Wheat Ridge Recreation Center

Lennox Rooftop Unit Replacement Analysis

November 30, 2018

4005 Kipling St. Wheat Ridge, CO 80033

The Ballard Group, Inc.
Mechanical Consulting Engineers

Analysis Prepared for	Analysis Prepared by
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This facility assessment report summarizes the condition of existing mechanical and plumbing systems at the Community Center of Aurora – Student Center Building. This report summarizes the existing equipment and suggested replacements. The information presented in this document is not for construction or permitting. Final construction and permit documents are to be provided by others.	
This report has been prepared at the request of the client, and the conclusions, and recommendations contained herein constitute the opinions of The Ballard Group. In preparing this report, TBG has utilized the replacement model numbers provided in the insurance report by the client and associated equipment manuals available online for existing and replacement equipment data. TBG cannot make certification or give assurances except as explicitly defined in this report.	

Wheat Ridge Recreation Center

LENNOX ROOFTOP UNIT REPLACEMENT

1 –Summary

Building Name: Wheat Ridge Recreation Center

Address: 4005 Kipling St. Wheat Ridge, CO 80033

Phone: (303) 231-1300

General Use: Community Recreation Center.

Original Construction: 1999

Code References:

1) 2017 NEC – National Electric Code
2) 2015 IEBC – International Existing Building Code
3) 2015 IBC – International Building Code
4) 2015 IMC – International Mechanical Code
5) 2015 IECC – International Energy Conservation Code
6) 2015 IFGC – International Fuel Gas Code
7) 2015 IPC – International Plumbing Code
8) 2015 IFC – International Fire Code

General:

The roof of the Wheat Ridge Recreation Center incurred significant damage from a May 2017 hail storm. The insurance report completed by HVAC Investigators listed the Lennox rooftop units as damaged beyond repair with a full system replacement included in the insurance claim. This analysis outlines the replacement options from Lennox for the RTUs. Intent is to identify where added value can be incurred by using the available Lennox lines with higher efficiency.

Replacement Lennox Equipment:

(NOTE: Although this report identifies three (3) different lines of Lennox equipment that is compatible with the existing equipment, the City of Wheat Ridge has decided that the Landmark High Efficiency product line. Please disregard information pertaining to the other lines.)

There are (3) lines of rooftop units from Lennox available that have configurations that are relatively close to the existing equipment. With these (3) lines, replacement is anticipated to be feasible using adapter curbs and duct transitions as necessary to connect the existing

equipment to the existing roof curbs and existing duct connections within the curbs. The applicable rooftop equipment lines from Lennox included in the analysis include the ~~Landmark~~, Landmark High Efficiency ~~and Energance~~. ~~The other rooftop equipment lines available from Lennox, Strategos, Raider and Energance Ultra were also reviewed but the dimensions and/or duct configurations vary significantly from the existing L-Series Lennox equipment and are therefore not included in the analysis~~. ~~A side by side comparison of dimensions and efficiency for each Lennox line is provided in Appendix A. The comparison matrix is based on like for like size replacements.~~

Replacement Equipment Controls: The existing Lennox L-Series equipment utilizes field installed DDC controls. The local DDC controllers are manufactured by Delta Controls and were installed by Setpoint Systems. The controllers operate in conjunction with the existing Lennox factory controls. The replacement rooftop units will also be provided with factory installed controllers. The replacement units must retain the factory controllers and shall be interfaced to the Delta controllers via the factory controller terminal block with other devices field installed to match the existing configurations. An additional feature that we would recommend including with the replacement Lennox rooftop units is the optional BACnet interface. This would allow for interface of additional factory control points to the Delta control system once it is upgraded to a BACnet system in the future. This interface would allow for detailed equipment monitoring and additional setpoint adjustment capability.

~~1) Lennox Landmark Standard Efficiency.~~

~~a) Summary: Light duty commercial rooftop unit, constant volume supply fan, with economizer cooling, direct expansion (DX) cooling and natural gas heating. Unit is constructed with single wall sheetmetal and duct liner. These units should be the basis for a "like for like" replacement. However when replacing equipment it must still be installed per current local codes.~~

~~b) Configurations: Dimensions and duct layouts do not exactly match the existing units however configurations are similar. Thus replacement is feasible using an adapter roof curb and ductwork transitions as necessary to match existing to new dimensions.~~

~~c) Staging: Unit supply fans operate at a constant speed during occupied mode. The economizer modulates, DX cooling stages and gas heat stages as necessary to maintain the room temperature at its setpoint.~~

~~d) Replacement Scope of Work:~~

i) ~~Replace existing L-Series RTUs with Lennox Landmark Standard Efficiency units of capacities closely matching existing unless larger units are required to comply with local ventilation codes (see item x.). Provide each unit with an adapter curb and duct transitions necessary to install the equipment.~~

ii) ~~Replacement equipment and their installation shall be reviewed and permitted by the local permitting agency. Code references above assume compliance with the 2015 International Codes is required, verify with the local permitting agency.~~

iii) ~~Verify existing power connections to the RTU are of matching voltage and verify that the existing service is adequate for the connected load as per requirements of the 2017 NEC. Verify and provide electrical devices as required to meet the 2017 NEC, possible items required for compliance; disconnects, fuses, convenience outlets and/or short circuit protection.~~

iv) ~~Verify that the gas pressure available from the existing system is with-in the operating gas pressure range of the selected RTU and verify that the existing gas piping is adequately sized. Connect adequately sized gas piping to RTU with shut off valve and PRV (if required) per the 2015 IFGC requirements.~~

v) ~~Interface replacement units to the Delta DDC controllers via the factory controller terminal block with other miscellaneous sensors added to match existing. Controls available through the terminal block are limited to fan enable, heat stage 1, heat stage 2, cooling stage 1 and cooling stage 2. Additional field installed controls that shall be provided and wired by the Setpoint Systems to match the existing unit controls include a filter high pressure alarm switch, supply air temperature sensor, return air temperature sensor, supply fan current switch for fan monitoring, exhaust fan current switch for fan monitoring. The final controls installation should be configured and programmed to match existing. It is assumed that the existing delta controllers, temperature sensors and override switches shall remain for reuse with the replacement equipment unless upgraded and replaced with a separate project~~.

vi) ~~Existing duct mounted smoke detectors should be reconnected to the replacement equipment for unit shutdown~~.

vii) ~~Provide replacement rooftop units with a factory installed BACnet interface for connection to the Delta controls system upon its future upgrade~~.

viii) ~~Provide unit cooling coil with condensate drain and trap assembly in compliance with the 2015 IPC~~.

ix) ~~Provide the Rooftop unit with all other applicable options as necessary to match the existing equipment and as necessary meet the current local code requirements, including but not limited to; CO2 sensors for demand ventilation control, 100% outside air economizer, relief for outside air economizer, hail guards, short circuit protection and local disconnect switch. Set limits of the CO2 demand ventilation control as required by the 2015 IMC and as required for adequate building pressurization~~.

x) ~~Power Exhaust: Provide replacement equipment with factory mounted power exhaust fans to match the existing unit configurations. It is believed that units 5~~

~~ton and smaller have barometric relief air and units 8.5 ton and larger have power exhaust fans~~.

xi) ~~Rebalance rooftop unit total supply air to match existing equipment. Verify ventilation required by the 2015 IMC and balance outside air damper to comply. The required minimum OA may be greater than existing, which could require an increase in the gas heating and/or cooling capacity of the RTU to comply~~.

xii) ~~Provide commissioning of replacement equipment as required by the 2015 IECC~~.

xiii) ~~Adapter curbs should be adequately sized, installed and flashed for a complete water proof, support system~~.

xiv) ~~Roof penetrations for any new or modified electrical or controls conduit should be adequately flashed for a water proof system~~.

xv) ~~Verify that the final installation is in compliance with the manufactures installation requirements~~.

xvi) ~~Provide Comcheck report to the permitting agency to verify that the installation is in compliance with the 2015 IECC~~.

xvii) ~~Provide ventilation calculations to the permitting agency to verify that the final installation meets the 2015 IMC ventilation requirements~~.

xviii) ~~Where total RTU weights exceed limits noted in the original record structural drawings or where original record structural drawings do not indicate RTU weight limits; provide structural calculations to verify structural compliance with the 2015 IBC~~.

2) Lennox Landmark High Efficiency.
   a) Summary: Light duty commercial rooftop unit, variable volume supply fan, with economizer cooling, direct expansion (DX) cooling and natural gas heating. Unit is constructed with single wall sheet metal and duct liner. These units provide a slight cooling efficiency upgrades vs the base equipment however they have the same cabinet layout and unit design. Units 8.5 ton and larger have a multi-stage fan speed control utilizing a supply fan variable frequency drive that operates at pre-set "staged" speeds based on the applicable heating or cooling stage.
   b) Configurations: Dimensions and duct layouts do not exactly match the existing units however configurations are similar. Thus direct replacement is feasible using an adapter roof curb and ductwork transitions as necessary to match existing to new dimensions.
   c) Staging: Unit supply fans operate at multi-stage speeds during occupied mode. The operating supply fan speed shall be automatically controlled to match the applicable heating or cooling stage. The economizer modulates, DX cooling stages and gas heat stages as necessary to maintain the room temperature at its setpoint. The small units under 8.5 ton do not have a multi-stage supply fan option, these operate at a constant supply fan speed.

d) Heating: The addition of the Muti-Stage fan speed control will create conditions where the mixed air temperature could fall below 45°F. Recommend use of stainless steel heat exchanger with this option.
e) Replacement Scope of Work: The replacement scope of work for the Lennox Landmark High Efficiency unit option shall be identical to the Lennox Landmark Standard Efficiency however should include the following additional options
   i) Include higher operating cooling efficiencies as indicated in Appendix A.
   ii) Supply fan wired to a factory provided variable frequency drives with Multi-Stage Air Volume fan speed control.
   iii) Stainless steel gas heat exchanger.
   iv) Controls scope shall match the Landmark Standard Efficiency unit however configure unit factory controller to also include the Multi-Stage Air Volume fan speed control.

3) ~~Lennox Energence High Efficiency~~.
   a) ~~Summary: Light duty commercial rooftop unit, variable volume supply fan, with economizer cooling, direct expansion (DX) cooling and natural gas heating. Unit is constructed with single wall sheetmetal with foil faced insulation. These units are very similar to the Landmark High Efficiency units~~.
   b) ~~The Energence units also offer an option for upgraded factory controls that includes a dehumidification mode to control the unit. This was not available with the existing equipment~~.
   c) ~~The cabinet construction is very similar however includes a foil faced insulation in lieu of exposed duct liner for longer expected life of equipment insulation~~.
   d) ~~Configurations: Dimensions and duct layouts do not exactly match the existing units however configurations are similar. Thus direct replacement is feasible using an adapter roof curb and ductwork transitions as necessary to match existing to new dimensions~~.
   e) ~~Staging: Unit supply fans operate at multi-stage speeds during occupied mode. The operating supply fan speed shall be automatically controlled to match the applicable heating or cooling stage. The economizer modulates, DX cooling stages and gas heat stages as necessary to maintain the room temperature at its setpoint~~.
   f) ~~Replacement Scope of Work: The replacement scope of work for the Lennox Energence High Efficiency unit option shall be identical to the Lennox Landmark Standard Efficiency however should include the following additional options~~
      i) ~~Include higher operating cooling efficiencies as indicated in Appendix A~~.
      ii) ~~Supply fan wired to a factory provided variable frequency drives with Multi-Stage Air Volume fan speed control~~.
      iii) ~~Stainless steel gas heat exchanger~~.
      iv) ~~Single wall construction and foil faced insulation~~.
      v) ~~Controls scope shall match the Landmark Standard Efficiency unit however configure unit factory controller to also include the following~~

(1) ~~Configure the Multi-Stage Air Volume fan speed control~~.
(2) ~~Configure the Lennox factory dehumidification control mode, utilize a space humidity setpoint of 50% maximum. Provide with a field mounted and installed space humidity sensor as required~~.