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 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?
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 where 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 where 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 where 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 where 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 recyclable?

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 where 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 recyclable?

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?