower	Current
VSD0012x0A_	FR4	1	4.8
VSDF152x0A_		1-1/2	6.6
VSD0022x0A_		2	7.8
VSD0032x0A_		3	11
VSD0052x0A_	FR5	5	17.5
VSD0072x0A_		7-1/2	25
VSD0102x0A_		10	31
VSD0152x0A_	FR6	15	48
VSD0202x0A_		20	61
VSD0252x0A_	FR7	25	75
VSD0302x0A_		30	88
VSD0402x0A_		40	114
VSD0502x0A_	FR8	50	140
VSD0602x0A_		60	170
VSD0752x0A_		75	205

① Insert a "1" for TYPE 1 or a "2" for TYPE 12 in place of the "x" in the Catalog Number.

Table 2: 480V VT Output Power Ratings — Open Drive

Catalog Number ①	Frame Size	Three-Phase Input	
		Horsepower	Current
VSDF154x0A_	FR4	1-1/2	3.3
VSD0024x0A_		2	4.3
VSD0034x0A_		3	5.6
VSD0054x0A_		4	7.6
VSD0074x0A_		7-1/2	12
VSD0104x0A_	FR5	10	16
VSD0154x0A_		15	23
VSD0204x0A_		20	31
VSD0254x0A_	FR6	25	38
VSD0304x0A_		30	46
VSD0404x0A_		40	61
VSD0504x0A_	FR7	50	72
VSD0604x0A_		60	87
VSD0754x0A_		75	105
VSD1004x0A_	FR8	100	140
VSD1254x0A_		125	170
VSD1504x0A_		150	205
VSD2004x0A_	FR9	200	261
VSD2504x0A_		250	300

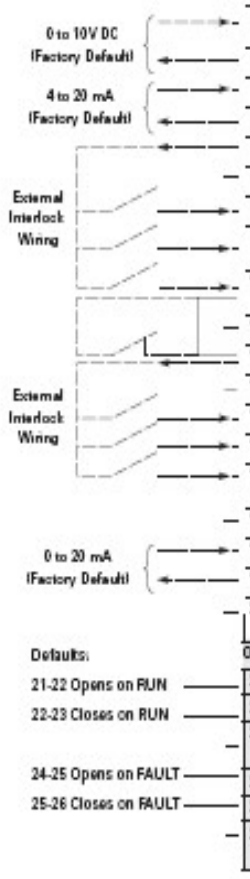
① Insert a "1" for TYPE 1 or a "2" for TYPE 12 in place of the "x" in the Catalog Number.

Table 3: 575V VT Output Power Ratings — Open Drive

Catalog Number ①	Frame Size	Three-Phase Input	
		Horsepower	Current
VSD0035x0A_	FR5	3	4.5
VSD0055x0A_		5	7.5
VSD0075x0A_		7-1/2	10
VSD0105x0A_		10	13.5
VSD0155x0A_		15	18
VSD0205x0A_		20	22
VSD0255x0A_		25	27
VSD0305x0A_		30	34
VSD0405x0A_	FR7	40	41
VSD0505x0A_		50	52
VSD0605x0A_	FR8	60	62
VSD0755x0A_		75	80
VSD1005x0A_		100	100
VSD1255x0A_	FR9	125	125
VSD1505x0A_		150	144
VSD2005x0A_		200	208

① Insert a "1" for TYPE 1 or a "2" for TYPE 12 in place of the "x" in the Catalog Number.

Table 4: Remote Input Application Default I/O Configuration Main Control Board



Terminal		Signal	Description
OPTA1			
1	+10V DC$_{ref}$	Reference output	Voltage for potentiometer, etc.
2	AI-1+	Analog input, voltage range 0 – 10V DC	Voltage input frequency setpoint
3	AI-1-	I/O Ground	Ground for reference and controls
4	AI-2+	Analog input, current range 0 – 20 mA	Current input frequency setpoint
5	AI-2-		
6	24V DC	Control voltage output	Voltage for switches, etc. max 0.1A
7	GND	I/O ground	Ground for reference and controls
8	DI-1	Start/Stop Control	Contact closed = start
9	DI-2	External fault input (programmable)	Contact closed = fault Contact open = no fault
10	DI-3	External Interlock (programmable)	Contact closed = OK Open = Interlocked
11	CMA	Common for DI-1 – DI-3	Connect to GND or 24V DC
12	24V DC	Control voltage output	Voltage for switches (see terminal 6)
13	GND	I/O ground	Ground for reference and controls
14	DI-4	PM Setback (programmable)	Contact closed = PM setback active
15	DI-5	Fire Mode (programmable)	Contact closed = Fire Mode active
16	DI-6	Overload relay (IntelliPass) (programmable)	Contact open = no fault Contact closed = fault
17	CMB	Common for DI-4 – DI-6	Connect to GND or 24V DC
18	AO-1+	Output frequency Analog output	Programmable Range 0 – 20 mA, RL max. 500Ω
19	AO-1		
20	DO-1	Digital output READY	Programmable Open collector, I=50 mA, V=48V DC
OPTA2			
21	RO-1	Relay output 1	Programmable Drive RUN is default.
22	RO-1		
23	RO-1		
24	RO-2	Relay output 2	Programmable Drive FAULT is default.
25	RO-2		
26	RO-2		

Note: For more information on jumper selections, see *User Manual LIT-1201929, Chapter 4.*

X3 Jumper Setting — CMA and CMB Grounding

CMB Connected to Ground
CMA Connected to Ground

CMB Isolated from Ground
CMA Isolated from Ground

CMB and CMA Internally Connected and Isolated from Ground

⚠ CAUTION

Unattended start will occur if power is supplied with Start Command activated.

Option Board A9 Jumper Location and Settings — Slot A

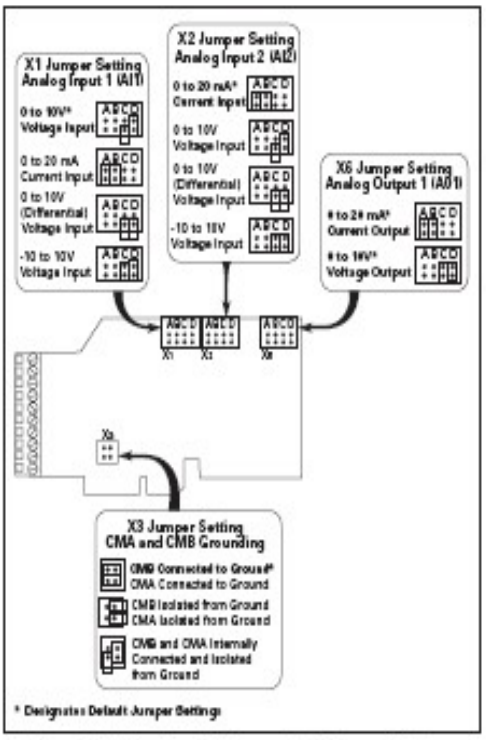


Figure 12: Option Board A9 Jumper Location and Settings

Fault and Warning Codes/Solutions

Table 5: Fault Codes

Fault Code	Fault	Possible Cause	Solution
1	Overcurrent	VSD Series drive has detected a high current ($>4x I_H$) in its output due to: • sudden heavy load increase • short in the motor • short in the cables to the motor • unsuitable motor	Check loading. Check motor. Check cables.
2	Overvoltage	The DC-link voltage has exceeded its high limit due to: • too short a deceleration time • high voltage levels or surges in the utility supply	Make the deceleration time longer. Use brake chopper and brake resistor (standard on some models, available as options on others). Correct utility supply voltage (level is too high). Add input impedance to limit surges.
3	Ground (Earth) Fault	Current sensing indicates that the sum of motor phase currents is not zero. • insulation failure in motor or motor cables	Check motor and motor cables.
5	Charging Switch	The charging switch was open, when the START command was given due to: • faulty operation • component failure	Reset the fault and restart. Should the fault re-occur, contact your Johnson Controls distributor.
6	Emergency stop	An Emergency stop signal was received from one of the digital inputs	Determine reason for the Emergency stop and remedy it.
7	Saturation trip	• defective component • motor or motor cable short	Cannot be reset from the keypad. Switch off power. IF THE PROBLEM IS NOT IN THE MOTOR OR ITS CABLES, DO NOT RE-CONNECT POWER! Contact your Johnson Controls distributor. If this fault appears simultaneously with Fault 1, check the motor and motor cables.
8	System fault	• component failure • faulty operation Note: exceptional fault data record, see Active Fault Menu for more information	Reset the fault and restart. Should the fault re-occur, contact your Johnson Controls distributor.
9	Undervoltage	DC-link voltage is less than the minimum safe operating voltage limit: • most probable cause: too low a utility supply voltage • VSD Series internal fault	If there was a supply voltage loss or dip, reset the fault and restart the VSD Series drive. Check the supply voltage. If it was within specification at the time of the fault, an internal failure has occurred. Contact your Johnson Controls distributor.
10	Input line supervision	Input line phase is low or missing.	Check the utility supply voltage, cables and connections.
11	Output phase supervision	Current sensing indicates that there is no current in one motor phase	Check the motor cables, connections and motor.

Table 6: Fault Codes (Continued)

Fault Code	Fault	Possible Cause	Solution
12	Brake chopper supervision	• no brake resistor installed • brake resistor is broken • brake chopper failure	Check the brake resistor. If the resistor is ok, the chopper is faulty. Contact your Johnson Controls distributor.
13	VSD Series under-temperature	Heatsink temperature is under -10°C	Provide supplemental heating or relocate the VSD Series drive to a warmer location.
14	VSD Series overtemperature	Heatsink temperature is over 90°C.	An overtemperature warning is issued when the heatsink temperature exceeds 85°C, a fault occurs at 90°C. Check for the correct amount and unrestricted flow of cooling air. Check the heatsink for dust or dirt buildup. Check the highest ambient temperature level. Make sure that the switching frequency is not set too high in relation to the ambient temperature and motor load.
15	Motor stalled	• motor or load mechanical failure • load too high • stall parameter settings incorrect	Check the motor, mechanical system and load level. Confirm the stall parameter settings.
16	Motor overtemperature	• motor is overloaded • motor overheating has been detected by VSD Series motor temperature model	Decrease the motor load. If no motor overload exists, check the temperature model parameters.
17	Motor underload	• mechanical or load problem • underload parameter settings incorrect	Check the motor, check for a loose belt, broken coupling or load problems. Confirm underload parameter settings.
22 23	EEPROM checksum fault	Parameter save fault • faulty operation • component failure	Upon reset of this fault, the VSD Series drive will automatically reload the parameter default settings. Check all parameter settings after reset. If the fault reoccurs, contact your Johnson Controls distributor.
25	Microprocessor watchdog fault	• faulty operation • component failure	Reset the fault and restart. If the fault reoccurs, contact your Johnson Controls distributor.
26	Start-up prevented	Start-up of the drive has been prevented.	Check Start Enable/ Interlock settings.
29	Thermistor fault	The thermistor input of an option board has detected a high motor temperature	Check the motor cooling and the motor loading. Check the thermistor connection. (If the thermistor input of an option board is not being used, it must be short-circuited.)
31	IGBT temperature hardware	IGBT Inverter Bridge overtemperature protection has detected high short term overload current	Check loading. Check motor size.
32	Fan cooling	The VSD Series cooling fan did not start when commanded	Contact your Johnson Controls distributor.

Table 6: Fault Codes (Continued)

Fault Code	Fault	Possible Cause	Solution
34	CAN bus communication	Sent message not acknowledged	Ensure that there is another device on the bus with the appropriate configuration.
36	Control unit	Control unit cannot control the power unit and vice-versa	Change control unit.
37	Device change	• option board changed • different power rating of drive	Reset. Note: No fault time data record!
38	Device added	• option board added • drive of different power rating added	Reset. Note: No fault time data record!
39	Device removed	• option board removed • drive removed	Reset. Note: No fault time data record!
40	Device unknown	Unknown option board or drive	Contact your Johnson Controls distributor.
41	IGBT temperature software	IGBT Inverter Bridge overtemperature protection has detected high short term overload current	Check loading. Check motor size.
42	Brake resistor overtemperature	Brake resistor overtemperature protection has detected excessive braking	Set the deceleration time longer. Use an external brake resistor.
43	Encoder fault	Note: the exceptional Fault data record. See Active Fault Menu for more information. Additional coder: 1 Encoder 1 channel A is missing 2 Encoder 1 channel B is missing 3 Both encoder 1 channels are missing 4 Encoder reversed	Check encoder channel connections. Check the encoder board.
50	Analog input I_{in} < 4 mA (for signal range 4 to 20 mA)	Current at the analog input is < 4 mA • control cable is broken or loose • signal source has failed	Check the current loop, signal source and wiring.
51	External fault	Digital input set as an external fault input has been triggered.	Check source of trigger.
52	Keypad communication fault	The connection between the control keypad and the VSD Series drive has been lost.	Check keypad connection and keypad cable.
53	Communication bus fault	The data connection between the communication bus master and the communication bus board has failed	Check installation. If installation is correct, contact your Johnson Controls distributor.
54	Slot fault	Defective option board or slot	Check that the board is properly installed and seated in slot. If installation is correct, contact your Johnson Controls distributor.
82	BypassOverLoad	The motor has been overloaded while connected to the bypass	Decrease the motor load. Disable the Current Imbalance feature – see the *I.T. manual*.

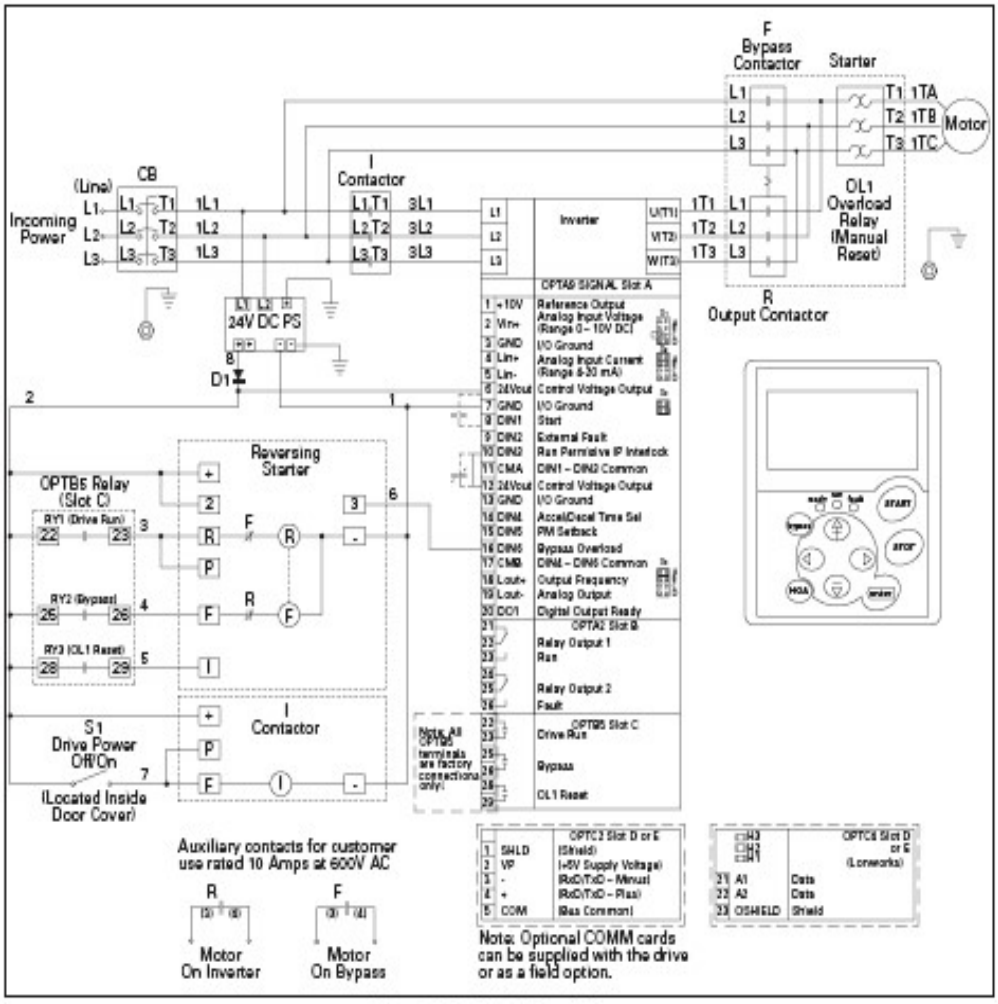


Figure 13: IntelliPass 3 Contactors

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