Anthony Jones & Associates Inc
CONSULTANTS - SOFTWARE

5178 EOI – Direct Digital Controls Systems Strategic Plan

Schedule A

Technical Submission

City of Richmond

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TECHNICAL SUBMISSION

The Technical Submission for this Expression of Interest (EOI) is to include the following Sections titled and ordered as follows:

Section 1 - Description Organization Forms (Service and Construction)

Use forms provided.

Section 2 - Programming Language Example

Include screen shots of the completed program sample implemented in the programming environment.

Section 3 – BACnet Compliance

Include a drawing of a sample network and provide manufacturer's PICS statements for each proposed component.

Section 4 – Trend Capabilities

Section 5 – Scheduling, Alarm Processing – Run Analysis

Section 6 – FDD and Data Analytics Example

Include screen shots of analysis environment showing sample analysis.

Section 7 – Other Information as Desired by Respondent

This could include information on lighting controls, wireless devices etc.

- Submissions should include all Sections except Section 7.
- Each Section to start at the top of a new page.
- The information requests in each Section are numbered. Submissions should include a response to each numbered information request. Each response should be provided in the order requested and should be identified with the item number. Supporting brochures may be provided at the end of each Section if desired, but should not separate the numbered responses.
- Submission should be delivered according to the method and format identified in any general conditions identified in the EOI.

1 COMPANY INFORMATION

1.1 Service Organization

- Number of mechanical service trucks in Metro Vancouver.
- Number of DDC controls service trucks in Metro Vancouver.
- Total number of service trucks in Metro Vancouver.
- Name and telephone number of Controls Service Manager.
- How are normal service requests handled?
- Where is service dispatch office located?
- How are after hours service requests handled?
- Where is after hours service dispatch office located?
- What is the service rate for DDC controls service during normal hours?
- What is the service rate for DDC controls service for after hours?
- What is your usual on site response time during normal hours?
- What is your usual on site response time for after hours?
- What is your hourly charge for remote Internet accessed service?
- How many staff do you have dedicated to service sales?
- Provide an organizational chart of your construction department.

1.2 Construction Organization

- How many years' experience does your local firm installing DDC System Technology?
- In the last five years only, in how many buildings has your firm installed DDC systems with a minimum of 200 hardware points per building.
- How many programmers do you currently have on staff?
- How many graphic developers do you currently have on staff?
- How many construction electricians do you have on staff on average?
- What are the terms of your standard product warranty?
- How many of your programmers also work in the construction department?
- How many of your graphics developers also work in the service department?
- Does your firm manufacture the DDC product it installs?
- Where is the DDC product manufactured?
- Where is the DDC product manufacturer's head office?
- Has your firm offered DDC products from manufacturers other than the manufacturer of your current product offering?
- How long has your firm installed the products from the manufacturer of your current DDC product offering?
- Where is your centre for advanced user training on DDC system programming and graphics production?
- Provide an organizational chart of your construction department.

2 PROGRAMMING LANGUAGE

A textual programming language is defined herein to be comprised solely of ASCII characters, numbers, decimals, mathematical operators, Boolean operators and hierarchal designations.

A Block programming language is defined herein to be comprised or partially comprised of geometric shapes connected by lines to indicate calculations and program flow.

1. Describe the general form of the user programming language such as Textual or Block.
2. Briefly describe the programming environment that the City will use to create sequences of operation.
3. Provide a screen shot of the programming environment which will be used by the City.
4. Upon request - the submitter shall provide within 36 hours from request, a web link to a functioning programming environment to allow the City to evaluate all aspects of the programming language and the software development environment for up to a two week period. Provide Microsoft Remote Desktop access if the programming environment is not accessible through a Browser.
5. Describe where the TCL or BPL programming language is stored and executed in both the case of the BC and AAC.
6. Describe capabilities and limitations of performing calculations using variables and points from multiple panels connected by the network.
7. For TCL programming, describe how nested IF, THEN, ELSE statements are constructed.
8. Identify the location of your facilities where training in DDC sequence of operation programming, graphics production and system operation will be performed.
9. Identify licensing costs per seat for the programming language and environment.
10. Identify costs per seat for the BOWS software license.
11. Provide a soft copy of the programming language user's manual.

2.1 Example of TCL or BPL

1. Provide the Textural Control Language (TCL) or Block Programming Language (BPL) code example with your submission to carry out the example strategy. Provide this example code for each panel programming language and identify which panel model numbers use which language example.

Demonstrate precisely how the Control Language would be utilised to implement the following strategy:

Calculate the Minimum Weighted Temperature (MWT) by measuring 24 space temperature ST1 to ST24. Discard the four lowest space temperatures. Take the 5th lowest space temperature (STL5). Take the average of the balance of the 19 space temperatures sensors and multiply it by 0.66 (STLAVG). Calculate MWT by adding 33% of STL5 and 66% STLAVG.

If real time (RT)is between 8:00 AM and 4:00 PM and minimum weighted space temperature (MWT) is more than 4 Deg C below the building objective temperature (BOT) then start Pump #1 (P1)

As soon as Pump #1 has been on for 10 minutes, turn on the boiler (B1)

If the day of year is before July 2, then factor A is equal to 1667 - (July 2 - day of year)/1368, otherwise the factor A is equal to 1661 - (day of year - July 2)/136

If the real time is greater than (8:00 AM minus a variable) times the difference between setpoint and space temperature, and if the real time is less than 3:30 PM and if outside air temperature is less than 10 Deg C, then enable boiler.

3 BACNET COMPLIANCE

1. Identify which of the BACnet Device Profiles are provided by the manufacturer of the proposed DDC system.

3.1 DDC Panels and Network

1. Submit technical specifications for all Building Controllers (B-BC), Advanced Application Controllers (B-AAC), Application Specific Controllers (B-ASC), Operator Workstations (B-OWS), Advanced Operator Workstations (AWS), Operator Display (B-OD) and other BTL Listed products offered by the manufacture of the proposed DDC system.
2. Include BACnet Protocol Implementation Conformance Statements (PICS) per Annex A of ANSI/ASHRAE Standard 135 for all proposed components.

3.2 BACnet Intra-System Communication

1. Describe if and how gateways are implemented in a typical network structure.
2. Describe BACnet protocols implemented over Ethernet for each Device Profile offered.
3. Describe any limitations to functionality such as graphics editing, and sequence of operation programming that are imposed when using the browser interface.
4. Provide a sample Network Architecture drawing that shows vendors complying panel types, model numbers, network connection, network speed and protocol and sample point count.

3.3 Building Controllers (BC)

1. Verify that the proposed B-BC conforms to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and is listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

2. Describe where B-BCs would typically be applied.

3.4 Advanced Application Controllers (AAC)

1. Verify that the proposed B-AAC conforms to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and is listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
2. Describe where B-AACs would typically be applied.

3.5 Field devices and Smart sensors and Actuators

1. Provide technical specifications for input and output field devices generally installed with the proposed system.

3.6 Operator Workstation

1. Provide technical literature on the operator workstation.
2. Provide PICS for the proposed B-OWS, B-AWS and/or B-OD for the proposed system.
3. Identify which web browsers are supported for full functionality of the design.
4. Identify any Flash, Multimedia or third party plug-ins, or software dependencies required for the full functionality of the browser interface.

4 TREND LOGS AND GRAPHS

In reference to B-AACs:

1. Identify the minimum interval that timed trend logs can be performed (e.g. 15 seconds between samples).
2. Identify how many samples can be stored locally on the AAC for each trend log.
3. Identify how many trend logs can be created on each model of AAC.

In reference to B-BCs

4. Identify the minimum interval that timed trend logs can be performed (e.g. 15 seconds between samples).
5. Identify how many samples can be stored locally on the BC for each trend log.
6. Identify how many trend logs can be created on each model of BC.

The sample frequency and number of samples identified must assume that 1 (one) trend log has been implemented for each input and output.

7. Provide a description on the features and usage of your historical data trend logging tool.
8. Describe which formats the data can be exported in.
9. Describe how historical data is stored and which query protocols are supported.

5 SCHEDULING – ALARM PROCESSING – RUN ANALYSIS

1. Describe how normal schedules, annual holiday schedules and temporary schedules are implemented and how they are used.
2. Describe options on how alarms are can be filtered, processed and distributed.
3. Provide a screen shot of a run time totalizer showing start and stop times, durations and any other features.

6 F.D.D. AND DATA ANALYTICS

The City seeks to improve energy efficiency and reduce operating costs by implementing automated measures to identify mechanical system operational faults. Examples of a Fault Detection and Diagnostics (FDD) implementation may include for example:

- identifying air handler operation that has not taken full advantage of free cooling
- identifying excessive equipment runtime beyond present daily and weekly limits
- Valve leak-by
- Damper operational fault
- Oscillating Control Loop
- Setpoint out of threshold range
- Statistical control accuracy index for terminal equipment

6.1 Data Analysis Language

To carry out the various required analyses a Data Analysis Language is required.

1. Provide information on the language and programming environment for constructions rules for analyzing system operation.
2. Identify the manufacturer of the Data Analytics hardware and software.
3. Describe how the system may allow queries to be performed to facilitate data analysis without the need for manual data normalization, manual interpolation to compensate for missing samples, different sample frequencies or different sample timing.
4. Describe how date and time formats are handled when exporting to Excel.

6.1.1 SAMPLE ANALYSIS

1. Provide screen shots of the symbolic or textual language and programming environment to implement the following analysis:

Use the following Data Inputs:

Outdoor air temperature (OAT)

Average Perimeter Space Temperature (STPAVG)

Air handler electrical current (SFAMPS)

Perform the Following Bin Analysis

Create OAT bin of 3 C starting at minus 3.0C to 30C

Create Time of Day bins of one hour with 24 per day

Take Average of operating fan current for each cross section of OAT and hourly bins.

Segregate Tuesday to Friday, Saturday, Sunday, and Monday into four groups.

Prepare the Following Analysis Output or Similar

Provide a graphical report showing average operating fan current by hour of day during Tuesdays to Fridays for each of the 27 OAT bins. Provide a family of line graphs with hourly bins on the abscissa and average amps on the ordinate. Each line graph is for an outdoor temperature bin.

APPENDIX – FORMS FOR PART 1

6.2 Service Organization Form

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6.3 Construction Organization Form

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