

## **PRODUCT CHECKLIST - COMMERCIAL CONTROLS/BIM**

### **From a Design Engineer's Point-of-View:**

- Innovative but with proven existing software performance?
- Is the software AEC or AECO&M (architect, engineer, contractor, operation and/or maintenance) user friendly?
- Multi-discipline AEC or AECO&M library?
- Equipment linked from floor plan to schedule sheet?
- Multi-discipline (mechanical, electrical, structural, communication, codes, & safety)?

### **From an HVAC Contractor Point-of-View:**

- Can equipment schedules be linked to purchase orders?
- Can equipment be linked to accessibility e.g., coil removal?
- Can sheet metal and pipe distribution be linked to estimate take off?
- Can sheet metal and pipe distribution be fabricated and bar coded for distribution to site?
- Actively track RFI's (request for information) and change orders?

### **From a Facility Manager's Point-of-View:**

- Can equipment schedule sheets be linked to CMMS (computerized maintenance management software) system database?
- Can program have pre-assigned facility management layers e.g., layer for shutoff valves?
- Can program link equipment to service contracts and warranties?
- Can program create emergency planning (safety shelter space, egress, etc.)

### **From an Environmental & Energy Point-of-View:**

- Can program sort and record removal materials for recycle?
- Can program provide estimated equipment useful service life in years?
- Can program sort and record local materials?
- Can program tracking the construction-operation process lifecycle from installation, operation and maintenance to end-of-useful life demolition?
- Can program link to life cycle energy simulation based on building materials and different mechanical and electrical systems?

### **From an Educational Application Point-of-View:**

- Program is protected in the Cloud?
- Suitable for students and educational institutions to use for an introduction to model-based design coordination
- Program applicable to Microsoft Corporation and Apple-Macintosh?
- Can be used on a tablet computer?
- Can be used in sync with graphic art software?

## **PRODUCT CHECKLIST- COMMERCIAL CONTROLS/BAS**

### **From a Design Engineer's Point-of-View:**

- Innovative but with proven existing performance documentation?
- Can program link with equipment manufacturer's BAS programs?
- Can program generate the associated sequence of operation document?
- Can program initiate suggested safety and security point suggestions?
- Can designer edit BAS manufacturer's "canned" system flow diagrams?

### **From an HVAC Contractor Point-of-View:**

- Can program highlight "work by orders" e.g., electrical power requirements?
- Can program be linked to field coordinated HVAC fabrication drawings with BAS devices?
- Can BAS software and equipment manufacturer BAS software be integrated into one record document for project closeout?
- Does BAS program include commissioning functional performance test procedures?
- Local BAS technical support available?

### **From a Facility Manager's Point-of-View:**

- Automatic controls are compatible with latest Internet communication?
- Automatic controls come with security/fire wall?
- Can maintenance be performed by in-house maintenance staff?
- Can program sequences be enhanced by in-house operation staff?
- Can BAS provide continuous commissioning including regular reports and alarm reports?

### **From an Environmental Point-of-View:**

- Are BAS devices recycle able versus throw-away?
- Uses \_\_\_% recycled materials?
- Uses \_\_\_% local materials
- Estimated products have a documented useful service life of estimates?
- Can BAS devices be recycled again?

### **From an Energy Conservation Point-of-View:**

- Can BAS provide budget estimates for "canned" sequences of operation systems
- Has a return-on-investment for the premium it costs over traditional automatic control systems?
- Can BAS program be able to calculate Net Zero Energy consumption?
- Can BAS trend gallons per minute (GPM) and cubic feet per minute (CFM) to continuously monitor and report on air and water balancing?
- Can BAS be linked and used on a tablet?

## **PRODUCT CHECKLIST- BOILERS**

*(Keep It Defendable criteria)*

### **From a Design Engineer's Point-of-View:**

- Furnish engineering technical documentation. Boiler performance, dimensions, utility connections, application manuals, installation manuals, CAD and REVIT files, and operation manuals.
- What is normal operating range (percentage of full load)?
- Can operate up to \_\_\_% burner efficiency?
- Can operate on natural gas, propane gas, #2 oil, and/or electricity?
- Can generate \_\_\_F hot water, \_\_\_F high temperature hot water, 15 PSIG steam, 125 PSIG steam

### **From an HVAC Contractor Point-of-View:**

- Can be shipped in one piece?
- Can the boiler be partially disassembled to accommodate installation into existing building?
- Additional delivery time in relation to standard boiler?
- Manufacturer technician training staff readily available?
- Can the boiler be easily recommissioned?

### **From a Facility Manager's Point-of-View:**

- Automatic controls are compatible with latest Internet communication?
- Automatic controls come with security/fire wall?
- Can maintenance be performed by in-house maintenance staff?
- Extended warranty is for \_\_\_-years?
- Direct connection to outdoor combustion air?
- Additional components and options available.

### **From an Environmental Point-of-View:**

- What is the embedded carbon footprint of boiler manufacturing?
- What nonozone-depleting, recyclable, and energy-efficient materials were used in manufacturing the boiler? What percentage of material weight meets these criteria?
- What is the environmental impact of boiler exhaust?
- What weight percentage of boiler was made from recycled material?
- Can boiler be refurbished to extend useful service life of ? What is anticipated boiler useful life \_\_\_-years?
- Percentage of boiler that is recycleable?

### **From an Energy Conservation Point-of-View:**

- Boiler energy consumption below IECC Table C403.3.5 (5) energy performance requirements?
- What is innovated boiler cost premium compared to standard boiler? Please provide a baseline energy cost. What is return-on-investment for innovated boiler based upon 0.10 \$/KWH and ??? \$/BTU energy rate?

## **PRODUCT CHECKLIST - IAQ & VENTILATION**

*(Keep It Defendable criteria)*

a. **Note: based on air handling equipment with filter section**

### **From a Design Engineer's Point-of-View:**

- Innovative but with proven existing performance documentation?
- Includes \_\_\_\_\_ type humidification and/or \_\_\_\_\_ dehumidification?
- Can also use charcoal filters, electronic filters and/or ultraviolet light?
- Includes humidity and/or dust control monitoring?
- Can be provided with centrifugal, in-line, propeller, plug, and/or vane axial type of fan?

### **From an HVAC Contractor Point-of-View:**

- Can be shipped in one piece?
- Can be disassembled to accommodate existing building conditions?
- Readily available within \_\_-weeks?
- IAQ certified technician on staff or consultant to contractor?
- Locally made IAQ equipment?

### **From a Facility Manager's Point-of-View:**

- Manufacturer furnished automatic controls are compatible with latest Internet communication?
- Manufacturer furnished automatic controls come with security/fire wall?
- Can IAQ/ventilation verification of equipment be performed by in-house maintenance staff?
- Extended IAQ warranty is for \_\_-years?
- Can accommodate full range of MERV (minimum efficiency reporting value) rated filters?

### **From an Environmental Point-of-View:**

- Can be added within room to improve IAQ movement
- Uses \_\_% recycled materials?
- Uses \_\_% local materials
- Estimated equipment useful service life of \_\_-years?
- Can materials be recycled again?

### **From an Energy Conservation Point-of-View:**

- Energy consumption of equipment can be up to \_\_% efficient?
- Has a return-on-investment for the premium it costs over traditional IAQ equipment?
- Can contribute to Net Zero Energy consumption?
- Unit furnished continuous commissioning capabilities?
- Variable flow and variable speed while maintaining \_\_% relative humidity?

## **PRODUCT CHECKLIST - MOTORS**

*(Keep It Defendable criteria)*

### **From a Design Engineer's Point-of-View:**

- Furnish engineering technical documentation. Motor performance, dimensions, utility connections, application manuals, installation manuals, CAD and REVIT files, and operation manuals.
- What is normal operating range (percentage of full load)?
- Non-overload profile?
- Direct digital controlled?
- Applicable in an existing building application?

### **From an HVAC Contractor Point-of-View:**

- Motor and drive can be shipped in one piece?
- Can be provided explosion-proof?
- Additional delivery time in relation to standard motor?
- Manufacturer technician training staff readily available?

### **From a Facility Manager's Point-of-View:**

- Automatic controls are compatible with latest Internet communication?
- Automatic controls come with security/fire wall?
- Can maintenance be performed by in-house maintenance staff?
- Extended warranty is for \_\_\_-years?
- Additional components and options available.
- Motor energy consumption below IEC 60034-30-1 requirements for IE3 premium efficiency motors?

### **From an Environmental Point-of-View:**

- What is the embedded carbon footprint of motor manufacturing?
- What nonozone-depleting, recyclable, and energy-efficient materials were used in manufacturing the motor? What percentage of material weight meets these criteria?
- What weight percentage of motor was made from recycled material?
- Can motor be refurbished to extend useful service life of ? What is anticipated motor useful life \_\_\_-years?
- Percentage of motor that is recycleable?

### **From an Energy Conservation Point-of-View:**

- What is innovated motor cost premium compared to standard motor? Please provide a baseline energy cost. What is return-on-investment for innovated motor based upon 0.10 \$/KWH energy rate?

## **PRODUCT CHECKLIST - PUMPS**

*(Keep It Defendable criteria)*

### **a. separated pumps from flow controls because they are really different programs**

#### **From a Design Engineer's Point-of-View:**

- Furnish engineering technical documentation. Pump performance, dimensions, utility connections, application manuals, installation manuals, CAD and REVIT files, and operation manuals.
- What is normal operating range (percentage of full load)?
- Uses a variety of seals?
- Applicable in an existing building application?

#### **From an HVAC Contractor Point-of-View:**

- Can be shipped in one piece?
- Can the pump be partially disassembled to accommodate installation into existing building?
- Additional delivery time in relation to standard pump?
- Manufacturer technician training staff readily available?

#### **From a Facility Manager's Point-of-View:**

- Automatic controls are compatible with latest Internet communication?
- Automatic controls come with security/fire wall?
- Can maintenance be performed by in-house maintenance staff?
- Extended warranty is for \_\_\_-years?
- Can the pump be easily recommissioned?
- Additional components and options available.

#### **From an Environmental Point-of-View:**

- What is the embedded carbon footprint of pump manufacturing?
- What nonozone-depleting, recyclable, and energy-efficient materials were used in manufacturing the pump? What percentage of material weight meets these criteria?
- What weight percentage of pump was made from recycled material?
- Can pump be refurbished to extend useful service life of ? What is anticipated pump useful life \_\_\_-years?
- Percentage of pump that is recycleable?

#### **From an Energy Conservation Point-of-View:**

- Pump total energy consumption below Department of Energy Pump Energy Indexes, Pump Energy Index Constant Load (PEICL) and Pump Energy Variable Load (PEIVL)?
- What is innovated pump cost premium compared to standard pump? Please provide a baseline energy cost. What is return-on-investment for innovated pump based upon 0.10 \$/KWH energy rate?

## **PRODUCT CHECKLIST - CHILLERS**

*(Keep It Defendable criteria)*

### **a. Separated chillers from cooling towers because they are really different programs**

#### **From a Design Engineer's Point-of-View:**

- Furnish engineering technical documentation. Chiller performance, dimensions, utility connections, application manuals, installation manuals, CAD and REVIT files, and operation manuals.
- What is normal operating range (percentage of full load)?
- Uses something other than a refrigerant for mechanical cooling?
- Doesn't require ASHRAE Standard 15 Safety Standards for Refrigeration Systems?
- Applicable in an existing building application?

#### **From an HVAC Contractor Point-of-View:**

- Can be shipped in one piece?
- Can the chiller be partially disassembled to accommodate installation into existing building?
- Additional delivery time in relation to standard chiller?
- Manufacturer technician training staff readily available?

#### **From a Facility Manager's Point-of-View:**

- Automatic controls are compatible with latest Internet communication?
- Automatic controls come with security/fire wall?
- Can maintenance be performed by in-house maintenance staff?
- Extended warranty is for \_\_-years?
- Can the chiller be easily recommissioned?
- Additional components and options available.

#### **From an Environmental Point-of-View:**

- What is the embedded carbon footprint of chiller manufacturing?
- What nonozone-depleting, recyclable, non-toxic, and energy-efficient materials were used in manufacturing the chiller? What percentage of material weight meets these criteria?
- What weight percentage of chiller was made from recycled material?
- Local to the project or local to the manufacturing plant?
- Can chiller be refurbished to extend useful service life of ? What is anticipated chiller useful life \_\_-years?
- Percentage of chiller that is recycleable?

#### **From an Energy Conservation Point-of-View:**

- Chiller total energy consumption below IECC Table C403.3.2 (7) for both full load (FL) and part load performance (IPLV).
- What is innovated chiller cost premium compared to standard chiller? Please provide a baseline energy cost. What is return-on-investment for innovated chiller based upon 0.10 \$/KWH energy rate?

## **PRODUCT CHECKLIST - COOLING TOWERS**

*(Keep It Defendable criteria)*

### **From a Design Engineer's Point-of-View:**

- Furnish engineering technical documentation. Cooling tower performance, dimensions, utility connections, application manuals, installation manuals, CAD and REVIT files, and operation manuals.
- What is normal operating range (percentage of full load)?
- What material of construction options are there?
- Is the cooling tower easily commissioned?

### **From an HVAC Contractor Point-of-View:**

- How easy is on-site assembly of cooling tower?
- Can the cooling tower be partially disassembled to accommodate installation into existing building?
- Additional delivery time in relation to standard cooling tower?
- Certified technician for tower readily available?

### **From a Facility Manager's Point-of-View:**

- Automatic controls are compatible with latest Internet communication?
- Automatic controls come with security/fire wall?
- Can maintenance be performed by in-house maintenance staff?
- Extended warranty is for \_\_\_-years?
- Can the cooling tower be easily recommissioned?
- Additional components and options available.

### **From an Environmental Point-of-View:**

- What is the embedded carbon footprint of cooling tower manufacturing?
- What nonozone-depleting, recyclable, and energy-efficient materials were used in manufacturing the cooling tower? What percentage of material weight meets these criteria?
- What weight percentage of cooling tower was made from recycled material?
- Local to the project or local to the manufacturing plant?
- Can cooling tower be refurbished to extend useful service life of? What is anticipated cooling tower useful life \_\_\_-years?
- Percentage of cooling tower that is recycleable?

### **From an Energy Conservation Point-of-View:**

- Pump energy consumption below IECC Table C403.3.2 (8) GPM/HP for full load and partial load conditions. The partial load calculations should use the same weighted average as chiller IPLV.
- Total energy consumption (pump, fans) KW/Ton for full load and partial load conditions. The partial load calculations should use the same weighted average as chiller IPLV.
- What is innovated cooling tower cost premium compared to standard cooling tower? Please provide a baseline energy cost. What is the turn-on-investment for innovated cooling tower based upon 0.10 \$/KWH energy rate?



## **PRODUCT CHECKLIST - ROOFTOP UNITS & DOAS**

### **From a Design Engineer's Point-of-View:**

- Innovative but with proven existing performance documentation?
- Utility Source: [ ] Gas @ \_\_\_% Efficiency Output [ ] Oil @ \_\_\_% Efficiency Output [ ] All Electric
- Can Heat Down to [ ] Fan \_\_\_% Load [ ] Heating \_\_\_% Load [ ] Heat Pump VRF \_\_\_% Load?
- Can Cool Down to [ ] Fan \_\_\_% Load [ ] Compressor \_\_\_% Load [ ] VRF \_\_\_% Load?
- Energy Recovery: [ ] Air-to-Air HR [ ] Water Coil HR [ ] Refrigerant HR

### **From an HVAC Contractor Point-of-View:**

- Can be shipped in one piece?
- Can be disassembled to accommodate existing building conditions?
- Readily available within \_\_\_-weeks?
- Manufacturer technician training staff readily available?
- Locally made?

### **From a Facility Manager's Point-of-View:**

- Automatic controls are compatible with latest Internet communication?
- Automatic controls come with security/fire wall?
- Can maintenance be performed by in-house maintenance staff?
- Extended warranty is for \_\_\_-years?
- Manufacturer's service local?

### **From an Environmental Point-of-View:**

- What is the environmental impact of refrigerant?
- Uses \_\_\_% recycled materials?
- Uses \_\_\_% local materials
- Estimated equipment useful service life of \_\_\_-years?
- Can materials be recycled again?

### **From an Energy Conservation Point-of-View:**

- Energy consumption is in the top 15% per kW/Ton?
- Has a return-on-investment for the premium it costs over traditional high-efficient RTU?
- Can contribute to Net Zero Energy consumption potential?
- Continuous commissioning capabilities?
- Variable flow and variable speed while maintaining \_\_\_% system efficiency?

## **PRODUCT CHECKLIST - VRF/VRV**

### **From a Design Engineer's Point-of-View:**

- Innovative but with proven existing performance documentation?
- Can operate down to \_\_\_% heating load?
- Can operate up to \_\_\_% cooling load?
- Sound level is \_\_\_db at discharge of unit?
- Applicable in an existing building application?

### **From an HVAC Contractor Point-of-View:**

- Outdoor condensing unit require assembling on roof?
- Certified VRF technician required for installation and startup?
- Readily available within \_\_\_-weeks?
- Manufacturer technician training staff readily available?
- Locally made?

### **From a Facility Manager's Point-of-View:**

- Automatic controls are compatible with latest Internet communication?
- Automatic controls come with security/fire wall?
- Can maintenance be performed by in-house maintenance staff?
- Extended warranty is for \_\_\_-years?
- Issues associated with ASHRAE Standard 15?

### **From an Environmental Point-of-View:**

- What is the environmental impact of refrigerant?
- Uses \_\_\_% recycled materials?
- Uses \_\_\_% local materials
- Estimated equipment useful service life of \_\_\_-years?
- Can materials be recycled again?

### **From an Energy Conservation Point-of-View:**

- Has a heat recovery capability?
- Has a return-on-investment for the premium it costs over traditional VRF systems?
- Can contribute to Net Zero Energy consumption potential?
- Continuous commissioning capabilities?
- Variable flow and variable speed while maintaining \_\_\_% system efficiency?