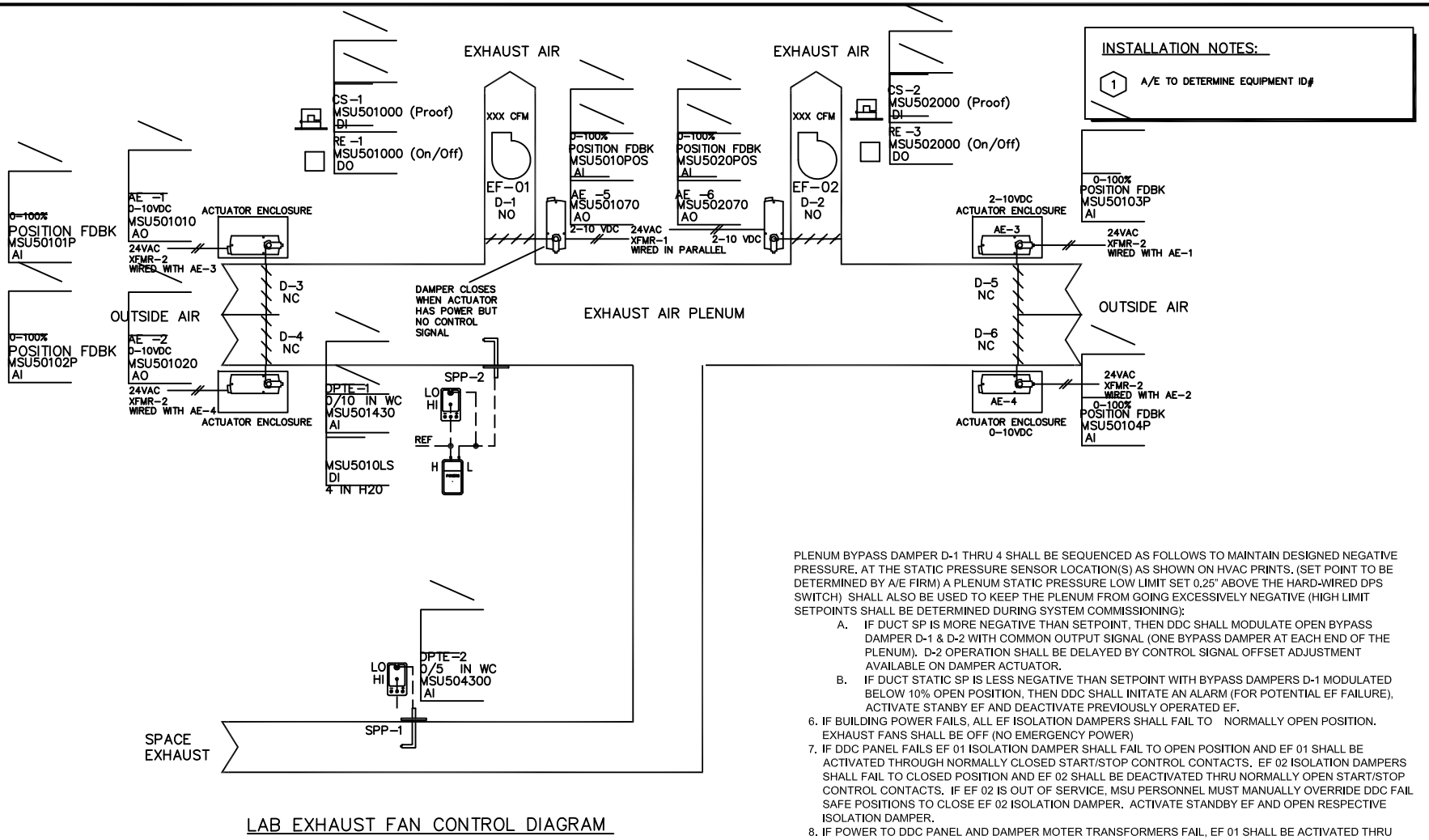

LAB EXHAUST FAN CONTROL DIAGRAM

SEQUENCE OF OPERATION

LAB EXHAUST FAN CONTROL

NOTE: ALL SETPOINTS DESCRIBED IN THE SEQUENCE WILL BE ADJUSTABLE BY SYSTEM OPERATORS. (CREATE REQUIRED VIRTUAL POINTS). APPROPRIATE DEADBANDS SHALL BE USED TO PREVENT SHORT CYCLING SITUATIONS. ALL FAN MOTOR CONTROL SWITCHES SHALL BE IN "AUTO" POSITION.

1. EXHAUST FANS EF-01 & EF-02 SHALL HAVE START/STOP CAPABILITY FROM THE DDC SYSTEM. ONE EF SHALL OPERATE AND THE OTHER SHALL SERVE AS STANDBY. THE SYSTEM SHALL OPERATE CONTINUOUSLY.
2. DDC SHALL OPEN RESPECTIVE EA ISOLATION DAMPERS WHENEVER EF-01 OR EF-02 IS ACTIVATED. EF SHALL START WHILE DAMPER IS OPENING. DDC SHALL MONITOR DAMPER POSITION TO VERIFY THAT DAMPER REACHES FULL OPEN POSITION; OTHERWISE AN ALARM SHALL BE INITIATED, UPON ALARM, DDCSHALL DEACTIVATE FAILED FAN AND ACTIVATE STANDBY EF.
3. EXHAUST FAN STATUS FOR EACH FAN SHALL BE MONITORED BY DDC THRU RESPECTIVE CURRENT SWITCH. ABNORMAL STATUS CONDITION SHALL ACTIVATE ALARM, UPON ALARM, DDC SHALL DEACTIVATE FAILED FAN AND ACTIVATE THE STANDBY FAN.
4. DDC SHALL ALTERNATE EF-01 & EF-02 OPERATION AT THE BEGINNING OF EACH MONTH OR MANUALLY. OPERATOR SELECTABLE.
5. PLENUM BYPASS DAMPER D-1 THRU 4 SHALL BE SEQUENCED AS FOLLOWS TO MAINTAIN DESIGNED NEGATIVE PRESSURE. AT THE STATIC PRESSURE SENSOR LOCATION(S) AS SHOWN ON HVAC PRINTS. (SET POINT TO BE DETERMINED BY A/E FIRM) A PLENUM STATIC PRESSURE LOW LIMIT SET 0.25" ABOVE THE HARD-WIRED DPS SWITCH) SHALL ALSO BE USED TO KEEP THE PLENUM FROM GOING EXCESSIVELY NEGATIVE (HIGH LIMIT SETPOINTS SHALL BE DETERMINED DURING SYSTEM COMMISSIONING):
   A. IF DUCT SP IS MORE NEGATIVE THAN SETPOINT, THEN DDC SHALL MODULATE OPEN BYPASS DAMPER D-1 & D-2 WITH COMMON OUTPUT SIGNAL (ONE BYPASS DAMPER AT EACH END OF THE PLENUM). D-2 OPERATION SHALL BE DELAYED BY CONTROL SIGNAL OFFSET ADJUSTMENT AVAILABLE ON DAMPER ACTUATOR.
   B. IF DUCT STATIC SP IS LESS NEGATIVE THAN SETPOINT WITH BYPASS DAMPERS D-1 MODULATED BELOW 10% OPEN POSITION, THEN DDC SHALL INITATE AN ALARM (FOR POTENTIAL EF FAILURE), ACTIVATE STANBY EF AND DEACTIVATE PREVIOUSLY OPERATED EF.ACTS. IF EF 02 IS OUT OF SERVICE, MSU PERSONNEL MUST MANUALLY OVERRIDE DDC FAIL SAFE POSITIONS TO CLOSE EF 02 ISOLATION DAMPER. ACTIVATE STANDBY EF AND OPEN RESPECTIVE ISOLATION DAMPER.

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   B. IF DUCT STATIC SP IS LESS NEGATIVE THAN SETPOINT WITH BYPASS DAMPERS D-1 MODULATED BELOW 10% OPEN POSITION, THEN DDC SHALL INITATE AN ALARM (FOR POTENTIAL EF FAILURE), ACTIVATE STANBY EF AND DEACTIVATE PREVIOUSLY OPERATED EF.

6. IF BUILDING POWER FAILS, ALL EF ISOLATION DAMPERS SHALL FAIL TO NORMALLY OPEN POSITION. EXHAUST FANS SHALL BE OFF (NO EMERGENCY POWER)
7. IF DDC PANEL FAILS EF 01 ISOLATION DAMPER SHALL FAIL TO OPEN POSITION AND EF 01 SHALL BE ACTIVATED THROUGH NORMALLY CLOSED START/STOP CONTROL CONTACTS. EF 02 ISOLATION DAMPERS SHALL FAIL TO CLOSED POSITION AND EF 02 SHALL BE DEACTIVATED THRU NORMALLY OPEN START/STOP CONTROL CONTACTS. IF EF 02 IS OUT OF SERVICE, MSU PERSONNEL MUST MANUALLY OVERRIDE DDC FAIL SAFE POSITIONS TO CLOSE EF 02 ISOLATION DAMPER. ACTIVATE STANDBY EF AND OPEN RESPECTIVE ISOLATION DAMPER.
8. IF POWER TO DDC PANEL AND DAMPER MOTER TRANSFORMERS FAIL, EF 01 SHALL BE ACTIVATED THRU NORMALLY CLOSED START/STOP CONTROL CONTACTS AND ALL EF ISOLATION DAMPERS SHALL FAIL TO NORMALLY OPEN POSITION. MSU SHALL BE CAPABLE OF MANUALLY ACTIVATING EF 02 AS REQUIRED.
9. EF 01 & EF-02 TO OPERATE PER ABOVE SEQUENCE
10. EF ISOLATION DAMPER ACT SHALL BE 2-10 V DC MODULATION TYPE FOR REVERSE ACTING CONTROL CAPABILITY AND WITH POSITON FEEDBACK. ISOLATION DAMPERS FOR EF-01 SHALL BE FULL FULL OPEN AT 10 VOLTS AND ISOLATION DAMPERS FOR EF-02 SHALL BE FULL CLOSED AT 10 VOLTS. UPON LOSS OF 24V POWER DAMPERS SHALL SPRING RETURN TO NORMALLY OPEN POSITION.
11. DAMPER ACTUATORS FOR BYPASS DAMPER CONTROL SHALL BE 0-10V WITH ADJUSTABLE OFFSET AND FEEDBACK. BYPASS DAMPERS D-1 AND D-2 SHALL BE CONTROLLED FROM COMMON DDC OUTPUT WITH D-1 SET FOR 0-10 V AND D-2 SET 2-10V. BYPASS DAMPERS D-3 AND D-4 SHALL BE CONTROLLED FROM COMMON OUTPUT, BOTH SET 0-10V.
12. A HARD-WIRED LOW STATIC PRESSURE SWITCH SHALL BE USED TO SHUT-DOWN BOTH FAN UPON EXCEEDING SETPOINT (SETPOINT TO BE DETERMINED BY A/E FIRM). A PANEL MOUNT PILOT LIGHT SHALL BE USED FOR LOCAL INDICATION THAT THE DPS HAS TRIPPED
13. ALL FAN FAILURE AND ALARMS SHALL HAVE MESSAGES ASSIGNED TO THEM AND SET UP FOR AFTER HOURS ALARMING TO DPS.

ALARMING

NORMAL
- STATIC PRESSURE
- ISOLATION DAMPER FAILURE

"ENHANCED" 24/7
- FAN FAILURE
- CRITICAL STATIC PRESSURE (AS APPLICABLE)

MICHIGAN STATE UNIVERSITY
Infrastructure Planning and Facilities

LAB EXHAUST FAN CONTROL DIAGRAM

DATE 9/12/10
DRAWN
REVISION 7/11/16 RLANDRUM
DETAIL NO. XXXXXX-XX
SHEET OF ONE

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