VARIABLE FREQUENCY DRIVES

DESIGN GUIDELINES

1. Summary:
   a. This section provides guidelines and standards for Variable Frequency Drives.

2. General
   a. Provide one drive for each motor being controlled. This does not include “fan-walls”.
   b. Review with WUSM OFMD the use of VFD's on pumps and HVAC equipment prior to design.
   c. Drive to include the following features:
      • Nema type 1 enclosure or upgraded to NEMA 3R/4 where required due to harsh environmental conditions.
      • Exterior drives should be avoided.
      • Units shall have automatic high temperature shut down at and above 50°C where serving non critical spaces.
      • Custom enclosure (ABB BCR) is preferred. Where space is an issue, vertical style VFD enclosure can be used (ABB VCR),
      • Variable torque
      • Three contactor manual bypass or two contactor bypass w/maintenance safety switch.
      • 100KAIC rating minimum (To be determined by electrical engineer).
      • VFD control panel shall include LCD display to indicate operating mode and alarms, Enable LED, Drive and Bypass LED and Motor Run LED.
      • Line reactors: A 3% line reactor minimum required installed on all drives.
      • VFD Fault Contact.
      • VFD Run Contact.
      • Fire/Freeze stat contact to shutdown fans from fire alarm or building automation system.
      • Unit shall be designed for easy fan replacement without removal of other components.
      • Drives shall be provided with a 3-year factory warranty.
   d. Communications: All VFD to be used with external system within a multidrop LAN configuration. Interface shall allow all parameter settings of VFD to be programmed via
BAS control. Provide capability for VFD to retain these settings within the nonvolatile memory. Provide a communications card (N2, Bacnet, ModBus or similar) with the VFD.

e. Remote mounted variable frequency drives shall be interlocked to its respective auxiliary contacts on the disconnect switch. Coordinate with Temperature Controls Contractor.

f. Control/communications wiring shall not be installed in the same conduit, raceway or wire-trough as power wiring.

g. Load and Line power wiring shall not be installed in the same conduit, raceway or wire-trough.

3. Location

a. Ambient temperature.

b. Ventilated space.

c. Provide cooling capacity for VFD heat load.

d. Remote mounted variable frequency drives shall be interlocked to its respective auxiliary contacts on the disconnect switch. Coordinate with Temperature Controls Contractor.

e. Control wiring shall not be installed in same conduit with power wiring.

f. Label and provide appropriate Signage.

g. Not inside any equipment being served.

h. With-in sight, so not to have additional disconnects.

i. Unit shall be protected during construction from construction dust and debris.

j. Do not install in public spaces (ex. Parking garages) where public could access drives. If installed in public space, provide protection around drive that is lockable.

k. Location coordination with animal research, lab equipment, etc.

4. Equipment Manufacturer provided VFD’s – Coordinate the following:

a. Location

b. Manual bypass (if required)

c. Unit-mounted or remote

5. DDC Controls

a. BACnet card to expose all BACnet points to BAS.

b. All overloads shall provide “alarm” to the BAS vs shutting down.

c. BAS points to be monitored:

- Start/Stop
- Speed command.
- Hertz
- Voltage
- Status
6. Related Sections:
   a. AHUs
   b. RTUs
   c. Pumps
   d. Fans
   e. Cooling Towers
   f. Enclosed Motor Controllers
   g. Enclosed Switches And Circuit Breakers
   h. Motors
   i. DDC Controls

EQUIPMENT and PRODUCT REQUIREMENTS

1. VFD’s
   a. Approved Manufacturers:
      • ABB (Preferred)
      • Toshiba
      • Yasakawa preferred for small factional horsepower equipment (i.e. small fan coil units).

2. Manual bypass
   a. Speed limitation needs to be verified so as not to over pressurize ductwork or piping systems when unit is operated in bypass.
   b. Speed limitation for pumps without triple-duty valves.

3. Enclosure Style
   a. Use custom enclosure (ABB BCR).
   b. Vertical style (ABB VCR) enclosure are only allowed for space considerations and must be approved by WUSM Engineering.
   c. NEMA-1
   d. Unit shall be designed for easy internal cooling fan replacement without removing of other electronic boards, etc.

END OF SECTION