

SECTION 230593 APPENDIX A: STAIRWELL PRESSURIZATION TEST FORM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the basic test procedures and reporting form for the stairwell pressurization system included on the project.
1. Equipment included:
 - a. SPF-2-1.
 - b. SPF-2-2.
 - c. Fire Alarm System.
 - d. Emergency Power System.
 - e. Building Management Systems
- B. Related Sections include the following:
1. Division 01 Section "Construction Waste Management"
 2. Division 01 Section "Sustainable Design Requirements - LEEDv4 BD+C" for additional LEED requirements

1.2 SUBMITTALS

- A. LEED Submittals: Provide submittals for the products named herein as delineated in Division 01 Section, "Sustainable Design Requirements - LEED V4 BD+C" Article 1.6, Action Submittals, subparagraph 1.6.C.9 for VOC content of sealants and adhesives.

PART 2 - PRODUCTS

2.1 COMPONENT INSPECTION

- A. The intent is to prevent smoke from migrating into the stairwell during occupant egress by pressurizing the stairwell with respect to the rest of the building. The pressure differentials are created by actively controlling dedicated supply fan(s) and damper(s) to supply the stairwell with 100% outdoor air. Prior to performing any functional tests, the commissioning pre-start, start-up, and verification checklists on all fan systems and dampers should be completed, as well as applicable manufacturer's pre-start and start-up recommendations. Refer to Division 23 "Commissioning of HVAC Systems" for required equipment test forms.
- B. Prior to the commencement of activating the exit pressurization system it is important to walk through the stairwell or passageway and confirm that all door hardware has been fitted and installed in working order. Test each door that it closes and latches correctly.

- C. Pre-functional checklist items include, but not limited to, the following:
1. Fan systems and damper(s) are installed per contract documents and manufacturer's installation instructions.
 2. Control system point-to-point checkout is complete to ensure all fan and damper input/output points are wired correctly.
 3. Normal power, and emergency power if applicable, is provided to each fan and damper assembly at proper voltage.
 4. All fan systems have been balanced per the contract documents.
 5. All safeties and interlocks, especially fan status and high-pressure cut-out, are installed and function per contract documents.

2.2 VERIFY PROPER SEQUENCE OF OPERATION

- A. Refer to Division 23 "Sequence of Operations for HVAC Controls."

2.3 RECOVERY TIME

- A. The recovery time is the time taken for the velocity at the door or the pressure differential in the stairwell to recover after the opening and closing of doors. The best way to test the recovery time is to monitor the stairwell pressure using a magnehelic gauge with all doors closed. Then by, opening the fire effected floor door fully, allow the exit pressurization system to settle. Close the door quickly and watch the magnehelic gauge. The pressure will rise suddenly then begin to drop. Record the time taken for the pressure differential to recover back to its set value. The time taken should be less than 10 seconds.

2.4 TEST PROCEDURE

- A. In order to test proper operation of the stairwell pressurization system initiate an event signal and perform the following:
1. Ensure all isolation dampers are open (if applicable) and supply fans turn ON.
 2. Confirm fan rotation is correct and measure the fan motor amperage and voltage. Confirm the motor is not overloaded.
 3. Measure and record pressure differential across each stairwell door with all doors closed. Measured pressure differential should exceed value required by code. Note that stack effect; wind speed and direction; and outdoor temperature may all influence measured pressures and system balance. A pressure differential of 0.05 in w.g. (12.5 Pa) from stair shaft to the reference point is the minimum acceptable pressure difference.
 4. Measure and record the force needed to open one door using a spring scale, belt tension checker, or other appropriate device for test door-opening forced. Hold door open and measure the pressure differential across each stairwell door again. Measured door opening force should not exceed code, while pressure differential across remaining doors should meet or exceed code. This force should not exceed 30 pounds (13.6 kg) or a locally specified value.
 5. Continuing from above, open the required number of doors one at a time, measuring and recording the force needed to open each door respectively, and the pressure differential across the remaining stairwell doors. Measured door opening force should not exceed

code, while pressure differential across remaining doors should meet or exceed code requirements.

6. With all required doors open, determine direction of air flow across each door opening. Verify that air flows from the stairwell to the occupied space.
7. For variable flow supply systems, follow the same procedures as described above confirming the design stairwell pressure set point is maintained throughout the test and the response time of the control algorithm must be checked. The response time of the pressurization control loop should not allow short-term pressure values to fall below the value required by code.
8. Verify the hands-off-automatic (HOA) manual controls at the Fire Alarm Control Panel (FACP) perform their intended life safety functions.
9. Operate system in both normal and emergency power. Confirm if system resets itself when power switches its source.

2.5 NOISE LEVELS

- A. With the system operating in fire mode each exit should be tested to ensure the minimum noise levels are maintained. The noise level in the stairwell at each exit should be tested with the stairwell door open and is required to be less than 80 dB(A) on the overall spectrum scale. The noise level at each exit inside the occupied space should be tested with the stairwell door closed and is required to be less than 65 dB (A) or 5 dB (A) above the normal background level to a maximum of 80 dB (A).

2.6 REPORT

- A. At a minimum, the Contractor shall supply the test forms included in Section 3. Single page copies will be provided to the awarded Contractor. Additional basic reporting for fire alarm system and building management system will be provided under other Sections.
- B. Contractor may substitute their own forms as long as the form meets the intent of the sample form included within this Section.
- C. Contractor shall provide one test form per stairwell for each test condition as follows:
 1. TEST CONDITION 1: ALL DOORS CLOSED, NO FAN RUNNING, DAMPER CLOSED
 2. TEST CONDITION 2: NORMAL POWER, BOTTOM EXIT DOOR OPEN, ALTERNATE EACH FLOOR DOOR OPEN/CLOSED, SUPPLY FAN RUNNING, DAMPER OPEN
 3. TEST CONDITION 3: SAME AS CONDITION 2 WITH EMERGENCY POWER

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT (LEED)

- A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

3.2 STAIRWELL PRESSURIZATION TEST FORM (DUPLICATE AS REQUIRED)

<u>STAIR TOWER PRESSURIZATION TEST FORM</u>				
TEST CONDITION - <u> 1, 2, 3 </u> (Circle Number that Applies)				
PROJECT: _____				
DATE OF TEST: _____				
SYSTEM TESTED: _____				
OUTSIDE TEMPERATURE: _____ DEG F				
AMBIENT TEMPERATURE: _____ DEG F				
WIND SPEED: _____ MPH OR FPM				
WIND DIRECTION: _____				
SPF TAG: _____				
SPF STATUS: _____ ON OR OFF				
DAMPER STATUS _____ OPEN OR				
VFD SETPOINT: _____ HZ				
TOTAL AIR VOLUME: _____ CFM				
RESPONSE TIME FROM DETECTOR: _____ SEC				
DAMPER OPEN, FAN START, FAN AT DESIGN SPEED: _____ / _____ / _____ SEC				
<u>TEST RESULTS</u>				
FLOOR	STAIRWELL PRESSURE (in WC)	DOOR THRESHOLD DIFFERENTIAL PRESSURE (in WC)	DOOR PULL LATCH-START-FULL (lbs)	OPEN DOOR THRESHOLD DIFFERENTIAL PRESSURE* (in WC)
1			/ /	
2			/ /	
3			/ /	
4			/ /	
5			/ /	
6			/ /	
7			/ /	
8				
9				
10				
11				
12				
14				
15				
16				
17				
18				
19				
* Applies to Condition 2 and 3 testing only with bottom exit door open.				
<u>FOR CONDITION 3, RECORD THE FOLLOWING ADDITIONAL TEST POINTS:</u>				

UPON TRANSFER TO EMERGENCY POWER, HOW LONG DOES IT TAKE FOR SYSTEM TO RESPOND:	_____	SEC
SHUTDOWN SYSTEM WHILE ON EMERGENCY POWER AND RESTART, DOES IT RESTART:	_____	YES OR NO

<i>ATTENDEES (NAME, PHONE NUMBER, SIGNATURE):</i>	
CODE OFFICIAL:	_____
OWNER:	_____
SPECIAL INSPECTOR:	_____
ENGINEER:	_____
CX AGENT:	_____
CONST MANAGER:	_____
CONTRACTORS:	_____

END OF SECTION 230593