SECTION 25 35 15
SWITCHES AND RELAYS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section include switches and relays for the building control systems
   B. Related Sections:
      1. 25 05 53 Identification

1.2 REFERENCES
   A. Refer to 25 00 00 Integrated Automation

1.3 DEFINITIONS
   A. Refer to 25 00 00 Integrated Automation

1.4 SYSTEM DESCRIPTION
   A. Systems include switches and relays for the monitor and control of Heating, Ventilation, and Air Conditioning and other various systems as specified or shown on drawings.

1.5 SUBMITTALS
   A. Refer to 25 06 11 Integrated Automation Definitions

1.6 QUALITY ASSURANCE
   A. Electrical devices, switches, and relays shall be UL listed and of type meeting current and voltage characteristics of controlled or monitored equipment.
   B. Hard-wired safeties including, but not limited to fire alarm, high/low static, high/low temperature, etc, that cause unit shutdowns, shall allow automatic restart upon manual reset of tripped device. (no additional reset at front end required)
   C. Identify relays and switches per section 25 05 53.

Note: Section specific quality requirements should be defined here but not repeated from other sections.

PART 2 - PRODUCTS

2.1 DRY PRESSURE SWITCHES
   A. Manufacturers: Dwyer, Ashcroft, Johnson Controls/Penn, or approved equal.
   B. Field adjustable set point.
   C. Manual Reset where required.
   D. Where used as safety interlock include auxiliary contact for alarm condition reporting to the DDC or Delta V system.
2.2 E-P SWITCHES (SOLENOID VALVES)
   A. Manufacturers: Asco, Johnson Controls, Kele or MAC Valves.

2.3 CONTROL RELAYS
   A. Relays
      1. Manufacturers: IDEC, Potter Brumfield, Square D.
      2. For DeltaV digital outputs shall be wired to an octal base socket mount DPDT 24 VDC relays with pilot LED for indication. (RR2P-UL)
      3. For DDC relays shall be different pin configurations for each coil voltage, all relays to have pilot indicator lights.
   B. Enclosed Relay (Relay-in-a-Box):
      2. Relay in an enclosure to match installation environment. Coil voltage shall be selected for control circuit characteristics.
      3. LED status indication.

2.4 CURRENT SWITCHES
   A. Manufacturers: Veris Industries, Kele & Associates, or approved equal.
   B. Induction type sensors over single-phase conductor of AC electrical power and shall be solid-state sensors with adjustable threshold, visual indication and normally open contacts.

2.5 HAND-OFF-AUTO SWITCH
   A. Manufacturers: Allen Bradley 800T, IDEC, Square D, or approved equal.
   B. 3-position 4-pole switches shall be used for HOA switches. The minimum ratings are:
      1. Contact Type: Maintained
      2. Voltage: 120 VAC/60 Hz.
      4. Mechanical Switch Actuation Life: 500,000 cycles minimum.
      5. Dielectric Strength: 2000 V for 1 minute.
      7. Shock: 1/2 cycle sine wave for 8 milliseconds without switch actuation.

2.6 WET DIFFERENTIAL PRESSURE SWITCH
   A. Manufacturers: Barksdale EPD1H-AA40 or approved equal.

2.7 WET FLOW SWITCH:
   A. Manufacturers: Dwyer GVS-111 or approved equal.

2.8 SELECTOR SWITCH
   A. Manufacturers: Allen Bradley Bulletin 800T, IDEC, Square D, or approved equal.
   B. Heavy-duty non-illuminated 120 VAC/60 Hz 10A continuous selector switches with same NEMA rating as panel enclosure shall be used for control panel operator interface switching.
      1. Voltage: 120 VAC/60 Hz.
      2. Current: 5 amp continuous.
3. Mechanical Switch Actuation Life: 500,000 cycles minimum.
5. Vibration: 6 G minimum without false trip or switch damage.
6. Shock: 1/2 cycle sine wave for 8 milliseconds without switch actuation

2.9 PILOT LIGHTS

A. Manufacturer: Allen Bradley Bulletin 800T, IDEC, Square D, or approved alternate.
B. Heavy-duty illuminating pilot lights with same NEMA rating as panel enclosure shall be used for operator interface indication. Include power module to match control system voltage to lamp and push-to-test feature.
   1. Lamp Type: LED
   2. Voltage: 120 VAC/60 Hz or 24 VDC as required, unless otherwise noted.

2.10 PUSHBUTTON SWITCH

A. Manufacturer and Type: Allen Bradley, IDEC, Square D, or approved equal.
   1. Heavy-duty flush push buttons with same or better NEMA rating as panel enclosure shall be used for control panel operator interface switching. Pilot lights may be integrated as needed.
   2. Voltage: 120 VAC/60 Hz or 24 VDC as required unless otherwise noted.
   4. Mechanical Switch Actuation Life: 500,000 cycles minimum.
   5. Dielectric Strength: 2000 V for 1 minute.
   7. Shock: 1/2 cycle sine wave for 8 milliseconds without switch actuation.

PART 3 - EXECUTION

3.1 DRY PRESSURE SWITCHES

A. Provide pressure switches where indicated on drawings or as required to accomplish sequences.
B. Select switches for accuracy, ranges (20 to 80% of operating range) and dead-band to match process conditions, electrical requirements and to implement intended functions.

3.2 E-P SWITCHES (SOLENOID VALVES)

A. Provide control relay between DO & E-P.
B. Provide solenoid valves where indicated on drawings or as required to accomplish sequences.
C. Locate in FTP. (See Section 25 1423)

3.3 CONTROL RELAYS

A. Control relays shall be used to isolate controller wiring and power supplies from foreign voltage sources. Provide control relays where indicated on drawings or as required to accomplish sequences.
B. DeltaV relays shall be mounted inside FTPs.
C. DDC with control panel shall have relays mounted inside panel.
D. DDC without control panel shall use RIB type relays.
   1. Mount relay so that visual inspection & adjustment can be made while following NFPA70E requirements for easy accessibility.
2. Mount relay near controlled equipment.

3.4 CURRENT SWITCH
   A. Provide current switches where indicated on drawings or as required to accomplish sequences, so that each motor is individually monitored.
   B. Locate in adjacent enclosure, not inside motor starter or VFD. Mount so that visual inspection & adjustment can be made while following NFPA70E requirements for easy accessibility
   C. Select switch for proper operating range of current.
   D. Adjust the relay switch point so that the relay responds to motor operation under load as an “on” state and so that the relay responds to an unloaded running motor as an “off” state. A motor with a broken belt/coupler is considered an unloaded motor.

3.5 HAND-OFF-AUTO SWITCH
   A. Provide HOA switches where indicated on drawings or as required to accomplish sequences.

3.6 WET DIFFERENTIAL PRESSURE SWITCH
   A. Provide Wet Differential Pressure switches where indicated on drawings or as required to accomplish sequences.

3.7 WET FLOW SWITCH:
   A. Provide Flow switches for make-up water applications and where indicated on drawings or as required to accomplish sequences.
   B. Provide water sensing switches with NPT fittings suitable for piping mounting where required.

3.8 SELECTOR SWITCH
   A. Provide Selector switches where indicated on drawings or as required to accomplish sequences.
   B. Select contact type based on drawings or as required to meet intended control function.

3.9 PILOT LIGHTS
   A. Provide Pilot Lights where indicated on drawings or as required to accomplish sequences.

3.10 PUSHBUTTON SWITCH
   A. Provide Selector switches where indicated on drawings or as required to accomplish sequences.
   B. Select contact type based on drawings or as required to meet intended control function.

3.11 GENERAL
   A. Ratings of normally open and normally closed contacts shall be adequate for 1.5 times expected load.
   B. Mount adjustable or resettable instruments for easy access without the need for a ladder, flashlight, etc.
   C. Unless otherwise specified, functionality of interlocks and safeties shall be operational in hand, auto, or bypass (for VFD’s).
   D. Digital Inputs: Each digital input shall be a contact closure (or opening) having no power on it other than that provided by the control system.