SECTION 25 15 23

GRAPHICS

PART 1 - General

1.1 SUMMARY
A. Section includes the general requirements for graphic generation.
B. Related Sections:
   1. 25 12 23 Client-Server Information/Database Integration
   2. 25 15 00 Building Control Systems Server Software

1.2 REFERENCES
A. Refer to 25 00 00 Integrated Automation

1.3 DEFINITIONS
A. Refer to 25 06 11 Integrated Automation Definitions

1.4 SYSTEM DESCRIPTION
A. Provide software and labor for graphical representation of all systems specified.
B. Show all hardware points, setpoints, integrated points as shown in drawings and as needed to properly control and monitor systems.

1.5 SUBMITTALS
A. Stanford University has developed campus standards including detailed graphics templates (Px Graphic) contact Stanford University FAC for latest examples.
B. Submit for Review:
   1. Each graphic page shall be submitted for review and requires approval by Owner.

1.6 QUALITY ASSURANCE
A. All graphics shall be rendered as N4 HTML 5 views. Any graphic page that depends on JAVA-based animated widgets, or in any way depends on any browser-side-applet shall not be acceptable.
B. All graphic images shall be Scalable Vector Graphic (SVG) format.
C. All widgets, overlaid on top of SVG images, shall be compatible with N4 HTML 5 views and shall scale at the same ratio as SVG images. For example, spectrum binding polygons shall scale at the same ratio as the floorplan background SVG image. Any graphic page with widgets that do not resize at the same ratio as the SVG image(s), shall not be acceptable.
   1. Note. Some sample graphics below were created in Niagara 3.x and depict widgets that are not compatible with N4 HTML 5 views.
   2. Note: Some N4 HTML 5 graphics features are still in development by Tridium. To fully meet this specification, graphics for this project may require Contractor modifications to graphics during Warranty Period, upon release of future Niagara builds by Tridium.
D. Text fields, column header labels, button labels, etc. must be a text string. Mapping text strings, from Niagara string objects or Tags, is acceptable; mapping Niagara object names to text fields is not acceptable.
E. Decimal precision. Unless indicated otherwise, point values shall use the following decimal precision. Temperatures and temperature setpoints: 1 decimal place. Airflow (CFM) and airflow setpoints: no decimal places. Water flow (GPM) and water flow setpoints: 1 decimal place. Duct static pressure (Inches Water Column) and duct static pressure setpoints: 2 decimal places. Building static pressure (Inches Water Column) and building static pressure setpoints: 3 decimal places. Humidity (%RH) and humidity setpoints: 1 decimal place.

F. All valve and damper output positions should be denoted as %OPEN.

G. Provide consistency in measurement units.

H. Graphics for identical mechanical systems shall utilize relative ORD’s to minimize number of graphics. Graphics for identical mechanical systems that utilize absolute ORD’s are not acceptable.

I. All graphics shall conform to the Stanford Identity Design Guidelines.

J. All graphics shall conform to the Stanford University N4 standards document.

K. Vendor names, logos, hyperlinks to vendor site, or other vendor identification or promotion, are not permitted on graphics.

L. Owner shall furnish sample Stanford Standard Graphics to ensure consistency of look and feel across all Niagara sites.
   1. Stanford Standard Graphics, furnished to Contractor, are dynamic with programming code embedded in the graphics. Contractor may not modify embedded programming code, variable ORD schemes, color schemes, spectrum binding weighting values, BQL queries, etc., in graphics, unless approved by Owner.
   2. Screen captures of example Stanford Standard Graphics are depicted below.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 GRAPHIC GENERATION

A. Each graphic shall include all control points, devices and user adjustable setpoints/parameters associated with the system. All points, as specified in points list table, shall be displayed and adjustable in graphics.

B. User adjustable points, displayed on any graphic page, shall be identifiable by highlighting (turn blue) upon mouse over.

C. Provide links, in a “breadcrumb trail” navigation menu, that allow a user to logically navigate all graphics in a hierarchical manner.

D. There shall be only one graphic header file that shall be used as a “PX Include file” on all graphics required for the project.

E. Graphic Pages Required.
   1. At a minimum, all the example graphics depicted below, shall be included as part of the project.
   2. Additional graphic pages may be required for a specific project.

F. Operator specific password access protection shall be provided for each application to allow the administrator to limit access to point control, display and data base manipulation capabilities as deemed appropriate for each user, based upon an assigned password. There shall be 6 access levels as defined below.
2. Administrator – Full WebUI and Workbench access to Station except to files that can potentially corrupt database. Can set or override adjustable setpoints on graphics. Can set passwords and add users.
3. Integrator - WebUI and Workbench access to Station. Same access level as Administrator except cannot set passwords and add users. Can set or override adjustable setpoints on graphics. Can change own user name, password and email address.
4. Programmer – WebUI and Workbench access to Station. Same access level as Administrator except cannot set passwords and add users. Can set or override adjustable setpoints on graphics. Can change own user name, password and email address.
5. Operator – WebUI access only. View all graphics and override points only, no set point access, can acknowledge alarms. Can override adjustable setpoints on graphics. Can change own user name, password and email address.
6. Read Only – Read only WebUI access. Can change own user name, password and email address.
7. Scheduler – Read only WebUI access with ability to modify equipment schedules as required. Can change own user name, password and email address.
8. Owner will furnish a written matrix of Categories, Permissions and Roles that must be followed exactly.

G. All overrides are globally limited to a maximum of 96 hours.

3.2 COMMON FOR ALL GRAPHICS

A. Header:
Header is one PX Include file for the entire project that shall appear on every graphic page. For efficiency of graphics maintenance, all links, labels, etc., shall be edited from only one instance of header. With the exception of Building Name, the header and each of the link buttons should appear exactly the same on all campus buildings.

1. Label: Trends; Link: Chart Builder popup
2. Label: Alarms; Link: Alarm Selection page
3. Label: Reports; Link: Report Selection page
4. Label: Modbus; Link: Modbus page
5. Label: Schedule; Link: Schedules Selection page
6. Label: User Manager; Link: User Manager page
7. Label: Back; Link: Returns user to previous graphic page
8. Label: Logoff; Link: Logs user off.
10. Label: (Building Name) Home; Link: Building Home page
11. Label: Dashboard; Link: Unique custom Dashboard or Dashboard Selection Page specifically for currently logged in User.
12. Space for Bread Crumb Trail Menu Navigation (details below)
13. Building Name
14. Stanford Logo
15. Note. Some sample graphics below were created in Niagara 3.x and depict Headers that are missing the Dashboard Button
B. Footer:
Footer is one PX Include file for the entire project that shall appear on every graphic page. For efficiency of graphics maintenance, all links, labels, etc., shall be edited from only one instance of footer. Footer buttons shall vary by building depending on what mechanical equipment, etc. is being controlled in the building. The following is a typical example:

1. Label: Floor Plans; Link to: Floor Plan Selection page
2. Label: Air Handlers; Link to: Air Handler page
3. Label: CHW System; Link to: CHW System page
4. Label: HW System; Link to: HW System page
5. Label: PCHW System; Link to: PCHW System page (If PCHW System in project scope)
6. Label: Cold Rm Overview; Link to: Cold Room Overview page (If cold rooms in project scope)
7. Label: FHC Overview; Link to: Fume Hood Control System Overview page (If fume hoods in project scope)
8. Label: VAV Overview; Link: VAV Overview or VAV Overview Selection page (depending on number of Variable Air Volume Terminal Units in project scope)
9. Label: Lab Overview; Link: Lab Overview page (If labs in project scope)
10. Label: S.O.O; Link: Sequence of Operations (PDF format)
11. Additional footer buttons may be required for each specific project depending on equipment controlled, i.e, FCU Overview page if Fan Coil Units in project scope.

C. Bread Crumb Trail Menu Navigation:
The "Bread Crumb Trail" Menu Navigation consists of dynamic buttons and links that appear as required by context to facilitate logical user navigation of the graphics. Graphics examples below shall indicate Bread Crumb Trail menu navigation buttons germane to each specific graphic page.
3.3 HOME PAGE

A. The primary purpose of the building home page is to provide an Operator one place to quickly see the status of major equipment in the building and other critical, real-time information. The contents of the home page will vary by building depending on critical systems and mechanical equipment in that building. Typical systems include air handlers; building chilled water; building hot water, etc.

B. Home Page Example:

1. Header (No Bread Crumb Trail Menu buttons on Home Page)
2. Preferred Typical Equipment/System Summary. Mechanical system name text shall be in Blue Underline to indicate hyperlink to a more detailed display of system. Mechanical system name text shall be in Black if no hyperlink is present.
3. Critical Alarms
4. Footer Button
3.4 AIR HANDLING UNIT

A. It is not feasible to convey examples of every possible permutation of air handler configuration. Specific details shall be developed on a per-project or per-building basis.

B. Typical Air Handler Graphic Page

1. Header
2. Label: Air Handler ID; Link: None
3. Typical AHU Status Summary
4. Typical Point Value Display
5. Typical Supply Air Pressure Summary
6. Animated Display of HW/CHW Coil Valve Position
7. Animated Display of Fan Status
8. Typical Supply Fan Summary
9. Typical Setpoint and Setpoint Reset Summary
10. Typical Supply Air Temperature Summary
11. Typical Economizer Summary
12. Typical Morning Warmup Summary
13. Footer
14. Additional Points as required by project
3.5 REQUESTS PAGE

A. The purpose of the requests page is to see the relationship of zone data and how that zone data is resetting air handler setpoints. Include graphic table for all Zone Requests for Air Handler Reset, by floor & by air handler.

B. Depending on equipment configuration, other related Trim & Respond (Reset) parameters.

C. The contents of the request page will vary by building depending on critical systems and mechanical equipment in that building.

D. If air handlers are controlled by Delta V, (as in this example) Requests Page may also serve double duty as AHU’s page.

1. Header
2. Label: AHU’s (Requests); Link: None
3. Typical System Summary. Air handler discharge air temperature, duct static pressure, and supply fan status (point value and animated display). The entire box is a link to a more detailed display of system.
4. Air handler reset information. Static Pressure Requests, by Air Handler
5. Air handler reset information. Cooling Requests, by Air Handler
6. Air handler reset information. Heating Requests, by Air Handler
7. Air handler reset information. CO2 Requests, by Air Handler
8. Footer buttons
9. Include buttons to reset % Cumulative Request Hours of downstream terminal units served by Air Handler.
3.6 VARIABLE AIR VOLUME BOX – NO REHEAT (COOLING ONLY)

A. Example Cooling Only VAV Box Graphic

1. Header
2. Label: Floor that VAV box is located on; Link: Floorplan that VAV box is located on
3. Label: Air Handler that serves VAV box; Link: Air Handler that serves VAV box or link to Air Handler page
4. Label: VAV box ID – Room Number; Link: None
5. VAV status summary.
6. Room number or ID of room that VAV thermostat is physically located in.
7. Additional rooms served by VAV box.
8. Reset Multiplier
9. Space to record notes about zone. See “Zones with Notes” report below
10. If no sensor exists at the box (i.e. virtual point) Label: Zone Air Inlet Temp” do not show sensor. See 19
11. Animated display of damper position.
12. Discharge Air Temperature
13. Ahu Information Summary Table
14. Air Flow Status Summary Table
15. Space Conditions Summary Table
16. Air Flow Settings Summary Table.
17. Footer
18. Effective Temperature Setpoints Summary Table
19. If sensor exists at the box, Label: Air Inlet Temp; show sensor. See 10
3.7 VARIABLE AIR VOLUME BOX – WITH REHEAT

A. Example VAV Box with Reheat Graphic

1. Header
2. Label: Floor that VAV box is located on; Link: Floorplan that VAV box is located on
3. Label: Air Handler that serves VAV box; Link: Air Handler that serves VAV box or link to Air handler page
4. Label: VAV box ID - Room Number; Link: None
5. VAV status summary.
6. Room number that VAV thermostat is physically located in.
7. Additional rooms served by VAV box.
8. Reset Multiplier
9. Space to record notes about zone. See “Zones with Notes” report below
10. If no sensor exists at the box (i.e. virtual point) Label: Zone Air Inlet Temp” do not show sensor. See 19
11. Animated display of damper position.
12. Discharge Air Temperature
13. Ahu Information Summary Table
14. Air Flow Status Summary Table
15. Space Conditions Summary Table
16. Air Flow Settings Summary Table.
17. Footer
18. Effective Temperature Setpoints Summary Table
19. If sensor exists at the box, Label: Air Inlet Temp; show sensor. See 10

20. Animated display of reheat coil valve position
21. Reheat Status Summary Table
3.8 LAB VARIABLE AIR VOLUME BOX – WITH EXHAUST

A. It is not feasible to convey examples of every possible permutation of Lab Exhaust configuration. Specific details shall be developed on a per-project or per-building basis.

B. Example Lab VAV Box with Exhaust Graphic

1. Header
2. Label: Floor that VAV box is located on; Link: Floor plan that VAV box is located on
3. Label: Air Handler that serves VAV box; Link: Air Handler that serves VAV box or link to Air handler page
4. Label: Zone (Room Number); Link: None
5. VAV status summary.
6. Occupancy Status
7. Unit Mode
8. Room number that VAV thermostat is physically located in.
9. VAV box Device ID.
10. Reset Multiplier
11. Space to record notes about zone. See “Zones with Notes” report below
12. Inlet Temperature. If no sensor exists at the box (i.e. virtual point) do not show sensor.
13. Animated display of damper position.
14. Animated display of reheat coil valve position
15. Discharge Air Temperature
16. Ahu Information Summary Table
17. Exhaust Air Valve
18. Air Flow Status Summary Table
19. Space Conditions Summary Table
20. Reheat Valve Status Summary Table
21. Space Conditions Summary Table.
22. Effective Temperature Setpoints Summary Table
23. Air Flow Settings Summary Table.
24. Footer
25. Additional Real-time Data Fields, as required by specific project
3.9 LAB VARIABLE AIR VOLUME BOX – WITH FUME HOOD EXHAUST

A. It is not feasible to convey examples of every possible permutation of Fume Hood exhaust configuration. Specific details shall be developed on a per-project or per-building basis.

B. Example Lab VAV Box with Fume Hood Exhaust Graphic

1. Header
2. Label: Specific Floor/Wing; Link: None
3. Label: Air Handler that serves VAV box; Link: Air Handler that serves VAV box or link to Air handler page
4. Label: Floor that VAV box is located on; Link: Floorplan that VAV box is located on
5. Label: Zone (Room Number); Link: None
6. Lab Information table
7. SAV Inlet Temperature
   a. If no sensor exists at the box (i.e., virtual point) do not show sensor.
8. SAV Supply Temperature
9. SAV Status Table
10. Reheat Valve Command
11. Cooling Valve Command
12. Fume Hoods
13. Lab Status Table.
14. SAV Inlet Temperature
   a. If no sensor exists at the box (i.e., virtual point) do not show sensor.
15. SAV Supply Temperature
16. Airflow Setpoints Table
17. SAV Status Table
18. Reheat Valve Command
19. Cooling Valve Command
20. Space Conditions
21. EAV Status Table
22. Fume Hood Status Table
23. Temperature Setpoints Table
24. Footer Button
25. Additional Real-time Data Fields, as required by specific project
3.10 FLOOR PLAN

A. Example Floorplan Graphic

1. Header
2. Label: Floorplans; Link: Floorplan Selection Page
3. Label: Specific Floorplan; Link: None
4. Embellished Description of Floorplan (optional, as required).
5. T-stat location, static but editable from Niagara graphics editor. Shall not require editing of background image.
6. Box level summary table with VAV box identification, space temperature, and identification of the AHU serving the box. This table includes a navigation link to the specific VAV box.
7. Typical animated spectrum binding of entire area served by VAV box to indicate zone temperature. Zone color shall go from light blue to bright blue with greater deviation below effective setpoint and from light red to bright red with greater deviation above effective setpoint. Zones between heating and cooling setpoint shall be light grey. Each spectrum binding shape shall maintain approximately 10 pixel space to distinguish from adjacent spectrum binding shape to prevent confusion when both shapes are the same color. Entire spectrum binding shape shall be a navigation link to the specific VAV box. Upon mouse over, mouse cursor icon shall change from pointer to hyperlink.
8. Room Number, static but editable from Niagara graphics editor. Modifying room number shall not require editing of background image.
9. Include box level summary table with box identification, space temperature, and identification of the AHU serving the box. This table includes a navigation link to the AHU.

10. Key Plan. Required when one level of building layout is split into multiple floor plan sections. Key Plan depicts current floor plan section, relative to entire floor plan. Lightened Key Plan Section(s) indicates additional sections of floorplan on same level and serves as link to those additional sections of floorplan.

11. Darkened Key Plan Section indicates section of floorplan currently being displayed.
### 3.11 VAV OVERVIEW TABLE

A. Example VAV Overview Page (one page per air handling unit, per floor)

<table>
<thead>
<tr>
<th>Column Label</th>
<th>Cell Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone</td>
<td>VAV Box ID</td>
</tr>
<tr>
<td>TRm #</td>
<td>Room number</td>
</tr>
<tr>
<td>Description</td>
<td>Additional</td>
</tr>
<tr>
<td>Reset Multiplier</td>
<td>Integer value</td>
</tr>
<tr>
<td>Temp</td>
<td>Space Temperature</td>
</tr>
<tr>
<td>Mode</td>
<td>VAV Operating Mode</td>
</tr>
<tr>
<td>Cooling Setpoint</td>
<td>Heating Setpoint</td>
</tr>
<tr>
<td>Heating Setpoint</td>
<td>Heating Demand</td>
</tr>
<tr>
<td>HWV Command</td>
<td>Heating Water Valve Command</td>
</tr>
<tr>
<td>Air Flow</td>
<td>Air Flow (CFM)</td>
</tr>
</tbody>
</table>

1. Header
2. Label: VAV Overviews; Link: VAV Overviews Selection Page
3. Label: Specific group of VAV’s summarized; Link: none
4. Link to specific VAV graphic
5. Column Label: Zone; Cell Contents: VAV Box ID; Link: Specific VAV graphic; Mouse Over: Highlight; Edit: Programmer-Level or higher.
6. Column Label: TRm #; Cell Contents: Room number that VAV thermostat is physically located in.; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
7. Column Label: Description; Cell Contents: Additional rooms served by VAV box.; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
8. Column Label: Reset Multiplier; Cell Contents: Integer value of reset weighting (Zone Criticality); Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
9. Column Label: Temp; Cell Contents: Space Temperature; Link: None
10. Column Label: Mode; Cell Contents: VAV Operating Mode, Indicate “Cool” and color Blue, when in cooling mode, Indicate “Heat” and color Red, when in heating mode, Indicate “Deadband” and no color, when in deadband mode; Link: None.
11. Column Label: Cooling Setpoint; Cell Contents: Cooling Setpoint; Link: None
12. Column Label: Heating Setpoint; Cell Contents: Heating Setpoint; Link: None
13. Column Label: HWV Command; Cell Contents: Heating Water Valve Command; Spectrum Binding: Red 0-100%; Link: None. Indicate “N/A” on cooling-only VAV’s.
14. Column Label: Cooling Demand; Cell Contents: Cooling Demand; Spectrum Binding: Blue 0-100%.
15. Column Label: Heating Demand; Cell Contents: Heating Demand; Spectrum Binding: Red 0-100%.
16. Column Label: Air Flow; Cell Contents: Air Flow (CFM)
17. Column Label: Air Flow SP; Cell Contents: Air Flow Setpoint (CFM)
18. Column Label: Damper CMD; Cell Contents: Damper Command; Spectrum Binding: Green 0-
   100%.
19. Column Label: Occupancy; Cell Contents: Zone Occupancy Mode; Link: None; Mouse Over:
   Highlight; Edit: Programmer-Level or higher.
20. Footer
21. Additional Columns, as required by project.
22. Column Label: DAT; Cell Contents: Discharge Air Temperature; Link: None (locate between 13 
   & 14)
23. Cooling Cumulative %-request-hours
24. Reheat Valve Cumulative %-request-hours (N/A for Cooling-Only boxes)
25. Static Pressure Cumulative %-request-hours.

B. Notes to develop Cumulative %-request-hours values
   1. Each Cumulative %-request-hours point shall include a button to reset Cumulative %-request-
      hours to 0
   2. Definition of Request Hours: This point accumulates the integral of requests to help identify
      zones/systems that are driving the reset logic. Every 5 minutes, if the zone is generating at least
      one request, add 5/60 to this request-hours accumulator point.
   3. The following Cumulative request-hours points are required:
      a. Cooling Cumulative request-hours
      b. Reheat Valve Cumulative request-hours
      c. Static Pressure Cumulative request-hours
   4. The request-hours point is reset to zero upon a global command from the Air Handler serving
      the zone – this global point simultaneously resets the request-hours point for all zones served
      by this Air Handler. A request-hours reset button, for all request-hours associated with an Air
      Handler, shall be located on Air Handler page.
   5. Cumulative %-request-hours is the zone request-hours divided by the zone run-hours (the hours
      that zone is in any Mode other than Unoccupied Mode) since the last reset, expressed as a
      percentage.
3.12 LAB OVERVIEW

A. Example LAB Overview Graphic

1. Header
2. Label: Lab Overviews; Link: Lab Overviews Page
3. Label: Specific Floor/Wing.
4. Column Label: Lab #; Cell Contents: Room Number of Lab; Link: Specific Zone graphic; Mouse Over: Highlight; Edit: Programmer-Level or higher.
5. Column Label: Device; Cell Contents: Air Flow Devices serving Lab
6. Column Label: Description; Cell Contents: Lab Description; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
7. Column Label: Zone Temp. Cell Contents: Actual Zone Temperature; Link: None.
8. Column Label: Effective Heating Setpoint; Cell Contents: Effective Heating Setpoint; Link: None.
9. Column Label: Effective Cooling Setpoint; Cell Contents: Effective Cooling Setpoint; Link: None.
10. Column Label: Mode; Cell Contents: VAV Operating Mode, Indicate “Cool” and color Blue, when in cooling mode, Indicate “Heat” and color Red, when in heating mode, Indicate “Deadband” and no color, when in deadband mode; Link: None
11. Column Label: HWV Command; Cell Contents: Heating Water Valve Command; Spectrum Binding: Red 0-100%; Link: None. Indicate “N/A” if no reheat coil.
12. Column Label: CHWV Command; Cell Contents: Chilled Water Valve Command; Spectrum Binding: Blue 0-100%; Link: None. Indicate “N/A” if no reheat coil.
13. Column Label: Discharge Air Temperature; Cell Contents: Discharge Air Temperature; Link: None
14. Column Label: Damper CMD; Cell Contents: Damper Command; Spectrum Binding: Green 0-100%.
15. Column Label: Airflow; Cell Contents: Actual Airflow in CFM; Link: None
16. Column Label: Flow Offset Setpoint; Cell Contents: Flow Offset Setpoint; Link: None
17. Column Label: Flow Offset; Cell Contents: Actual Flow Offset; Link: None
18. Column Label: Air Change Rate (ACR); Cell Contents: Air Change Rate; Link: None
19. Column Label: Air Change Rate (ACR) Setpoint; Cell Contents: Air Change Rate Setpoint; Link: None
20. Column Label: Maximum Air Change Rate (ACR); Cell Contents: Maximum Air Change Rate; Link: None
21. Column Label: Occupancy; Cell Contents: Zone Occupancy Mode; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
22. Hyperlink to Lab space.
23. Hyperlink to Lab space.
24. Footer Button
25. Additional required columns not shown:
   a. Cooling Cumulative %-request-hours
   b. Reheat Valve Cumulative %-request-hours (N/A for Cooling-Only boxes)
   c. Supply Static Pressure Cumulative %-request-hours.
26. To avoid visual confusion, each Lab space to be separated from other Lab spaces by 10 pixels.
27. Each Lab Space “Row” configuration shall be a PX include file.
28. Additional columns may be required depending on LAB configuration and or Lab Exhaust Equipment brand
### 3.13 LAB VAV WITH EXHAUST OVERVIEW

**A. Example LAB VAV with Exhaust Overview Graphic**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header</strong></td>
<td><strong>Label: Specific Floor; Link: Specific Floor Plan Graphic</strong></td>
<td><strong>Label: Specific AHU serving Labs; Link: Graphic for Specific AHU serving Labs</strong></td>
<td><strong>Label: VAVs with EV; Link: None</strong></td>
</tr>
<tr>
<td><strong>5</strong></td>
<td><strong>6</strong></td>
<td><strong>7</strong></td>
<td><strong>8</strong></td>
</tr>
<tr>
<td><strong>Column Label: Zone; Cell Contents: Room Number of Space; Link: Specific Zone graphic; Mouse Over: Highlight; Edit: Programmer-Level or higher.</strong></td>
<td><strong>Room Number</strong></td>
<td><strong>Temp</strong></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td><strong>9</strong></td>
<td><strong>10</strong></td>
<td><strong>11</strong></td>
<td><strong>12</strong></td>
</tr>
<tr>
<td><strong>Column Label: T Rm #; Cell Contents: Room number that VAV thermostat is physically located in.; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.</strong></td>
<td><strong>Room Number</strong></td>
<td><strong>Temp</strong></td>
<td><strong>Equipment</strong></td>
</tr>
<tr>
<td><strong>13</strong></td>
<td><strong>14</strong></td>
<td><strong>15</strong></td>
<td><strong>16</strong></td>
</tr>
<tr>
<td><strong>Column Label: Actual Temp. Cell Contents: Actual Space Temperature; Link: None.</strong></td>
<td><strong>Actual Temp.</strong></td>
<td><strong>Equipment</strong></td>
<td><strong>Mode</strong></td>
</tr>
<tr>
<td><strong>17</strong></td>
<td><strong>18</strong></td>
<td><strong>19</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Column Label: Equipment; Cell Contents: Equipment Label; Link: None.</strong></td>
<td><strong>Equipment</strong></td>
<td><strong>Mode</strong></td>
<td><strong>Setpoint</strong></td>
</tr>
<tr>
<td><strong>20</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Column Label: Mode; Cell Contents: VAV Operating Mode, Indicate &quot;Cool&quot; and color Blue, when in cooling mode, Indicate &quot;Heat&quot; and color Red, when in heating mode, Indicate &quot;Deadband&quot; and no color, when in deadband mode; Link: None.</strong></td>
<td><strong>Mode</strong></td>
<td><strong>Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
</tr>
<tr>
<td><strong>21</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Column Label: Cooling Setpoint; Cell Contents: Cooling Setpoint; Link: None</strong></td>
<td><strong>Cooling Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
</tr>
<tr>
<td><strong>22</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Column Label: Heating Setpoint; Cell Contents: Heating Setpoint; Link: None</strong></td>
<td><strong>Heating Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
</tr>
<tr>
<td><strong>23</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Column Label: HWV Command; Cell Contents: Heating Water Valve Command; Spectrum Binding: Red 0-100%; Link: None. Indicate “N/A” if no reheat coil.</strong></td>
<td><strong>HWV Command</strong></td>
<td><strong>Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
</tr>
<tr>
<td><strong>24</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Column Label: Airflow; Cell Contents: Actual Airflow in CFM; Link: None</strong></td>
<td><strong>Airflow</strong></td>
<td><strong>Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
</tr>
<tr>
<td><strong>25</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Column Label: Airflow Setpoint; Cell Contents: Airflow Setpoint; Link: None</strong></td>
<td><strong>Airflow Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
</tr>
<tr>
<td><strong>26</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Column Label: Damper CMD; Cell Contents: Damper Command; Spectrum Binding: Green 0-100%.</strong></td>
<td><strong>Damper CMD</strong></td>
<td><strong>Setpoint</strong></td>
<td><strong>Setpoint</strong></td>
</tr>
</tbody>
</table>
16. Column Label: Occupancy; Cell Contents: Zone Occupancy Mode; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
17. Typical example of Space with 1 VAV and 1 Exhaust Air Valve
18. Typical example of Space with 2 VAV, 2 Exhaust Air Valves, and 1 Fume Hood
19. Footer
20. Additional columns may be required depending on LAB configuration
21. Cooling Cumulative %-request-hours
22. Reheat Valve Cumulative %-request-hours (N/A for Cooling-Only boxes)
23. Supply Static Pressure Cumulative %-request-hours.
24. Exhaust Static Pressure Cumulative %-request-hours.
25. To avoid visual confusion, each Lab space to be separated from other Lab spaces by 10 pixels.
3.14 FUME HOOD OVERVIEW

A. Example Fume Hood Overview Graphic

### Table: Fume Hood Overview

<table>
<thead>
<tr>
<th>Lab #</th>
<th>Device</th>
<th>Description</th>
<th>Mode</th>
<th>In Use SP 100 ft/min 70 ft/min</th>
<th>Stand By SP 100 ft/min 70 ft/min</th>
<th>Current Velocity</th>
<th>Current Velocity SP 100 ft/min 70 ft/min</th>
<th>Current Sash Position</th>
<th>Current Face Velocity</th>
<th>Fume Hood Alarm</th>
<th>Damper Command</th>
<th>Occupancy Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>426</td>
<td>FHC 1-4-2 Lab/Ext 4260</td>
<td>In use</td>
<td>100 ft/min 70 ft/min</td>
<td>60 ft/min 100 ft/min</td>
<td>24%</td>
<td>235 cfm</td>
<td>Normal</td>
<td>20%</td>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>420</td>
<td>FHC 1-4-9 Lab/Support 4200</td>
<td>In use</td>
<td>100 ft/min 70 ft/min</td>
<td>60 ft/min 100 ft/min</td>
<td>7%</td>
<td>202 cfm</td>
<td>Normal</td>
<td>29%</td>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>334</td>
<td>FHC 1-3-3 Lab/Support 334B</td>
<td>In use</td>
<td>100 ft/min 70 ft/min</td>
<td>60 ft/min 100 ft/min</td>
<td>6%</td>
<td>213 cfm</td>
<td>Normal</td>
<td>29%</td>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>329</td>
<td>FHC 1-3-1 Lab/Support 3296</td>
<td>In use</td>
<td>100 ft/min 70 ft/min</td>
<td>60 ft/min 100 ft/min</td>
<td>12%</td>
<td>212 cfm</td>
<td>Normal</td>
<td>29%</td>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2278</td>
<td>FHC 1-2-2 Support</td>
<td>In use</td>
<td>100 ft/min 70 ft/min</td>
<td>65 ft/min 100 ft/min</td>
<td>0%</td>
<td>199 cfm</td>
<td>Normal</td>
<td>29%</td>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>018</td>
<td>FHC 1-8-4 Lab</td>
<td>Standby</td>
<td>100 ft/min 70 ft/min</td>
<td>65 ft/min 70 ft/min</td>
<td>20%</td>
<td>199 cfm</td>
<td>Normal</td>
<td>29%</td>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>023</td>
<td>FHC 1-8-9 Lab</td>
<td>In use</td>
<td>100 ft/min 70 ft/min</td>
<td>65 ft/min 100 ft/min</td>
<td>21%</td>
<td>213 cfm</td>
<td>Normal</td>
<td>29%</td>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>020</td>
<td>FHC 1-8-14 Lab</td>
<td>Standby</td>
<td>100 ft/min 70 ft/min</td>
<td>63 ft/min 70 ft/min</td>
<td>20%</td>
<td>201 cfm</td>
<td>Normal</td>
<td>29%</td>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>030</td>
<td>FHC 1-8-25 Lab</td>
<td>Standby</td>
<td>100 ft/min 70 ft/min</td>
<td>63 ft/min 70 ft/min</td>
<td>1%</td>
<td>193 cfm</td>
<td>Normal</td>
<td>29%</td>
<td>Active</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Header
2. Label: FHC Overviews; Link to: FHC Overviews selection page
3. Label: Specific Floor/Wing; Link: None
4. Column Label: Lab #; Link to: Lab page corresponding to Zone; Cell Contents: Room Number of Lab / Space; Link to: Specific Lab/Zone (Lab #) graphic that fume hood is located in; Mouse Over: Highlight; Edit: Programmer-Level or higher.
5. Column Label: Device; Cell Contents: Fume Hood Controller Device Name
6. Column Label: Description; Cell Contents: Lab Description; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
7. Column Label: Mode; Cell Contents: Current Fume Hood Occupancy Operating Mode.; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
8. Column Label: In Use SP; Cell Contents: In Use Face Velocity SP; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
9. Column Label: Standby Face Velocity SP; Cell Contents: Standby Face Velocity SP; Link: None.; Edit: Programmer-Level or higher.
10. Column Label: Current Velocity; Cell Contents: Current Face Velocity; Link: None
11. Column Label: Current Velocity Setpoint; Cell Contents: Current Face Velocity Setpoint; Link: None
13. Column Label: Airflow; Cell Contents: Actual Airflow in CFM; Link: None
14. Column Label: Fume Hood Alarm; Cell Contents: Current Fume Hood Alarm Condition; Link: None
15. Column Label: Damper CMD; Cell Contents: Damper Command; Spectrum Binding: Green 0-100%.
16. Column Label: Occupancy Sensor; Cell Contents: Detected Occupancy Status; Link: None
17. Footer Button
18. Additional required column (not shown). Column Label: Notes; Cell Contents: Space to record notes about zone. See "Zones with Notes" report below.; Edit: Operator-Level or higher.
19. Additional columns may be required if available from Fume Hood Controller configurations
20. Column Label: Min Airflow SP; Cell Contents: Minimum Airflow Setpoint; Link: None.; Edit: Programmer-Level or higher.
21. Column Label: Max Airflow SP; Cell Contents: Maximum Airflow Setpoint; Link: None.; Edit: Programmer-Level or higher.
3.15 FAN COIL UNIT OVERVIEW

A. Example Fan Coil Unit (FCU) Overview Graphic

![Example Fan Coil Unit (FCU) Overview Graphic]

1. Header
2. Label: FCU Overviews; Link: FCU Overviews Selection Page
3. Label: Specific group of FCU’s summarized; Link: none
4. Link to specific FCU graphic
5. Column Label: Zone; Cell Contents: FCU Box ID; Link: Specific FCU graphic; Mouse Over: Highlight; Edit: Programmer-Level or higher.
6. Column Label: T Rm #; Cell Contents: Room number that FCU thermostat is physically located in.; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
7. Column Label: Description; Cell Contents: Additional rooms served by FCU. ; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
8. Column Label: Reset Multiplier; Cell Contents: Integer value of reset weighting (Zone Criticality; Link: None; Mouse Over: Highlight; Edit: Programmer-Level or higher.
9. Column Label: Space Temp; Cell Contents: Space Temperature; Link: None
10. Column Label: Heating Setpoint; Cell Contents: Heating Setpoint; Link: None
11. Column Label: HWV Command; Cell Contents: Heating Water Valve Command; Spectrum Binding: Red 0-100%; Link: None. Indicate “N/A” on cooling-only VAV’s.
12. Column Label: Discharge Temp; Cell Contents: Discharge Air Temperature
14. Column Label: Fan Status; Cell Contents: Fan Status
15. Footer
16. Additional columns may be required depending on FCU configuration
### 3.16 EXHAUST FAN SUMMARY TABLE

<table>
<thead>
<tr>
<th>Name</th>
<th>Controller Location</th>
<th>Fan Enable</th>
<th>Fan Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEF 0-1</td>
<td>AMB-6 South Basement Mech Room</td>
<td>Start</td>
<td>Running</td>
</tr>
<tr>
<td>TEF 0-2</td>
<td>AMB-5 North Basement Mech Room</td>
<td>Start</td>
<td>Running</td>
</tr>
<tr>
<td>TEF 7-1</td>
<td>VAV RB 1-06-02</td>
<td>Start</td>
<td>Running</td>
</tr>
<tr>
<td>TEF 4-1</td>
<td>RHB 2 Fourth Floor North Mech Room</td>
<td>Start</td>
<td>Running</td>
</tr>
<tr>
<td>TEF 4-3</td>
<td>AMB-4 Third Floor Attic South</td>
<td>Start</td>
<td>Running</td>
</tr>
<tr>
<td>TEF 5-2</td>
<td>AMB-9 Third Floor South</td>
<td>Start</td>
<td>Running</td>
</tr>
</tbody>
</table>

1. **Header**
2. **Label:** EF Overview (TEF Overview); Link: None
3. **Column Label:** Name; **Cell Contents:** Exhaust Fan ID; Link: None
4. **Column Label:** Controller Location; **Cell Contents:** Name and Location of controller that controls Exhaust Fan; Link: None
5. **Column Label:** Fan Enable (Fan Command); **Cell Contents:** Fan Command
6. **Column Label:** Fan Status; **Cell Contents:** Fan Status
7. **Footer**
8. **Additional Columns,** as required by project.
3.17 MAPPED POINTS SUMMARY

A. Example of Typical Modbus Points Summary

B. Include this summary page only if both a Niagara DDC system and the Delta V system are being utilized within the building for HVAC control. This illustrates which points are being shared between the two systems.

1. Header
2. Label: Modbus; Link: None
3. Summary table of Inputs passed from Delta V to DDC
4. Equipment Name
5. Point Name or Description (Grouped by Equipment)
6. Current Point Value
7. Summary table of Outputs passed from DDC to Delta V
8. Global Points (Not specific to equipment)
9. Footer
3.18 TRENDS (VIEW HISTORICAL DATA)

A. The “Trends” Header Button will navigate to the History Px page.

B. History trends will be organized by Hierarchies.

C. Using Hierarchies, navigate to Drag and Drop points onto the History Viewer.
3.19 ALARM SCREENS

A. Each building will have a minimum of two alarm pages to display alarm records from the Alarm Console (all alarms) and the Critical Alarms Console (critical alarms only).

B. Example of Alarm Page

1. Header
2. Label: Alarms (Critical Alarms); Link: None
3. Desired Time Range
4. Alarm records via alarm service console recipient
5. Buttons for Alarm Acknowledge, etc. (Native Niagara Alarm Console buttons)
6. Footer
3.20 NAVIGATION PAGES

A. Navigation or Selection pages facilitate logical site navigation with organized link buttons. Typical applications include selection from multiple Floorplans, Overviews, HVAC Equipment, Reports, etc.

B. Example of Typical Floorplan Selection Page

1. Header
2. Label: Floorplans; Link: None
3. Labels for logical grouping
4. Link buttons to facilitate navigation to pages
5. Footer
C. Example of Typical Report Selection Page

1. Header
2. Label: Reports; Link: None
3. Labels for logical grouping
4. Link buttons to facilitate navigation to report pages. At a minimum, the following reports shall be provided.
   a. Offline Controllers
   b. Points in Override
   c. Points in Fault
   d. Critical Zones Equal to 0
   e. Critical Zones Equal to 1
   f. Critical Zones Greater than 1
   g. Zones with Notes
   h. Zones with Reheat Valves => 95%
   i. Zones with Dampers => 95%
   j. Zones with Cooling Demand => 95%
   k. FCU with HW Valves => 95%
   l. Additional reports as required by specific project
5. Footer
3.21 REPORTS

A. At a minimum, the following Report Pages shall be provided:
   1. Offline Controllers
   2. Points in Override
   3. Points in Fault
   4. Critical Zones Equal to 0
   5. Critical Zones Equal to 1
   6. Critical Zones Greater than 1
   7. Zones with Notes
   8. Zones with Damper >= 95%
   9. Zones with RH Valve >= 95%
   10. Zones with Cooling Demand >= 95%

B. Additional Reports may be required by specific project.

C. Example Points in Override Report

1. Header
2. Label: Reports; Link: Report Selection Page
3. Label: Overridden Points; Link: None
4. Quantity of Overridden Points
5. Detailed Records of Overridden Points, including Device Name; Point Name; SlotPath Value and Status
6. Embellished Description of Report
7. Button to Refresh Report Data
8. Button to Export Report Data
D. Example Offline Controller Report

1. Header
2. Label: Reports; Link: Report Selection Page
3. Label: Offline Controllers; Link: None
4. Quantity of Offline Controllers
5. Detailed Records of Offline Controllers, including Device Name; SlotPath Value and Status (No records present in this example)
6. Embellished Description of Report
7. Button to Refresh Report Data
8. Button to Export Report Data
9. Footer
E. Example Points in Fault Report

1. Header
2. Label: Reports; Link: Report Selection Page
3. Label: Faulted Points; Link: None
4. Quantity of Points in Fault
5. Detailed Records of Points in Fault, including Device Name; Point Name; SlotPath Value and Status (No records present in this example)
6. Embellished Description of Report
7. Button to Refresh Report Data
8. Button to Export Report Data
9. Footer
F. Example Zone Criticality Report (Reset Weighting)

1. Header
2. Label: Reports; Link: Report Selection Page
3. Label: Zone Criticality Level; Link: None
4. Quantity of Zones that meet report criteria
5. Detailed Records of Zones with a Critical Level of 1, including Device Name; Point Name; SlotPath Value and Status
6. Embellished Description of Report
7. Scroll Bar (Appears as Required)
8. Footer
9. Button to Refresh Report Data (Not Shown)
10. Button to Export Report Data (Not Shown)
G. Example Zones with Notes Report

1. Header
2. Label: Reports; Link: Report Selection Page
3. Label: Zone With Notes; Link: None
4. Quantity of Zone With Notes
5. Detailed Records of Zones with Notes, including Device Name; Point Name; SlotPath Value and Status
6. Embellished Description of Report
7. Button to Refresh Report Data
8. Button to Export Report Data
9. Footer

3.22 DASHBOARDS

A. The Dashboard button in the Header will navigate to the Dashboard Px page.
B. History trends will be organized by Hierarchies.

C. Using Hierarchies, navigate to Drag and Drop points onto the Dashboard.

END OF SECTION