



# HGA

## EXISTING HILBERRY THEATER MEP PRICING ALTERNATES WAYNE STATE UNIVERSITY

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## Overview of the Existing Hilberry Theater and the MEPF Pricing Alternates

As part of the new Hilberry Gateway Project, the existing Hilberry Theater will be renovated to become the new Valade Jazz Center – a modern, jazz performance venue that will support current and future jazz performance needs.

With the initial renovation studies of the existing Hilberry Theater, the full state of the existing HVAC, Plumbing, Fire Protection, Electrical, and Life Safety Systems was not fully known nor documented to determine appropriate pricing. As such, Wayne State University hired Peter Basso and Associates to further assess and perform commissioning services of the existing HVAC, Plumbing, Fire Protection, Electrical, and Life Safety Systems of the existing Hilberry Theater. The initial phase of the report was completed in January of 2019, where a list of findings and recommendations for repairing, replacing, improving, etc. of systems were presented to Wayne State University.

Wayne State University and the Hilberry Gateway Project need to determine the cost of addressing each of the issues found in order to move forward with a renovation strategy, and ultimately, the Hilberry Gateway project.

## MEPF Pricing Alternates

Wayne State University needs to determine the costs of the various HVAC, Plumbing, Fire Protection, Electrical, and Life Safety System issues in the existing Hilberry Theater to determine how to proceed with further renovation activities to support the new Hilberry Gateway Project and the new Valade Jazz Center.

In the following spreadsheet, there will be a list of Mechanical and Electrical alternates that will require contractor pricing. Each of these pricing alternates are in addition to those project alternates and base bid activities submitted in earlier packages and information.

Each alternate includes the following to assist with pricing:

- A specific number for tracking purposes
- The description of the alternate for pricing
- A reference location for the system in the existing Hilberry Theater
- Reference information from the Peter Basso and Associates Retro-commissioning / Facility Assessments report
  - o A Peter Basso reference number for the issue from Section 2. Retro-Commissioning Findings/Recommendations from the Report

- A summary of the issue from the Section 2. Retro-Commissioning Findings/Recommendations of the Report
- Any associated reference photos useful for pricing that can be found in Section 7 of the Report.

### **Retro-Commissioning / Facility Assessments Report**

The Peter Basso & Associates is a detailed report of the existing conditions of the existing Hilberry Theater. As such, the pricing team may find the additional portions of the report useful so therefore the full report has been included in its entirety in an appendix to this pricing document.

It is recommended that the pricing team reference the mechanical and electrical floor plans in Section 5 and Section 6 of the report.



Mechanical	Alternate Number	Alternate Description	Existing Building Location	Peter Basso and Associates Retro-commissioning / Facility Assessment Report			Alternate Price (TBD)	Pricing Notes
				Report Ref Number	Report Description of Item	Report Photo Ref		
	M1 - AHU1	For existing Air Handling Unit 1, replace pneumatic return air temperature sensor with control dial, replace pneumatic bypass damper air temperature sensor, replace pneumatic discharge air temperature controller, and add new unit freezestat	Mech 102.1 (1st Flr West Side)	TC-1.1, TC-1.2, TC-1.3, TC-1.4	Cooling coil valve pneumatic return air temperature sensor no longer functions. Pneumatic discharge air temperature sensor for heating coil bypass damper control no longer functions. Pneumatic discharge air temperature controller used to stage the four heating coil control valves no longer functions. Unit has no freezestat for freeze protection.	28A, 28B, 28C		
	M2 - AHU1	Remove and replace existing pneumatic controls with new direct digital controls for the existing AHU-1. New controller, seshors, acuators and relays shall be able to provide the following control functions: Remote on/off scheduling capability, Remote monitoring of system status/alarms, Remote setpoint adjustment, Heating coil/cooling coil control to maintain space temperature, Enthalpy Economizer control, and Demand Control Ventilation	Mech 102.1 (1st Flr West Side)	TC-1.5	AHU-1 has no control panel and is operated manually.	-		
	M3 - AHU1	Provide new outdoor air damper for AHU-1 at outdoor air intake louver with new access panel.	Mech 102.1 (1st Flr West Side)	HVAC-1.2	Outside air damper could not be located.	-		
	M4 - AHU1	Clean AHU1 cooling coil drain valves	Mech 102.1 (1st Flr West Side)	HVAC-1.3	Cooling coil drain valve pipe is plugged.	-		
	M5 - AHU1	Provide new stainless steel AHU1 cooling coil drain pan.	Mech 102.1 (1st Flr West Side)	HVAC-1.4	Cooling coil drain pan does not meet current code and is rusted.	28D		
	M6 - AHU1	Replace four AHU-1 steam control valves.	Mech 102.1 (1st Flr West Side)	HVAC-1.8	All four AHU-1 steam control valves have signs of leaking.	-		
	M7 - AHU1	Replace first AHU-1 steam coil isolation valve	Mech 102.1 (1st Flr West Side)	HVAC-1.9	The first AHU-1 heating coil has a leaky isolation valve.	-		
	M8 - AHU1	Add AHU-1 fan belt guard	Mech 102.1 (1st Flr West Side)	HVAC-1.11	Fan belt guard is missing.	-		
	M9 - AHU1	Add AHU-1 access panels for fan service and adjust adjacent ductwork to allow for coil pulls	Mech 102.1 (1st Flr West Side)	HVAC-1.12	Access to unit for maintenance is inadequate. There is no space for coil pulls, and no space for fan belt replacement. Fan belt access is through a hole cut in the wall from the adjacent space.	-		
	M10 - AHU1	Clean AHU-1 casing and provide new AHU casing 2" fiber-board insulation.	Mech 102.1 (1st Flr West Side)	HVAC-1.14	Air handling unit casing is not insulated.	-		
	M11 - AHU1	Clean AHU-1 outside air ductwork and supply air ductworkand provide new 2" mineral fiber blanket insulation.	Mech 102.1 (1st Flr West Side)	HVAC-1.15	Outside air duct and supply air ductwork is not insulated.	-		
	M12 - AHU1	Remove and replace AHU-1 existing return air and outside air damper.	Mech 102.1 (1st Flr West Side)	HVAC-1.16	Return air damper has no seals and leaks. Unable to access outside air damper.	-		
	M13 - AHU1	Reconfigure AHU-1 supply fan power and controls with new hand/off/auto switch.	Mech 102.1 (1st Flr West Side)	HVAC-1.17	Supply air fan does not have a hand/off/auto switch.	-		
	M14 - AHU1	Completely replace AHU-1 with new 6,500 cfm air handling unit with new controls, connections and associated accessories.	Mech 102.1 (1st Flr West Side)	-	-	-		
	M15 - EXH	Provide new 3,500 cfm inline exhaust fan at exhaust relief air louver. Provide associated motorized isolation damper, space static pressure control, and inlet ductwork with silencer.	Mech 102.1 (1st Flr West Side)	HVAC-1.13	Relief fan was completely removed, relief air louver is closed off, and relief air ductwork was abandoned. The unit does not have means for relieving air from the space.	-		
	M16 - AHU2	Completely replace AHU-2 with new 16,000 cfm air handling unit with new controls, connections and associated accessories.	Mech Room 047	-	-	-		
	M17 - FC1/2	Reconfigure both lobby fan coil unit power and controls with new hand/off/auto switch.	West Corridor 102 Box Office 101 Mechanical Room	FC-0.2	Supply air fan does not have a hand/off/auto switch.	27, 38		
	M18 - FC1/2	Provide programmable direct digital controllers for both lobby fan coil units with new thermostats	West Corridor 102 Box Office 101 Mechanical Room	FC-0.3	Fan coil units have no start/stop control. They are switched on/off manually.	27, 38		
	M19 - FC1/2	Replace existing pneumatic cooling control valves on lobby fan coil units with new digital cooling coil valves.	West Corridor 102 Box Office 101 Mechanical Room	FC-0.4	Fan coil units have pneumatic controls for cooling coil valve.	27, 38		
	M20 - FC1	Balance fan coil unit fan.	West Corridor 102	FC-1.1	Fan vibrates excessively when operating.	27		
	M21 - FC1	Replace fan coil unit fan belts and sheaves.	West Corridor 102	FC-1.2	Fan belts are slipping/squeaking.	27		

Mechanical	Alternate Number	Alternate Description	Existing Building Location	Peter Basso and Associates Retro-commissioning / Facility Assessment Report			Alternate Price (TBD)	Pricing Notes
				Report Ref Number	Report Description of Item	Report Photo Ref		
	M22 - FC2	Calbrate fan coil unit return air sensor.	Box Office 101 Mechanical Room	FC-2.1	Return air sensor used for chilled water valve controls is out of calibration by approximately 20°F. It is currently set to 48°F.	-		
	M23 - FC2	Replace lobby fan coil unit fan belts	Box Office 101 Mechanical Room	FC-2.2	One fan belt is missing.	38A		
	M24 - FC2	Add fan belt guard to lobby fan coil unit	Box Office 101 Mechanical Room	FC-2.3	Fan belt guard is missing.	38A		
	M25 - FC1/2	Replace and remove existing lobby vertical, closet fan coil units with new 1,750 cfm fan coil units with new controls, piping connections and accessories.	West Corridor 102 Box Office 101 Mechanical Room	FC-0.5	Due to the need for ventilation air, additional cooling capacity for ventilation, and deficiencies listed for these units, we recommend replacing these fan coil units.	-		
	M26 - STM	Repair combined steam and condensate pipe in mechanical room.	Mech Room 047	HTG-1.1	Combination steam/condensate pipe leaks and puddles onto mechanical room floor. Repair has not begun.	14A, 14B		
	M27 - STM	Provide cost to reinsulate approximately 250 linear feet of steam and steam condensate piping.	Throughout Building	HTG-2	There are many locations where sections of steam piping insulation is missing.	N/A		
	M28 - STM	Calibrate steam header pressure sensor	Mech Room 045	HTG-3	Pressure sensor at steam header is out of calibration, and incorrect pressure is displayed on graphics.	N/A		
	M29 - STM	Replace steam header pressure gauge	Mech Room 045	HTG-4	Pressure gauge at steam header is out of calibration and reads incorrectly.	N/A		
	M30 - STM	Clean condensate receiver drain and add high water sensor with alarm.	Mech Room 045	HTG-5	Condensate receiver drain is plugged. There is no high water alarm locally, or on DDC.	8		
	M31 - STM	Replace existing feed water tank controls with new direct digital controller with pump stage and lead/lag operation.	Mech Room 045	HTG-6	Pump controller for feed water tank pumps runs both pumps simultaneously instead of alternating pumps. Facilities staff manually shuts off one pump at the hand/off/auto switch in order to alternate pumps weekly.	9		
	M32 - STM	Add boiler feed pump alarms and high/low water alarms.	Mech Room 045	HTG-7	There are no alarms for pump failures or low/high water alarms.	9		
	M33 - STM	Replace all backup pump solenoid valves serving feed water pumps P-1, P-2, and P-3.	Mech Room 045	HTG-8	Back-up feed water pump P-4 solenoid valves serving feed water pumps P-1, P-2, and P-3 leak. Whenever the back-up pump runs, water leaks through the solenoid valves and overflow the non- operating boilers.	5		
	M34 - STM	Replace boiler gauge glass.	Boiler Room 043	HTG-10	Boiler-1 gauge glass doesn't blow down.	N/A		
	M35 - STM	Replace auto blowdown valves. Replace conductivity sensors.	Boiler Room 043	HTG-10.1	Auto blowdown for boilers B-1, B-2, and B-3 are not functioning. Boiler conductivity sensors do not function.	N/A		
	M36 - STM	Replace fan belts and sheaves.	Boiler Room 043	HTG-11	Exhaust fan has a bad belt.	N/A		
	M37 - DHW	Replace domestic hot water circulation pump 1.	Mech Room 045	PLM-2	Pump 1 does not function.	N/A		
	M38 - RAD	Provide zone thermostat(s) and control valves on radiators for space temperature control.	Main Lobby 110	HTG-9.1	Main lobby radiators have no control valves.	30 through 37		
	M39 - RAD	Replace radiator steam isolation valve.	Storage Room 103	HTG-9.2	Radiator does not heat and may be plugged. Water leaks from isolation valve.	41		
	M40 - RAD	Replace steam radiator vents.	Room 201.1	HTG-9.3	Radiator vents in this room leak.	61		
	M41 - RAD	Provide zone thermostat(s) and control valves on radiators for space temperature control.	Common Area 202	HTG-9.4	Radiator has inconsistent control and no automatic controls	55		
	M42 - RAD	Provide zone thermostat(s) and control valves on radiators for space temperature control.	Room 203	HTG-9.5	Wall hung radiators were abandoned in place because space was too hot when occupants were working.	63		
	M43 - RAD	Replace isolation valve and slope finned tube properly.	Make-up Room 205	HTG-9.6	Finned tube under sinks does not heat. Isolation valve leaks.	64A, 64B		
	M44 - RAD	Repack isolation valve.	Men's Lounge 208	HTG-9.7	Radiator isolation valve leaks.	53		
	M45 - RAD	Clean, drain and pitch convector properly. Provide zone thermostat(s) and control valves on convector for space temperature control.	Room 210	HTG-9.8	Convector does not heat and may be plugged.	58		
	M46 - RAD	Replace wall mounted radiator control valve and thermostat.	Organ Echo Loft Room 302	HTG-9.9	Pneumatic control valve for wall mounted radiators does not function. Thermostat does not function.	68		
	M47 - RAD	Replace radiator air vent.	Common Area Stairwell (Southwest Corner)	HTG-9.10	Radiator behind couch in common area stairwell is cold and missing air vent.	40		
	M48 - RAD	Clean and drain radiator. Provide zone thermostat(s) and control valves on radiator for space temperature control.	2nd Flr Stairway	HTG-9.11	Radiator is cold and may be plugged. Air vent was recently replaced.	24		
	M49 - TC	Contractor shall pressure test temperature controls penumatic air system and repair any leaks found,	Mech Room 047	TC - 2.9	Temperature controls air compressor runs continuously.	12		



Electrical

Alternate Number	Alternate Description	Existing Building Location	Peter Basso and Associates Retro-commissioning / Facility Assessment Report			Alternate Price (TBD)	Pricing Notes
			Report Ref Number	Report Description of Item	Report Photo Ref		
E1 - FP	Contractor shall perform Fire Alarm system testing. As part of testing, contractor shall document Fire Alarm system capacity, program version and suitability for future full renovation of existing Hilberry Theater.	Throughout	FP-1	Latest fire alarm system testing conducted in 2010	16		
E2 - FP	Replace existing Fire Alarm system with capabilities and capacities to serve full renovated Existing Hilberry Theater	Throughout	-	-	-		
E3 - PWR	Replace LP-C Merc 30A breaker	Main Electrical Room	PWR-1	Merc 30A breaker is overheating. The load was checked and found acceptable. Cables were found loose and tightened. Equipment continued to overheat.	E6A, B, C, D, E, F		
E4 - PWR	Replace LP-J Stage Right stage works breaker	Second Floor	PWR-2	SR stage works breaker is overheating.	E15A, B, C, D, E, F, G		
E5 - PWR	Replace LP-F breakers at Circuits #24 and #28	Second Floor	PWR-3	Circuits #24 and #28 are overheating.	E10A, B, C, D, E, F		
E6 - PWR	Replace LP-BR breakers at Circuits #25, #27 and #29	Boiler Room	PWR-4	Supply fan breaker circuits #25, #27 and #29 are overheating.	E4A, B, C, D		
E7 - PWR	Replace disconnect	Basement	PWR-5	A phase fuse clip and disconnect serving the portable dimmer rack are overheating.	E9A, B, C, D		
E8 - PWR	Clean Main Switchboard and all Panelboards	Throughout	PWR-6	Interior of Main Switchboard and Panelboards are dirty.	-		

## **Retro-Commissioning / Facility Assessments Report**



Wayne State University  
Hilberry Theatre

Retro-Commissioning/Facility Assessment



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Wayne State University  
Hilberry Theatre

Retro-Commissioning/Facility Assessment

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## **1. Executive Summary**

The goal of this project is to perform Retro-Commissioning services and a Facility Assessment to assist the Hilberry Gateway project team in evaluating the condition, operation, and weaknesses of the mechanical, electrical and plumbing systems. The project goal is to keep/reuse the existing systems, identify system components that have failed or no longer function properly, provide recommendations to repair or replace system components, and identify system improvement opportunities to improve the reliability, operation and controllability of the systems.

Our focus is to reuse equipment as much as possible, so our findings listed in Section 2 are given two priorities marked with an “X” on the list. Items marked as Priority 1 are items that need to be addressed, as they no longer function, do not meet code, or present a health or safety concern. Items marked as Priority 2 are recommended as a system improvement to be considered in the budget. The findings list also includes a photo number, which can be used to reference the item to its associated photo in the appendix, and the location of the photo on the plans.

The project is divided into two phases. Phase 1 is complete with the exception of switching the chiller on/off due to cold weather, and the exercising the main electrical equipment because the building was occupied during the electrical contractor’s site visit.

Phase 2 was recently completed.

Below is a summary of our scope of services for this project:

### **Phase 1**

1. Review building mechanical, electrical and plumbing systems construction documents.
2. Attend project kick-off meeting and interview Wayne State University maintenance staff to identify operational and thermal comfort issues.
3. Perform visual/static review of mechanical, electrical, plumbing and fire protection equipment and provide the following:
  - a. List equipment with location, area served, and nameplate data
  - b. Develop equipment-anticipated sequences of operation.
  - c. Photograph equipment.
  - d. Identify equipment and photograph locations on building key plans.
  - e. Rate condition of equipment: “good,” “needs service,” “overhaul,” or “replace.”

4. Direct and observe HVAC system and equipment functional verification testing. Control system manipulation to facilitate functional testing shall be performed by WSU maintenance staff as directed by PBA. Functional testing, including operating the systems/equipment through all modes of operation including heating, cooling, occupied, unoccupied modes, safety shutdowns and verification of equipment interlocks. Functional testing will be performed on the following systems/equipment:
  - a. Air handling units including fans, mixed air dampers, steam heating coils, chilled water-cooling coils, and associated temperature controls.
  - b. Exhaust fans and associated controls.
  - c. Steam system including boilers, boiler feed system, deaerator, condensate return system, and associated controls.
  - d. Steam heating terminal equipment and associated temperature controls.
  - e. Chilled water system including indoor evaporator, outdoor condensing unit, distribution pumps and associated controls.
5. Perform electrical systems testing and verification including the following:
  - a. Test and exercise main electrical distribution equipment.
  - b. Perform infrared scan of main electrical switchboards and switchgear.
  - c. Perform functional test of egress lighting system.
6. Develop one-line diagrams for electrical power system, air handling systems, chilled water system, steam and steam condensate systems. One-line diagrams will include system components and distribution system sizes. This was completed in Phase 1 work.
7. Document all findings and recommendations on a system deficiency spreadsheet.
8. Attend review meeting with project team to discuss findings and recommendations.

## **Phase 2**

1. Mechanical and electrical field investigation of steam system, chilled water system, air-handling system, and electrical power system for development of one-line as-built schematic diagrams for each system.
2. Meter main electrical service switchgear and all electrical panels. Metering duration will be for 30 continuous days.
3. Perform functional test of fire alarm system.

## **2. Retro-Commissioning Findings/Recommendations**

## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<b>Priority 1:</b> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<b>Priority 2:</b>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
TC-1.1	X		28A	AHU-0001 Temperature Controls	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Cooling coil valve pneumatic return air temperature sensor no longer functions. Chilled water valve is always fully open and there is no control of space temperature. Also, temperature setpoint dial is worn off and unreadable.	Replace pneumatic return air temperature sensor.
TC-1.2	X		28B	AHU-0001 Temperature Controls	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Pneumatic discharge air temperature sensor for heating coil bypass damper control no longer functions. Bypass damper is always closed, and controller is disabled.	Replace pneumatic return air temperature sensor.
TC-1.3	X		28C	AHU-0001 Temperature Controls	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Pneumatic discharge air temperature controller used to stage the four heating coil control valves no longer functions.	Replace heating coil pneumatic discharge air temperature controller.
TC-1.4		X	N/A	AHU-0001 Temperature Controls	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Unit has no freezestat for freeze protection.	Provide means to shut unit down for freeze protection.
TC-1.5		X	N/A	AHU-0001 Temperature Controls	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	<p>We tested all of the unit controls and found none to be functional. This unit has no control panel and is operated manually. The unit is started/stopped through the fan disconnect switch. Outside air and return air dampers are controlled manually by a pneumatic selection switch on the wall, and the outside air damper could not be located (see item HVAC-1.2 below). The existing heating coil controller (if working) would only maintain a fixed discharge air temperature manually set by facilities staff, and would not have the ability to maintain the space temperature.</p> <p>Due to the number of temperature controls deficiencies listed above, we recommend upgrading to DDC controls for this unit, and to provide the following benefits:</p> <ul style="list-style-type: none"> <li>Remote on/off scheduling capability</li> <li>Remote monitoring of system status/alarms</li> <li>Remote setpoint adjustment</li> <li>Meet current code requirements</li> <li>Heating coil/cooling coil control to maintain space temperature</li> <li>Enthalpy Economizer control</li> <li>Demand Control Ventilation</li> <li>Energy Savings</li> </ul>	

## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	Priority 1: Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	Priority 2:  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
TC-2.1	X		12A	189-AHU-0002 Temperature Controls	Mech Room 047	Main Theatre 100	Electric to pneumatic (EP) switch does not bleed control air properly when supply fan is deactivated. Control air pressure drops too slowly, delaying the control of outside air ventilation damper and mixed air dampers back to their normal positions when the unit is deactivated.	Replace pneumatic EP switch.
TC-2.2	X		11, 11A	189-AHU-0002 Temperature Controls	Mech Room 047	Main Theatre 100	Pneumatic receiver controller for mixed air damper control is out of calibration by 38°F. Observed mixed air temperature setpoint at 32°F in order to maintain a 70°F mixed air temperature.	Replace pneumatic receiver controller.
TC-2.3	X		11, 11A	189-AHU-0002 Temperature Controls	Mech Room 047	Main Theatre 100	Mixed damper control is set to a 6 PSI minimum position. This does not meet code requirements for minimum outdoor air flow rate, and provides no means for demand control ventilation as required by code for high-occupancy spaces.	Perform ventilation calculations to determine outdoor air requirements. Upgrade unit controls to provide code required ventilation rate.
TC-2.4	X		11, 11A	189-AHU-0002 Temperature Controls	Mech Room 047	Main Theatre 100	Pneumatic receiver controller for discharge air temperature control is out of calibration by ten degrees. Observed discharge air temperature setpoint at 60°F in order to maintain 70°F discharge air temperature.	Replace pneumatic receiver controller.
TC-2.5	X		N/A	189-AHU-0002 Temperature Controls	Mech Room 047	Main Theatre 100	Pneumatic discharge air temperature sensor is out of calibration by 5.5°F. Sensor reads 69°F while actual measured temperature is 63.5°F.	Replace temperature sensor.
TC-2.6	X		N/A	189-AHU-0002 Temperature Controls	Mech Room 047	Main Theatre 100	Unit does not have a chilled water control valve. Unit runs at maximum cooling capacity during entire cooling season. Facilities staff opens outside air damper position manually during the cooling season to prevent overcooling of the theatre.	Add control valve for the chilled water coil.
TC-2.7	X		12B	189-AHU-0002 Temperature Controls	Mech Room 047	Main Theatre 100	Chilled water temperature sensor used to disable economizer is reading incorrectly by approximately 40°F.	Replace chilled water temperature sensor.
TC-2.8		X	N/A	189-AHU-0002 Temperature Controls	Mech Room 047	Main Theatre 100	<p>We functionally tested all of the unit controls and found them to be completely out of calibration, requiring continuous manual adjustment at the control panel to maintain environmental control of the space. The controls are mostly pneumatic with the exception of start/stop control, discharge air temperature, and fan failure alarm on DDC. Pneumatic controls are no longer supported and replacement parts are becoming less available. The current controls are not capable of meeting current code requirements for the space. Due to the temperature controls deficiencies listed above, we recommend replacing the controls in their entirety with DDC, adding a chilled water valve, and performing ventilation calculations to determine outdoor air requirements to meet current code. Upgrading the controls to DDC will provide the following benefits:</p> <ul style="list-style-type: none"> <li>Meet current code requirements</li> <li>Remote monitoring of system status/alarms</li> <li>Remote setpoint adjustment</li> <li>Enthalpy Economizer control</li> <li>Demand Control Ventilation</li> <li>Heating coil/cooling coil control to maintain space temperature</li> <li>Energy Savings</li> </ul>	

## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<u>Priority 1:</u> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<u>Priority 2:</u>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
TC-2.9		X	12	Temperature Controls Pneumatic Air System	Mech Room 047	Building Temperature Controls	Temperature controls air compressor runs continuously. If pneumatic controls are to be reused, the air system should be pressure tested to identify and repair leaks.	Pressure test temperature controls pneumatic air system and repair leaks.
HVAC-1.2	X		N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Outside air damper could not be located. It is not where the drawings indicate. We traced the outside air duct back to the outside air louver, and there was no access to the duct to verify the outside air damper location. Based on functional testing, the damper does not function (if it exists).	Provide new outside air damper.
HVAC-1.3	X		N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Cooling coil drain valve on return pipe is plugged.	Clean drain valve piping.
HVAC-1.4	X		28D	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Cooling coil drain pan is not IAQ, and is rusted.	Replace drain pan.
HVAC-1.5		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Cooling coil is located upstream of heating coil, requiring seasonal draining of the cooling coil for freeze protection.	Consider locating the heating coil upstream of the cooling coil when unit is replaced.
HVAC-1.6		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	No cooling coil capacity information or current outdoor air minimum CFM is available. Chiller replacement drawings do not indicate the GPM for the chilled water coil.	Verify existing cooling coil capacity is adequate to accommodate cooling load with current ventilation air requirements.
HVAC-1.7		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	No heating coil capacity information or current outdoor air minimum CFM is available.	Verify existing heating coil capacity is adequate to accommodate heating load with current ventilation air requirements.
HVAC-1.8		X	28E	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	All four steam control valves have signs of leaking. Piping is corroded at all valves, and two heating coils are valved off at the isolation valve. The two active heating coil control valves leak by when closed. The most downstream valve has a pneumatic air leak.	Replace steam control valves.
HVAC-1.9	X		28F	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	The first heating coil has a leaky isolation valve. Water is dripping onto the floor.	Repack isolation valve.



## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<u>Priority 1:</u> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<u>Priority 2:</u>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
HVAC-1.10		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	The heating coil consists of four steam radiators. Given the large mass of the heating coils, it will be difficult to modulate heating capacity to maintain a constant space temperature.	Replace steam heating coils to provide more accurate control.
HVAC-1.11	X		N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Fan belt guard is missing.	Replace fan belt guard.
HVAC-1.12		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Access to unit for maintenance is inadequate. There is no space for coil pulls, and no space for fan belt replacement. Fan belt access is through a hole cut in the wall from the adjacent space.	Provide means for proper access to equipment.
HVAC-1.13	X		N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Relief fan was completely removed, relief air louver is closed off, and relief air ductwork was abandoned. The unit does not have means for relieving air from the space.	Provide new fan for proper return/relief air provisions for this system.
HVAC-1.14		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Air handling unit casing is not insulated.	Insulate air handling unit casing.
HVAC-1.15		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Outside air duct and supply air ductwork is not insulated.	Insulate ductwork.
HVAC-1.16		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Return air damper has no seals and leaks. Unable to access outside air damper.	Replace return air damper.
HVAC-1.17		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Supply air fan does not have a hand/off/auto switch.	Replace disconnect with hand/off/auto switch.
HVAC-1.18		X	N/A	AHU-0001	Mech 102.1 (1st Flr West Side)	Basement Theatre 010	Due to the amount of deficiencies listed above, we recommend a complete replacement of this AHU.	

## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<u>Priority 1:</u> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<u>Priority 2:</u>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
HVAC-2.8	X		N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	Facility staff indicated that cooling coil drain pan overflows in summertime.	Clean cooling coil trap. Check measure negative pressure inside the unit to determine proper trap height.
HVAC-2.9		X	13B	189-AHU-0002	Mech Room 047	Main Theatre 100	Cooling coil is located upstream of heating coil, requiring seasonal draining of the cooling coil for freeze protection.	Consider locating the heating coil upstream of the cooling coil when unit is replaced.
HVAC-2.10		X	N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	No cooling coil capacity information or current outdoor air minimum CFM is available. Chiller replacement drawings do not indicate the GPM for the chilled water coil.	Verify existing cooling coil capacity is adequate to accommodate cooling load with current ventilation air requirements.
HVAC-2.11		X	N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	No heating coil capacity information or current outdoor air minimum CFM is available.	Verify existing heating coil capacity is adequate to accommodate heating load with current ventilation air requirements.
HVAC-2.12		X	13D	189-AHU-0002	Mech Room 047	Main Theatre 100	Supply air fan mounting is inadequate, causing fan to vibrate back and forth when operating.	Strengthen fan mounting to properly support supply fan, and balance fan.
HVAC-2.13	X		N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	Return air fan is not interlocked with supply fan start/stop control and runs continuously. Return fan does not stop when freezestat trips, or when firestat trips.	Interlock return air fan with supply air fan.
HVAC-2.14		X	12C	189-AHU-0002	Mech Room 047	Main Theatre 100	Return air fan does not have a hand/off/auto switch.	Replace disconnect with hand/off/auto switch.
HVAC-2.15		X	N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	No duct access door for the outside air isolation damper.	Add access door for outside air isolation damper.
HVAC-2.16		X	N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	No duct access door for the relief air damper. The existing damper downstream of the return fan is too far from the damper, and elbow turning vanes block access.	Add access door for the relief air damper.
HVAC-2.17		X	N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	Original design used the floor grilles as the supply air, but this was reversed later on, and now the floor grilles are used as return air.	Consider converting the system to a displacement type system with supply air at the floor and return from above for future renovations.
HVAC-2.18		X	N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	Firestat located in return air ductwork shuts down unit and requires a manual reset. Unit is now equipped with duct smoke detectors.	Confirm proper operation of duct smoke detectors (this is in Phase 2 scope of work) and eliminate firestat.
HVAC-2.19		X	N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	Mixed air dampers and relief air dampers have no seals and leak. Unable to access outside air isolation damper (no duct access door.)	Replace mixed air, relief air dampers. Eliminate outside air isolation damper.
HVAC-2.20		X	13B, C	189-AHU-0002	Mech Room 047	Main Theatre 100	Air handling unit has no access doors to access coils or fan.	Add access doors to air handling unit.
HVAC-2.21		X	N/A	189-AHU-0002	Mech Room 047	Main Theatre 100	Due to the amount of deficiencies listed above, we recommend a complete replacement this AHU.	

## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<u>Priority 1:</u> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<u>Priority 2:</u>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
HVAC-2.22	X		N/A	189-AHU-0002	Main Theatre 100	Main Theatre 100	Return air grilles in under the theatre seats are plugged with fiberglass insulation, plugged with dirt, or missing diffuser cap in multiple locations.	Remove insulation and clean return air floor grilles.
HVAC-3.1		X	60A, 60B, 60C, 60D	Lighting Booth Fans	Lighting Booth 206.1	Lighting Booth 206.1	Lighting booth has no air conditioning. The space has a "push pull" fan system to transfer air from the theatre space into the room.	Provide a separate split system air conditioning unit to serve the lighting booth, in lieu of transferring air from the theatre.
FC-0.1		X	27, 38	FC-1/FC-2	West Corridor 102 Box Office 101 Mechanical Room	Main Lobby 110	Main lobby has no mechanical ventilation.	It is our understanding that this building is being renovated. During design of the renovation, A/E shall determine current codes that apply to the building renovation, and determine ventilation requirements based on space usage and applicable code.
FC-0.2		X	27, 38	FC-1/FC-2	West Corridor 102 Box Office 101 Mechanical Room	Main Lobby 110	Supply air fan does not have a hand/off/auto switch.	Replace disconnect with hand/off/auto switch.
FC-0.3		X	27, 38	FC-1/FC-2	West Corridor 102 Box Office 101 Mechanical Room	Main Lobby 110	Fan coil units have no start/stop control. They are switched on/off manually.	Add DDC controls to schedule units on/off.
FC-0.4		X	27, 38	FC-1/FC-2	West Corridor 102 Box Office 101 Mechanical Room	Main Lobby 110	Fan coil units have pneumatic controls for cooling coil valve.	Upgrade cooling coil valve control to DDC.
FC-0.5		X	N/A	FC-1/FC-2	West Corridor 102 Box Office 101 Mechanical Room	Main Lobby 110	Due to the need for ventilation air, additional cooling capacity for ventilation, and deficiencies listed for these units, we recommend replacing these fan coil units.	
FC-1.1		X	27	FC-1	West Corridor 102	Main Lobby 110 (West Side)	Fan vibrates excessively when operating.	Balance fan.
FC-1.2	X		27	FC-1	West Corridor 102	Main Lobby 110 (West Side)	Fan belts are slipping/squeaking.	Replace fan belts and sheaves.
FC-2.1	X		N/A	FC-2	Box Office 101 Mechanical Room	Main Lobby 110 (East Side)	Return air sensor used for chilled water valve controls is out of calibration by approximately 20°F. It is currently set to 48°F.	Calibrate return air sensor.

## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<u>Priority 1:</u> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<u>Priority 2:</u>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
FC-2.2	X		38A	FC-2	Box Office 101 Mechanical Room	Main Lobby 110 (East Side)	One fan belt is missing.	Replace fan belts.
FC-2.3	X		38A	FC-2	Box Office 101 Mechanical Room	Main Lobby 110 (East Side)	Fan belt guard is missing.	Replace fan belt guard.
FC-2.4		X	N/A	FC-2	Box Office 101 Mechanical Room	Main Lobby 110 (East Side)	Fan is loud.	Provide sound attenuation.
FC-2.5		X	38	FC-2	Box Office 101 Mechanical Room	Main Lobby 110 (East Side)	Return grilles were added to the box office doors and to the back of FC-2 to allow for air transfer through the box office space.	Provide a separate split system air conditioning unit to serve the box office, in lieu of transferring air from FC-2.
EXH-1	X		66	Toilet Exhaust	Attic Fan Room	Men 208.1 Women 210.02	Main toilet exhaust fan no longer runs. Toilet rooms have no exhaust.	Provide toilet exhaust for these toilet rooms.
EXH-2	X		N/A	Toilet Exhaust	Toilet Room 104	Toilet Room 104	This toilet room has no exhaust.	Provide toilet exhaust for this toilet room.
EXH-3		X	N/A	Mechanical Room Exhaust Fan	Mech Room 045	Mech Room 045	Mechanical room exhaust fan is manually operated with wall switch.	Provide thermostat to activate exhaust fan whenever temperature rises above setpoint.
HTG-1.1	X		14A, 14B	Steam Piping	Mech Room 047	Heating System	Combination steam/condensate pipe leaks and puddles onto mechanical room floor. Repair has not begun.	Repair pipe leak.
HTG-1.2		X	N/A	Steam Piping	Throughout Building	Throughout Building	Steam piping has exceeded the end of its useful life, and many patches/repairs were observed during the building walkthroughs. Much of this piping is original to the building. In addition to the leak discovered in HTG-1.1 above, another leak was occurring during one of our site visits and under repair.	Conduct pipe corrosion/condition and/or pipe wall thickness testing.
HTG-2		X	N/A	Steam Piping Insulation	Throughout Building	Throughout Building	There are many locations where sections of steam piping insulation is missing.	Insulate steam piping.

## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<u>Priority 1:</u> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<u>Priority 2:</u>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
HTG-3		X	N/A	Steam Heating System	Mech Room 045	Steam Header	Pressure sensor at steam header is out of calibration, and incorrect pressure is displayed on graphics.	Calibrate Siemens steam pressure sensor.
HTG-4	X		N/A	Steam Heating System	Mech Room 045	Steam Header	Pressure gauge at steam header is out of calibration and reads incorrectly.	Replace pressure gauge.
HTG-5	X		8	Steam Condensate Receiver	Mech Room 045	Steam Condensate Return System	Condensate receiver drain is plugged. There is no high water alarm locally, or on DDC.	Clean condensate receiver drain. Add high water alarm to DDC.
HTG-6	X		9	Boiler Feed Water Tank Pumps	Mech Room 045	Boiler Feed Water System	Pump controller for feed water tank pumps runs both pumps simultaneously instead of alternating pumps. Facilities staff manually shuts off one pump at the hand/off/auto switch in order to alternate pumps weekly.	Upgrade controller to stage and alternate pumps automatically.
HTG-7		X	9	Boiler Feed Water Tank Pumps	Mech Room 045	Boiler Feed Water System	There are no alarms for pump failures or low/high water alarms.	Add local alarms and DDC alarms.
HTG-8	X		5	Deaerator	Mech Room 045	Boiler Feed Water System	Back-up feed water pump P-4 solenoid valves serving feed water pumps P-1, P-2, and P-3 leak. Whenever the back-up pump runs, water leaks through the solenoid valves and overflow the non-operating boilers.	Replace all backup pump solenoid valves serving feed water pumps P-1, P-2, and P-3.
HTG-9.0		X	N/A	Steam Radiators	Throughout Building	Throughout Building	Many steam radiators throughout building have no control valves or no thermostat control. Several units are clogged, have failed components, and do not heat. Facilities maintenance staff manually adjusts steam pressure each day in attempt to maintain an acceptable temperature through the building. See items below for specific locations identified during our walkthroughs.	Provide zone thermostat(s) and control valves on radiators for space temperature control.

## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<u>Priority 1:</u> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<u>Priority 2:</u>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
HTG-9.1		X	30 through 37	Steam Radiators	Main Lobby 110	Main Lobby 110	Main lobby radiators have no control valves. Steam is controlled on/off manually through an isolation valve in the main steam pipe, and manual isolation valves are used to adjust heat output of radiators.	Provide zone thermostat(s) and control valves on radiators for space temperature control.
HTG-9.2	X		41	Steam Radiators	Storage Room 103	Storage Room 103	Radiator does not heat and may be plugged. Water leaks from isolation valve.	Replace isolation valve. Investigate heating issue.
HTG-9.3	X		61	Steam Radiators	Room 201.1	Room 201.1	Radiator vents in this room leak.	Replace radiator vents.
HTG-9.4		X	55	Steam Radiators	Common Area 202	Common Area 202	This area is often too hot. One radiator has been capped off and abandoned in place.	Provide zone thermostat(s) and control valves on radiators for space temperature control.
HTG-9.5		X	63	Steam Radiators	Room 203	Room 203	Wall hung radiators were abandoned in place because space was too hot when occupants were working.	Provide zone thermostat(s) and control valves on radiators for space temperature control.
HTG-9.6	X		64A, 64B	Steam Radiators	Make-up Room 205	Make-up Room 205	Finned tube under sinks does not heat. Isolation valve leaks. Finned tube is improperly sloped.	Replace isolation valve and slope finned tube properly.
HTG-9.7	X		53	Steam Radiators	Men's Lounge 208	Men's Lounge 208	Radiator isolation valve leaks.	Repack isolation valve.
HTG-9.8	X		58	Steam Radiators	Room 210	Room 210	Convactor does not heat and may be plugged.	Pitch convactor properly.

## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<u>Priority 1:</u> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<u>Priority 2:</u>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
HTG-9.9	X		68	Steam Radiators	Organ Echo Loft Room 302	Organ Echo Loft Room 302	Pneumatic control valve for wall mounted radiators does not function. Thermostat does not function.	Replace control valve and thermostat.
HTG-9.10	X		40	Steam Radiators	Common Area Stairwell (Southwest Corner)	Common Area Stairwell (Southwest Corner)	Radiator behind couch in common area stairwell is cold and missing air vent. Radiator may be plugged.	Replace air vent. Investigate heating issue.
HTG-9.11	X		24	Steam Radiators	2nd Flr Stairway	2nd Flr Stairway	Radiator is cold and may be plugged. Air vent was recently replaced.	Investigate heating issue.
HTG-10	X		N/A	Boiler-1	Boiler Room 043	Heating System	Boiler-1 gauge glass doesn't blow down.	Replace gauge glass.
HTG-10.1	X		N/A	Boiler Blowdown B-1, B-2, B-3	Boiler Room 043	Boiler System	Auto blowdown for boilers B-1, B-2, and B-3 are not functioning. Boiler conductivity sensors do not function.	Replace blowdown valve. Replace conductivity sensors.
HTG-11	X		N/A	Boiler Room Exhaust Fan	Boiler Room 043	Boilers room	Exhaust fan has a bad belt.	Replace fan belts and sheaves.
PLM-1		X	N/A	Domestic Water Piping	Throughout Building	Throughout Building	Domestic water piping is a combination of galvanized steel and copper. Much of this piping is original to the building and has exceeded the end of its life. During our site visit, maintenance staff was repairing a plumbing leak in Toilet Room 104.	Conduct pipe corrosion/condition and/or pipe wall thickness testing.
PLM-2	X		N/A	Domestic Hot Water Circulation Pumps	Mech Room 045	Domestic Hot Water System	Pump 1 does not function.	Replace domestic hot water circulation pump 1.
PLM-3	X		N/A	Domestic Hot Water Circulation Pumps	Mech Room 045	Domestic Hot Water System	Pump 2 is deadheading because piping is capped and no longer used.	Turn off pump 2.



## Retro-Commissioning Findings/Recommendations Hilberry Theatre

Item #	<u>Priority 1:</u> Needs to be addressed. Currently does not function, does not meet code, or is a health/safety concern	<u>Priority 2:</u>  System Improvement	Photo #	System ID	Location	Area Served	Description of Issue	Recommendation
FP-1	X		16	Fire Protection System	Throughout Building	Throughout Building	Latest fire protection system test was conducted in 2010.	Retest fire protection system.
PWR-1	X		E6A, B, C, D, E, F	LP-C	Main Electrical Room	Basement	Merc 30A breaker is overheating. The load was checked and found acceptable. Cables were found loose and tightened. Equipment continued to overheat.	Recommend replacing the breaker.
PWR-2	X		E15A, B, C, D, E, F, G	LP-J	Second Floor	Second Floor	SR stage works breaker is overheating.	Recommend checking connections and replacing breaker if necessary.
PWR-3	X		E10A, B, C, D, E, F	LP-F	Second Floor	Second Floor	Circuits #24 and #28 are overheating.	Recommend checking connections and replacing breaker if necessary.
PWR-4	X		E4A, B, C, D	LP-BR	Boiler Room	Boiler Room	Supply fan breaker circuits #25, #27 and #29 are overheating.	Recommend checking connections and replacing equipment if necessary.
PWR-5	X		E9A, B, C, D	Portable Dimmer Rack	Basement	Basement	A phase fuse clip and disconnect are overheating.	Recommend checking connections and replacing equipment if necessary.
PWR-6		X	N/A	Main Switchboard and Panelboards	Throughout the Building	Throughout the Building	Interior of Main Switchboard and Panelboards are dirty. A number of panelboards have a lot of dust.	Recommend proper maintenance by cleaning of interior of panelboards.



### **3. Equipment Inventory List/Condition**

# Mechanical Equipment Inventory List/Condition



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Date Revised 1/17/2019

Project Name: HAA - WSU Hilberry Theater  
PBA PROJECT NO.: 2018.0465.00

GENERAL								TYPE OF CONTROL			AGE	CAPACITY	ELECTRICAL				CONDITION				Remarks
Equipment Tag	System Served	Location	Equipment Type	Manufacturer	Model No.	Serial No.	Area Served	Pneum.	DDC	Packaged	Year Installed		Volts	Phase	MCA	HP	Good	Needs Service	Overhaul	Replace	
CH-1	AHU-0001, 189-AHU-0002, FC-1 & FC-2 Chilled Water Cooling Coils	Outside Southwest Corner of building	Air Cooled Condenser W/ Remote Evaporator	York/JCI	YLAA0090SE17XCASDTXATXBLXCXX44SX1XXHXHXXSARXXX7XXXXXXNB1XXXX	2HWM007591	Entire Building		X	X	2010	85.8 Tons	200	3	391	N/A	X				R-410A Remote evaporator bundle located in Basement Mechanical Room. Chiller is enabled by DDC and common alarm is monitored by DDC. Chilled water temperature control by chiller package control.
Pump #1	AHU-0001, 189-AHU-0002, FC-1 & FC-2 Chilled Water Cooling Coils	Basement Mechanical RM 045	End Suction Pump	Armstrong	5/25/6 4030	650465	Entire Building		X		2010	206 GPM @ 40'	208	3	N/A	5	X				
Pump #2	AHU-0001, 189-AHU-0002, FC-1 & FC-2 Chilled Water Cooling Coils	Basement Mechanical RM 045	End Suction Pump	Armstrong	5/25/6 4030	Under insulation	Entire Building		X		2010	206 GPM @ 40'	208	3	N/A	5	X				
B-1	Steam Heating	Basement Boiler RM 043	Steam Boiler	Fulton	ICS 15	103514	Entire Building		X	X	2007	518 #/hr	120	1	13	N/A		X			Boiler control through boiler sequencing controller and/or boiler package controller. DDC monitors boiler status and common alarm.
B-2	Steam Heating	Basement Boiler RM 043	Steam Boiler	Fulton	ICS 15	103515	Entire Building		X	X	2007	518 #/hr	120	1	13	N/A		X			Boiler control through boiler sequencing controller and/or boiler package controller. DDC monitors boiler status and common alarm.
B-3	Steam Heating	Basement Boiler RM 043	Steam Boiler	Fulton	ICS 15	103518	Entire Building		X	X	2007	518 #/hr	120	1	13	N/A		X			Boiler control through boiler sequencing controller and/or boiler package controller. DDC monitors boiler status and common alarm.
CR-1	Steam Heating	Basement Mechanical RM 045	Condensate Receiver	Domestic	125CC	QE3716-SAO646283-003 1	Entire Building			X	2007	Tank 52 Gallons, (2) Pumps each @ 12 GPM @ 50 PSI	208	3	N/A	(2) @ 1 1/2		X			
BFS-1	Steam Condensate Surge Tank Heating	Basement Mechanical RM 045	Boiler Feed Water System	N/A	N/A	N/A	Entire Building			X	Unknown	Unknown	208	1	N/A	(2) @ 1/2		X			
CST-1	Steam Boilers	Basement Mechanical RM 045	Condensate Transfer Tank	Fulton	VT-20	N/A	Boilers B-1 thru B-3		X	X	2007	Tank 71 Gallons, (4) Pumps each @ 5 GPM @ 80 Ft. Hd.	208	1	N/A	(4) @ 1/2		X			Control through package controller. DDC monitors common alarm.
WH-1	Domestic Hot Water	Basement Boiler RM 043	Domestic Water Heater	A.O. Smith	DEL 30 110	1244M002482	Toilet / Dressing RMs			X	Unknown	30 gallon capacity, 9000 watts	208	3	N/A	N/A	X				
WH-2	Domestic Hot Water	Basement Boiler RM 043	Domestic Water Heater	A.O. Smith	DEL 30 110	1244M002409	Toilet / Dressing RMs			X	Unknown	30 gallon capacity, 9000 watts	208	3	N/A	N/A	X				
P-1	Domestic Hot Water	Basement Boiler RM 043	Domestic Hot Water Circulating Pump	WILO	Star S 21 FX	4090765/10w08	Unknown	None	None	None	Unknown	0.92 amps	120	1	N/A	N/A	X				Pipe is capped however pump running in dead head condition.
P-2	Domestic Hot Water	Basement Boiler RM 043	Domestic Hot Water Circulating Pump	WILO	Stratos ECO 16 BFX	4117302/10w39	Unknown	None	None	None	Unknown	0.90 amps	120	1	N/A	N/A				X	Cycles based on aquastat temperature set point.
189-AHU-0002	Main Auditorium	Basement Mechanical RM 047	Air Handling Unit	American Standard	24A	P	Main Auditorium	X			Unknown	Unknown	208	3	N/A	7 1/2		X			
RF-0002	AHU-002 Return Air	Basement Mechanical RM 047	In-Line Centrifugal Fan	New York Blower	T-307	F-2326	Main Auditorium	None	None	None	Unknown	Unknown	208	3	N/A	5	X				
AHU-0001	Basement Auditorium	Mechanical RM 201.1	Air Handling Unit	American Standard	6A	V	Basement Auditorium	X			1935	Unknown	208	3	N/A	5				X	
FC-1	Lobby - West Side	Coat Room 102	Chilled Water Fan Coil Unit	American Standard	Order No: 2-31179-7	V	Lobby	X			Unknown	Unknown	208	3	N/A	3		X			
FC-2	Lobby - East Side	Mech RM in Box Office	Chilled Water Fan Coil Unit	American Standard	Order No: 2-31179-7	V	Lobby	X			Unknown	Unknown	208	3	N/A	3		X			
FP-1	Fire Protection	Basement Fire RM	Electric Fire Pump	Aurora	481-BF, Size X5X11A	70-80211	Entire Building			X	Unknown	500 GPM @ 92.5'	208	3	N/A	20	X				Condition appears good, should be tested.
JP-1	Fire Protection	Basement Fire RM	Jockey Pump	Unknown	Unknown	Unknown	FP System			X	Unknown	Unknown	208	3	N/A	2	X				Condition appears good, should be tested.
SP-1	Storm Water	Dressing Room sump	Sump Pump	Zoeller	N/A	N/A	Foundation drains			X	Unknown	Unknown	120	1	Unknow n	Unkno wn	X				
SP-2	Storm Water	Dressing Room Sump	Sump Pump	Zoeller	N/A	N/A	Foundation drains			X	Unknown	Unknown	120	1	Unknow n	Unkno wn	X				

# Mechanical Equipment Inventory List/Condition

Project Name: HAA - WSU Hilberry Theater  
PBA PROJECT NO.: 2018.0465.00



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Date Revised 1/17/2019

GENERAL								TYPE OF CONTROL			AGE	CAPACITY	ELECTRICAL				CONDITION				Remarks
Equipment Tag	System Served	Location	Equipment Type	Manufacturer	Model No.	Serial No.	Area Served	Pneum.	DDC	Packaged	Year Installed		Volts	Phase	MCA	HP	Good	Needs Service	Overhaul	Replace	
SP-3	Storm Water	Landing under exterior entrance	Sump Pump	Weil	W-8111-1-160	501-954	BSMT Theater Entrance Stairs			X	Unknown	Unknown	120	1	18 amps	Unkno wn	X				
PCS	Pneumatic Control System	Mechanical RM 045	Air compressor and refrigerated air dryer	Speedaire and Hankison	3JR83A	(H)2/8/2001-1417024	Entire Building			X	Unknown	30 gallon tank, 3.7 SCFM @ 80 PSI	208	1	N/A	1			X		
SF-1	Boiler Room Supply Fan	Boiler Room 043	In-line Fan	Greenheck	Unknown	Unknown	Boiler RM	None	None	None	2007	300 CFM	120	1	N/A	1/3	X				Electric thermostat control.
EF-1	Boiler Room 043 Exhaust Fan	Boiler Room 043	In-line Fan	Greenheck	Unknown	Unknown	Boiler RM	None	None	None	2007	300 CFM	120	1	N/A	1/3	X				Electric thermostat control.
EF-2	Mech RM 045 Exhaust Fan	Mech RM 045	Window Exhaust	Unknown	Unknown	Unknown	Mechanical RM	None	None	None	Unknown	Unknown	120	1	Unknow n	Unkno wn	X				Local on/off switch.
EF-3	Make-up Dressing Room Exhaust Fan	Make-up RM Basement	Window Exhaust	Unknown	Unknown	Unknown	Make-up Dressing	None	None	None	Unknown	Unknown	120	1	Unknow n	Unkno wn	X				Local on/off switch.
EF-4	Toilet Room 115 Exhaust Fan	Near the ceiling	Ceiling Exhaust	Cook	Unknown	Unknown	1st FLR Toilet	None	None	None	Unknown	Unknown	120	1	Unknow n	Unkno wn	X				Local on/off switch.
EF-5	Toilet Room 107 Exhaust Fan	Near the ceiling	Ceiling Exhaust	Cook	Unknown	Unknown	1st FLR Toilet	None	None	None	Unknown	Unknown	120	1	Unknow n	Unkno wn	X				Local on/off switch.
LBF-A	Theater Control Booth Transfer Fan	Outside of Booth	In-line Fan	Cook	100 80N 100SGN150	1298D72716 0170000701	Lighting Booth	None	None	None	2011	350 CFM @ 0.25 " W.C.	120	1	Unknow n	1/6	X				Local on/off switch.
LBF-B	Theater Control Booth Transfer Fan	Outside of Booth	In-line Fan	Cook	100 80N 100SGN150	Unknown	Lighting Booth	None	None	None	2011	350 CFM @ 0.25 " W.C.	120	1	Unknow n	1/6	X				Local on/off switch.
LBF-C	Theater Control Booth Transfer Fan	In Booth Wall	Reversible window fan	Touch Point	Unknown	Unknown	Lighting Booth	None	None	None	Unknown	Unknown	120	1	Unknow n	Unkno wn	X				Local on/off switch.
LBF-D	Theater Control Booth Transfer Fan	In Booth Wall	Reversible window fan	Touch Point	Unknown	Unknown	Lighting Booth	None	None	None	Unknown	Unknown	120	1	Unknow n	Unkno wn	X				Local on/off switch.
Radiators	Heating throughout building	Throughout building	Steam radiator	Unknown	Unknown	Unknown	Building perimeter spaces	X (Some)			1915	Unknown	N/A	N/A	N/A	N/A		X			Radiator control varies, some pneumatic thermostat control, some self-contained control valves and some no control. Refer to drawings for each radiator type of control.
UH-1	Steam Heating	Hung from Structure in Boiler Room 043	Steam Unit Heater	Sterling	HS-072	A07712645003001	Boiler RM 043	None	None	None	2007	72 MBH	120	1	N/A	1/20	X				Electric thermostat control.

## Electrical Equipment Inventory List/Condition

### Panel A

208Y/120V 3PH 4W  
Manufacturer: SQD QOB  
No. of Circuits: 20  
Main: Main lug only  
1 Spare and 2 Spaces  
Feeder: 4 #1 and no ground  
(6) 30A Feeds with #12 wire  
Panelboard Condition: Good. Door lock missing

### LP-11

208Y/120V 3PH 4W  
Manufacturer: ITE Type BQ  
No. of Circuits: 42  
Main: Main lug only 225A  
No spare and spaces  
Feeder: 4 #2 and 1 #6(4) – 1 ¼"C  
Panelboard Condition: Good

### LP-F

208Y/120V 3PH 4W  
Manufacturer: ITE BQ  
No. of Circuits: 42  
Main: 225A Main Breaker  
No spares and 4 spaces  
Feeder: ?  
Panelboard Condition: Good

### KD-G

208Y/120V 3PH 4W  
Manufacturer: Siemens BQ  
No. of Circuits: 42  
Main: MLO  
16 spares and no spaces  
Feeder: 4 #1/0 and no ground  
Condition: Good

## Electrical Equipment Inventory List/Condition

### LP-H

208Y/120V 3PH 4W  
 Manufacturer: Siemens BQ  
 No. of Circuits: 42  
 Main: MLO  
 36 spares and no spaces  
 Feeder: 4 #1/0 and 1 #4 (4)  
 Panelboard Condition: Good

### LP-J

208Y/120V 3PH 4W  
 Manufacturer: Siemens  
 No. of Circuits: 42  
 Main: MLO  
 12 spares and no spaces  
 Feeder: 4 #1/0 and 1 #4 (4)  
 Panelboard Condition: Good

### LP-BR

208Y/120V 3PH 4W  
 Manufacturer: GE A Series THQB  
 No. of Circuits: 30  
 Main: 100A CB  
 No spares or spaces  
 Feeder: 4 #2 and 1 #8 (6) – 1 ¼" C  
 2-30A 3P are non GE Breakers  
 Panelboard Condition: Good. Need cleaning inside. Breakers are available.

### No Label (Mechanical Room Basement)

208Y/120V 3PH 4W  
 Manufacturer: SQD QMB  
 No. of Circuits:

LP-11	100A	Panel A	100A
LP-F	100A	Ltg Panel	100A
Pump #1	60A	BAD	60A
Trane ABS	60A	Main Supply Fan	60A
Pump #2	60A	Spare	60A
?	30A	Fire Alarm	30A
?	30A	RA Fan	30A

Main: N/A  
 No spares ? or spaces  
 Feeder: 4 #500 and no ground

## Electrical Equipment Inventory List/Condition

### LP-L

208Y/120V 3PH 4W  
Manufacturer: SQD QO  
No. of Circuits: 8  
Main: MLO  
No spares and 3 spaces  
Feeder: 3 #6 and 1 #10 (4)  
Panelboard Condition: Good. Need cleaning inside

### LP-K

208Y/120V 3PH 4W  
Manufacturer: ITE  
No. of Circuits: 20  
Main:  
9 spares and no spaces  
Feeder: 4 #4 and 1 #6 (4)  
Panelboard Condition: Good

### LP-E

208Y/120V 3PH 4W  
Manufacturer: Siemens  
No. of Circuits:  
Main:  
6 spares and spaces  
Feeder: 4 #1/0 and 1 #4 (4)  
Panelboard Condition: Good

### Dimmer A

208Y/120V 3PH 4W  
Manufacturer: FPE  
No. of Circuits: N/A  
Main: N/A  
Fed from 400A/400AP Disconnect Switch  
Feeder: 3 #500 and no ground  
Panelboard Condition: Good

## Electrical Equipment Inventory List/Condition

### Dimmer B

208Y/120V 3PH 4W  
Manufacturer: FRE  
No. of Circuits: N/A  
Main: N/A  
Fed from 600A/ ? 4 of Disconnect Switch  
Feeder: ?  
Panelboard Condition: Good

### MSB

2000A 208y/120V 3 PH 4W  
Manufacturer:  
No. of Circuits: N/A  
Main: N/A  
Feeder:  
Panelboard Condition: Good

### LP-B

208Y/120V 3PH 4W  
Manufacturer: Federal Pacific  
No. of Circuits:  
Main:  
Spares and spaces  
Feeder: 4 #6 and 1 #10 (4) – 1 ¼"C  
Panelboard Condition: Good

### LP-C

208Y/120V 3PH 4W  
Manufacturer: Federal Pacific  
No. of Circuits:  
Main: Main logs only  
No spares or spaces  
Feeder: 4 #2 and 1 #6 (4) – 1 ¼"C



## Electrical Equipment Inventory List/Condition

### SWBD

LP-J	200A	
LP-H	200A	
LP-G	200A	
LP-E	200A	
LP-C	200A	
LP-BR	100A	LP-C 100A
SPARE	60A	LP-D 60A
?	60A	LP-L 60A

### DP-I

	800A 208Y/120V 3 PH 4W	
Manufacturer:	Siemens	
No. of Circuits:		
60A LP-B	60A Spare	
400A PP-1		
400A Chiller		
No spare and spaces		
Feeder:		
Panelboard Condition:	Good	

### Panel By Sump

	100A 208Y/120V 3PH 4W	
Manufacturer:	Siemens	
No. of Circuits:		
Main:		
	No spare and 1 space	
Feeder:	2 #6 and 1 #6 (4) – 1 ¼" C	
Panelboard Condition:	Good	

#### **4. Equipment Sequence of Operations**

CHILLED WATER SYSTEM; AIR COOLED CHILLER CH-1, CHILLED WATER PUMPS P-1 AND P-2  
SEQUENCE OF OPERATION

1. THE CHILLED WATER SYSTEM IS MANUALLY ENABLED THROUGH DDC OR CAN BE SCHEDULED THROUGH DDC (TIME-OF-DAY). WHEN THE CHILLED WATER SYSTEM IS ENABLED AND THE OUTSIDE AIR TEMPERATURE IS ABOVE 55°F THE CHILLER AND LEAD CHILLED WATER PUMP START.
2. WITH CHILLED WATER PUMPS P-1 AND P-2 HAND/OFF/AUTO SWITCHES PLACED IN THE AUTO POSITION, PUMPS P-1 AND P-2 ARE STARTED AND STOPPED BY DDC. WHEN THE CHILLED WATER SYSTEM IS ENABLED ONE CHILLED WATER PUMP IS ACTIVATED WHILE THE SECOND PUMP SERVES AS STANDBY.
3. DDC ALTERNATES PUMPS BASED ON RUN TIME. SELECTION OF THE LEAD PUMP IS EVALUATED WEEKLY, THE PUMP WITH THE LEAST RUN TIME IS THE LEAD PUMP.
4. DDC MONITORS CHILLED WATER PUMP STATUS THROUGH EACH PUMPS CURRENT SENSOR. WHEN THE OPERATING STATE OF THE PUMP BASED ON THE PUMP CURRENT SWITCH DOES NOT MATCH THE DESIRED CONTROL STATE, AN ALARM IS INDICATED ON DDC AND THE STANDBY PUMP IS STARTED.
5. WHEN WATER FLOW IS PROVEN THROUGH THE CHILLER BY THE CHILLER'S FLOW SWITCH, THE CHILLER OPERATES TO MAINTAIN THE CHILLED WATER SUPPLY TEMPERATURE CONTROL SET POINT THROUGH CHILLER PACKAGE CONTROL PANEL.
6. WHEN THE CHILLED WATER SYSTEM IS DISABLED THE CHILLER IS DE-ENERGIZED AND AFTER A TIME DELAY THE CHILLED WATER PUMP IS STOPPED.
7. DDC MONITOR THE CHILLER CONTROL PANEL ALARM POINT. UPON CHILLER ALARM THE CHILLER IS DE-ENERGIZED AND AFTER A TIME DELAY THE CHILLED WATER PUMP IS STOPPED AND ALARM IS INDICATED ON DDC.
8. THE CHILLER START/STOP POINT, CHILLER ALARM POINT AND CHILLED WATER SUPPLY TEMPERATURE IS USED TO DETERMINE CHILLER OPERATING STATUS BY DDC.
9. DDC MONITORS CHILLED WATER RETURN TEMPERATURE FOR OPERATOR MONITORING AND TROUBLE SHOOTING.

## STEAM BOILERS – B-1, B-2 AND B-3 SEQUENCE OF OPERATION

1. WITH THE BOILERS LOCAL/OFF/REMOTE SWITCHES IN THE REMOTE POSITION; UPON MANUAL START OF THE BOILER SYSTEM, THE MICROPROCESSOR-BASED BOILER SEQUENCING CONTROLLER AUTOMATICALLY SEQUENCES THE BOILERS ON/OFF OPERATION AND MODULATES THE BOILERS FIRING RATE CONTROL TO MEET THE STEAM DEMAND, BASED ON THE COMMON STEAM HEADER PRESSURE CONTROL SET POINT. THE STEAM HEADER PRESSURE CONTROL SET POINT IS OPERATOR ADJUSTABLE THROUGH THE BOILER SEQUENCING CONTROLLER.
2. THROUGH BOILER SEQUENCING CONTROLLER, BOILER STAGING/MODULATION IS OPERATOR SELECTABLE AS EITHER "UNISON" (BOILERS FIRING AT SAME RATE) OR "SERIES" (LOADING ONE BOILER AT A TIME) WITH AUTO-SHIFT LOGIC TO EQUALIZE BOILER RUN TIMES AND MINIMIZE BOILER CYCLING.
3. BOILER SEQUENCING CONTROLLER UTILIZES BOTH STEAM HEADER PRESSURE AND BOILER FIRING RATE PERCENTAGE TO START AND STOP BOILER AND MINIMIZE THE NUMBER OF BOILERS IN OPERATION. BOILER SEQUENCING CONTROLLER STARTS/STOPS BOILERS WHENEVER STEAM HEADER PRESSURE IS OUTSIDE THE ADJUSTABLE PRESSURE LIMIT BAND FOR LONGER THAN AN ADJUSTABLE TIME PERIOD. TO MINIMIZE VARIATIONS IN HEADER PRESSURE, THE BOILER SEQUENCING CONTROLLER STARTS OR STOPS THE NEXT BOILER BASED ON THE OPERATING BOILERS FIRING RATE(S) OVER AN ADJUSTABLE TIME DELAY. PRIOR TO DISABLING A BOILER THE BOILER SEQUENCING CONTROLLER WILL REDUCE THE BOILER FIRING RATE TO MINIMUM TO PREVENT THE ACCUMULATION OF FUEL IN THE BOILER.
4. WHEN A BOILER IS INDEXED TO START, THE BOILER CONTROL PANEL OPENS THE BOILER COMBUSTION AIR DAMPER. WHEN THE COMBUSTION AIR DAMPER IS OPEN AS SENSED BY THE DAMPER END SWITCH, THE BOILER IS ALLOWED TO FIRE. IF THE BOILER COMBUSTION AIR DAMPER FAILS TO OPEN AS SENSED BY THE DAMPER END SWITCH, THE BOILER SHUTS DOWN, COMBUSTION AIR ALARM IS INDICATED AT THE BOILER CONTROL PANEL AND AT THE BOILER SEQUENCING CONTROLLER AND A COMMON BOILER ALARM IS INDICATED ON DDC.
5. INDIVIDUAL BOILER CONTROL PANEL THROUGH THE BOILER WATER LEVEL FLOAT SWITCH STARTS AND STOPS THE ASSOCIATED SURGE TANK BOILER WATER TRANSFER PUMP TO MAINTAIN THE BOILER WATER LEVEL.
6. WHEN THE BOILER LOW WATER FLOAT SWITCH SET POINT IS REACH; THE BOILER CONTROL PANEL SHUTS DOWN THE BOILER, A LOW WATER ALARM IS INDICATED AT THE BOILER CONTROL PANEL AND AT THE BOILER SEQUENCING CONTROLLER AND A COMMON BOILER ALARM IS INDICATED ON DDC.
7. WHEN THE BOILER AUXILIARY LOW WATER FLOAT SWITCH SET POINT IS REACH; THE BOILER CONTROL PANEL SHUTS DOWN THE BOILER, A LOW WATER ALARM IS INDICATED AT THE BOILER CONTROL PANEL AND AT THE BOILER SEQUENCING CONTROLLER AND A COMMON BOILER ALARM IS INDICATED ON DDC.
8. WHEN THE BOILER HIGH PRESSURE SET POINT IS REACH SENSED BY THE BOILER PRESSURE SENSOR; THE BOILER CONTROL PANEL SHUTS DOWN THE BOILER, A HIGH PRESSURE ALARM IS INDICATED AT THE BOILER CONTROL PANEL AND AT THE BOILER SEQUENCING CONTROLLER AND A COMMON BOILER ALARM IS INDICATED ON DDC.

9. BOILER CONTINUALLY MEASURES/MONITORS CONDUCTIVITY. WHEN CONDUCTIVITY LEVEL EXCEEDS THE CONTROL SET POINT THE ELECTRIC CONDUCTIVITY BLOW-DOWN CONTROL VALVE OPENS TO DRAIN CONDENSATE THROUGH THE BLOW-DOWN COOLER.
10. WITH THE BOILER LOCAL/OFF/REMOTE SWITCH IN THE LOCAL POSITION; BOILER ON/OFF OPERATION AND BURNER MODULATION IS CONTROLLED BY THE BOILER PRESSURE SENSOR THROUGH THE BOILER CONTROL PANEL.
11. ON/OFF STATUS OF EACH BOILER IS INDICATED ON THE BOILER CONTROL PANEL, BOILER SEQUENCING CONTROLLER AND AT DDC.

#### PACKAGE DUPLEX CONDENSATE RECEIVER – CR-1 SEQUENCE OF OPERATION

1. WITH PUMP #1 AND PUMP #2, HAND/OFF/AUTO SWITCHES IN THE AUTO POSITION, THE RECEIVER TANK'S OPERATING LEVEL FLOW SWITCH, STARTS AND STOPS THE LEAD PUMP TO MAINTAIN THE OPERATING LEVEL IN THE RECEIVER TANK. AFTER EACH START-STOP CYCLE THE PUMP WHICH SERVES AS THE LEAD PUMP IS AUTOMATICALLY ALTERNATED. IF ONE OF THE PUMP'S HAND/OFF/AUTO SWITCHES IS PLACED IN THE OFF POSITION, THE OTHER PUMP WILL FUNCTION AS THE LEAD PUMP UNTIL BOTH PUMP'S HAND/OFF/AUTO SWITCHES ARE RETURNED TO THE AUTO POSITION.
2. WHEN THE RECEIVER TANK LEVEL RISES TO THE LEVEL OF THE "HIGH LEVEL FLOAT SWITCH", BOTH THE LEAD AND LAG PUMPS OPERATE UNTIL THE RECEIVER TANK LEVEL DROPS TO BELOW THE LEVEL OF THE OPERATING LEVEL FLOAT SWITCH.
3. WITH A PUMP HAND/OFF/AUTO SWITCH IN THE HAND POSITION, IT'S ASSOCIATED PUMP RUNS CONTINUOUSLY.

#### PACKAGE BOILER FEED WATER SYSTEM SEQUENCE OF OPERATION

1. THE BOILER FEED WATER SYSTEM CONTROLLER THROUGH THE BOILER FEED TANK FLOAT SWITCH OPENS AND CLOSES THE MAKEUP WATER SOLENOID VALVE TO MAINTAIN THE BOILER FEED TANK WATER LEVEL.
2. WITH PUMP #1 AND PUMP #2, HAND/OFF/AUTO SWITCHES IN THE AUTO POSITION, THE CONDENSATE SURGE TANK CONTROLLER THROUGH THE BOILER FEED WATER SYSTEM CONTROLLER STARTS AND STOPS BOTH BOILER FEED WATER PUMPS TO MAINTAIN THE SURGE TANK WATER LEVEL.
3. WITH A PUMP HAND/OFF/AUTO SWITCH IN THE HAND POSITION, IT'S ASSOCIATED PUMP RUNS CONTINUOUSLY.



#### STEAM AND STEAM CONDENSATE CHEMICAL TREATMENT SYSTEM SEQUENCE OF OPERATION

1. OXYCORE SULFITE (OXYGEN SCAVENGE) IS INJECTED INTO THE STEAM CONDENSATE SYSTEM THROUGH AN INJECTION PUMP. THE INJECTION PUMP IS CONTROL BY ELECTRIC CHEMICAL FEED PUMP TIMER CONTROLLER.
2. QUEST BOILER POLYMER (DISPERSANT) IS INJECTED INTO THE STEAM CONDENSATE SYSTEM THROUGH AN INJECTION PUMP. THE INJECTION PUMP IS CONTROL BY ELECTRIC CHEMICAL FEED PUMP TIMER CONTROLLER.
3. NUTRIMENE (CORROSION INHIBITER) IS INJECTED INTO THE STEAM CONDENSATE SYSTEM THROUGH AN INJECTION PUMP. THE INJECTION PUMP IS CONTROL BY ELECTRIC CHEMICAL FEED PUMP TIMER CONTROLLER.

STEAM CONDENSATE BLOW-DOWN COOLER WITH SELF CONTAINED THERMOSTATIC CONTROL VALVE - SEQUENCE OF OPERATION

1. SELF CONTAINED THERMOSTATIC CONTROL VALVE MODULATES THE NON-POTABLE WATER FLOW INTO THE COOLER TO MAINTAIN THE COOLER'S DISCHARGE TEMPERATURE SET POINT.

#### ELECTRIC DOMESTIC WATER HEATER WH-1 AND WH-2 SEQUENCE OF OPERATION

1. THE WATER HEATER CONTROLLER MODULATES THE ELECTRIC HEATING ELEMENT TO MAINTAIN THE WATER HEATER TEMPERATURE CONTROL SET POINT.
2. ONE DOMESTIC HOT WATER CIRCULATION PUMP RUNS CONTINUOUSLY. AN AQUASTAT CYCLES THE OTHER PUMP TO MAINTAIN DOMESTIC HOT WATER RETURN TEMPERATURE SET POINT.

#### PACKAGE CONDENSATE SURGE TANK/TRANSFER PUMP – CST-1 SEQUENCE OF OPERATION

1. SURGE TANK PACKAGE CONTROLLER MONITORS AND MAINTAINS THE FEED WATER TO EACH BOILER. LEAD FEED WATER PUMP P-1, P-2 AND P-3 EACH SERVE THEIR RESPECTIVE BOILER. FEED WATER PUMP P-4 SERVES AS A COMMON BACK UP/STANDBY. P-4 DISCHARGE PIPING IS CONNECTED TO EACH LEAD PUMPS DISCHARGE PIPE AND ISOLATED WITH A TWO POSITION SOLENOID VALVES.
2. WITH EACH PUMPS HAND/OFF/AUTO SWITCH IN AUTO POSITION, PUMPS P-1, P-2 AND P-3 CYCLE ON AND OFF TO MAINTAIN THEIR RESPECTIVE BOILER'S WATER LEVEL THROUGH THE CONDENSATE SURGE TANK CONTROLLER.
3. THE CONDENSATE SURGE TANK CONTROLLER MONITORS THE OPERATING STATUS OF EACH PUMP THROUGH EACH PUMPS PRESSURE SWITCH. UPON A PUMP FAILURE, A PUMP FAILURE ALARM IS INDICATED ON THE CONDENSATE SURGE TANK CONTROL PANEL AND A COMMON ALARM IS INDICATED AT DDC. WHEN A LEAD PUMP FAILS, THE CONDENSATE SURGE TANK CONTROLLER OPENS THE SOLENOID VALVE ASSOCIATED WITH THE FAILED PUMP, AND ACTIVATES STANDBY PUMP P-4.
4. THE CONDENSATE SURGE TANK CONTROLLER THROUGH THE SURGE TANK FLOAT SWITCH STARTS AND STOPS THE BOILER FEED WATER PUMPS TO MAINTAIN THE SURGE TANK WATER LEVEL.
5. THE CONDENSATE SURGE TANK CONTROLLER MODULATES THE STEAM CONTROL VALVE TO MAINTAIN THE SURGE TANK TEMPERATURE CONTROL SET POINT.
6. WHEN THE LOW WATER FLOAT SWITCH SET POINT IS REACH; A LOW WATER ALARM IS INDICATED ON SURGE TANK CONTROLLER AND A COMMON IS INDICATED AT DDC.
7. WHEN THE HIGH WATER FLOAT SWITCH SET POINT IS REACH; A HIGH WATER ALARM IS INDICATED ON SURGE TANK CONTROLLER AND A COMMON IS INDICATED AT DDC.
8. WITH A PUMP HAND/OFF/AUTO SWITCH IN THE HAND POSITION, IT'S ASSOCIATED PUMP RUNS CONTINUOUSLY.

#### AIR HANDLING UNIT –AHU-0001 SEQUENCE OF OPERATION

1. AHU SUPPLY FAN IS MANUALLY STARTED AND STOP BY LOCAL DISCONNECT SWITCH.
2. HEATING MODE, PNEUMATIC HEATING COIL DISCHARGE AIR TEMPERATURE CONTROLLER MODULATES (4) STEAM HEATING COIL PNEUMATIC CONTROL VALVES IN SEQUENCE TO MAINTAIN HEATING COIL DISCHARGE AIR TEMPERATURE CONTROL SET POINT (70°F). A PNEUMATIC HEATING COIL DISCHARGE TEMPERATURE/HUMIDTY SENSOR MODULATES THE HEATING COIL BYPASS DAMPER TO MAINTAIN CONTROL SET POINT.
3. COOLING MODE, PNEUMATIC RETURN AIR TEMPERATURE SENSOR MODULATES THE CHILLED WATER COOLING COIL PNEUMATIC 3-WAY CONTROL VALVE TO MAINTAIN THE RETURN AIR TEMPERATURE CONTROL SET POINT.
4. MIXED AIR DAMPERS ARE MANUALLY CONTROLLED TO CLOSED, OPEN,  $\frac{1}{4}$  OPEN,  $\frac{1}{2}$  OPEN OR  $\frac{3}{4}$  OPEN THROUGH A PNEUMATIC DAMPER POSITION SELECTOR SWITCH.

#### AIR HANDLING UNIT – 189-AHU-0002 SEQUENCE OF OPERATION

1. WITH AHU SUPPLY FAN, HAND/OFF/AUTO SWITCH IN AUTO POSITION, AHU SUPPLY FAN HAS START/STOP CAPABILITY FROM THE DDC SYSTEM. AHU SUPPLY FAN IS OPERATED BASED ON TIME SCHEDULED OCCUPIED MODE.
2. AHU RETURN FAN IS NOT INTERLOCKED WITH AHU SUPPLY FAN AND OPERATES CONTINUOUSLY.
3. FOR HEATING OCCUPIED MODE, AHU SUPPLY AND RETURN FANS OPERATE, OUTSIDE AIR ISOLATION DAMPER IS OPEN, MIXED AIR DAMPERS ARE AT 6# MINIMUM POSITION OR MODULATE TO MAINTAIN MIXED AIR TEMPERATURE CONTROL SET POINT. AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
4. FOR HEATING UNOCCUPIED MODE, AHU SUPPLY FAN IS DE-ENERGIZED, AHU RETURN FAN CONTINUES TO OPERATE, OUTSIDE AIR ISOLATION, OUTSIDE AIR AND RELIEF AIR DAMPERS ARE CLOSED, RETURN AIR DAMPER IS OPEN. AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
5. FOR COOLING OCCUPIED MODE WHEN CHILLED WATER IS AVAILABLE AS SENSED BY THE CHILLED WATER TEMPERATURE SENSOR. AHU SUPPLY AND RETURN FANS OPERATE, OUTSIDE AIR ISOLATION DAMPER IS OPEN, MIXED AIR DAMPERS ARE AT 6# MINIMUM POSITION, CHILLED WATER FLOWS THROUGH COOLING COIL (NO COOLING COIL CONTROL VALVE). AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
6. FOR COOLING OCCUPIED MODE WHEN CHILLED WATER IS NOT AVAILABLE AS SENSED BY THE CHILLED WATER TEMPERATURE SENSOR. AHU SUPPLY AND RETURN FANS OPERATE, OUTSIDE AIR ISOLATION DAMPER IS OPEN, MIXED AIR DAMPERS ARE AT 6# MINIMUM POSITION OR MODULATE TO MAINTAIN MIXED AIR TEMPERATURE CONTROL SET POINT. AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
7. FOR COOLING UNOCCUPIED MODE WHEN CHILLED WATER IS AVAILABLE AS SENSED BY THE CHILLED WATER TEMPERATURE SENSOR. AHU SUPPLY FAN IS DE-ENERGIZED, AHU RETURN FAN CONTINUES TO OPERATE, OUTSIDE AIR ISOLATION, OUTSIDE AIR AND RELIEF AIR DAMPERS ARE CLOSED, RETURN AIR DAMPER IS OPEN, CHILLED WATER FLOWS THROUGH COOLING COIL (NO COOLING COIL CONTROL VALVE). AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
8. FOR COOLING UNOCCUPIED MODE WHEN CHILLED WATER IS NOT AVAILABLE AS SENSED BY THE CHILLED WATER TEMPERATURE SENSOR. AHU SUPPLY FAN IS DE-ENERGIZED, AHU RETURN FAN CONTINUES TO OPERATE, OUTSIDE AIR ISOLATION, OUTSIDE AIR AND RELIEF AIR DAMPERS ARE CLOSED, RETURN AIR DAMPER IS OPEN. AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL

VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.

9. WHEN FREEZESTAT SET POINT IS REACHED; ALARM IS INDICATED AT DDC, SUPPLY FAN DEACTIVATES, RETURN FAN CONTINUES TO OPERATE, DAMPERS GO TO THEIR NORMAL POSITIONS AND STEAM HEATING COIL CONTROL VALVE MODULATES TO MAINTAIN DISCHARGE AIR TEMPERATURE CONTROL SET POINT.
10. WHEN RETURN DUCT HIGH TEMPERATURE SENSOR SET POINT IS REACHED; SUPPLY FAN DEACTIVATES, RETURN FAN CONTINUES TO OPERATE, DAMPERS GO TO THEIR NORMAL POSITIONS AND STEAM HEATING COIL CONTROL VALVE MODULATES TO MAINTAIN DISCHARGE AIR TEMPERATURE CONTROL SET POINT.
11. WHEN AHU SUPPLY FAN IS DEACTIVATED; RETURN FAN CONTINUES TO OPERATE, DAMPERS GO TO THEIR NORMAL POSITIONS AND STEAM HEATING COIL CONTROL VALVE MODULATES TO MAINTAIN DISCHARGE AIR TEMPERATURE CONTROL SET POINT.

#### FAN COIL UNIT –FC-1 & FC-2 SEQUENCE OF OPERATION

1. FAN COIL UNIT SUPPLY FAN IS MANUALLY STARTED AND STOP BY LOCAL DISCONNECT SWITCH.
2. COOLING MODE, PNEUMATIC RETURN AIR TEMPERATURE SENSOR MODULATES THE CHILLED WATER COOLING COIL PNEUMATIC 3-WAY CONTROL VALVE TO MAINTAIN THE RETURN AIR TEMPERATURE CONTROL SET POINT.



#### SUMP PUMP – SP-1AND SP-2 SEQUENCE OF OPERATION

1. THE SUMP PUMP FLOAT SWITCH STARTS AND STOPS THE PUMP TO MAINTAIN THE SUMP WATER LEVEL.

#### SUMP PUMP – SP-3 SEQUENCE OF OPERATION

1. THE SUMP PUMP OPERATING FLOAT SWITCH STARTS AND STOPS THE PUMP TO MAINTAIN THE SUMP WATER LEVEL.
2. WHEN THE HIGH WATER FLOAT SWITCH SET POINT IS REACH; A HIGH WATER ALARM IS INDICATED ON THE SUMP PUMP CONTROLLER.
3. WHEN THE PUMP ELECTRICAL OVERLOAD SET POINT IS REACH; A PUMP OVERLOAD ALARM IS INDICATED ON THE SUMP PUMP CONTROLLER.
4. SUMP PUMP RUN HOURS ARE CONTINUOUSLY MONITORED. PUMP RUN HOURS ARE INDICATED ON THE SUMP PUMP CONTROLLER.

#### BOILER ROOM VENTILATION SYSTEM –EF-1 & SF-1 SEQUENCE OF OPERATION

1. ELECTRIC SPACE THERMOSTAT OPENS SUPPLY AIR FAN SF-1 OUTSIDE AIR DAMPER AND CYCLES SUPPLY AIR FAN SF-1 AND EXHAUST AIR FAN EF-1 TO MAINTAIN SPACE TEMPERATURE CONTROL SET POINT.

#### CEILING AND WALL MOUNTED EXHAUST FAN SEQUENCE OF OPERATION

1. EXHAUST FAN IS MANUALLY STARTED AND STOP BY LOCAL DISCONNECT SWITCH.

#### THEATER CONTROL BOOTH TRANSFER AIR FANS SEQUENCE OF OPERATION

1. SUPPLY AND EXHAUST AIR FANS ARE MANUALLY STARTED AND STOP BY LOCAL SWITCHES.
2. FAN SPEEDS ARE MANUALLY ADJUSTED BY THEIR RESPECTIVE FAN SPEED CONTROLLERS.
3. WALL MOUNTED FANS AIRFLOW DIRECTION IS MANUALLY SWITCHABLE BY THEIR RESPECTIVE FAN CONTROLLERS.

#### STEAM RADIATOR WITH PNEUMATIC THERMOSTAT - SEQUENCE OF OPERATION

1. PNEUMATIC THERMOSTAT MODULATES STEAM RADIATOR PNEUMATIC CONTROL VALVE TO MAINTAIN THERMOSTAT CONTROL SET POINT.

#### STEAM RADIATOR WITH SELF CONTAINED THERMOSTATIC CONTROL VALVE - SEQUENCE OF OPERATION

1. SELF CONTAINED THERMOSTATIC CONTROL VALVE MODULATES TO MAINTAIN TEMPERATURE SET POINT.

#### BOILER ROOM STEAM UNIT HEATER – UH-1 SEQUENCE OF OPERATION

1. ELECTRIC SPACE THERMOSTAT CYCLES THE UNIT HEATER FAN TO MAINTAIN SPACE TEMPERATURE CONTROL SET POINT. WHEN UNIT HEATER FAN IS ENERGIZED ELECTRIC STEAM CONTROL VALVE IS OPEN.

## **5. Mechanical Photo Locations/Equipment Floor Plans**



MECHANICAL ABBREVIATION LIST

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
A	COMPRESSED AIR	FD	FLOOR DRAIN	PACU	PACKAGED AIR CONDITIONING UNIT
A(—#)	COMPRESSED AIR (SPECIFIC PSIG)	FFD	FUNNEL FLOOR DRAIN	PBD	PARALLEL BLADE DAMPER
AAV	AUTOMATIC AIR VENT	PH	FIRE HYDRANT	PC	PUMPED CONDENSATE
ACC	AIR COOLED CONDENSER	PHC	FIRE HOSE CABINET	PCW	PROCESS COOLING WATER
ACCU	AIR COOLED CONDENSING UNIT	FHR	FIRE HOSE RACK	PCWR	PROCESS COOLING WATER RETURN
AD	ACCESS DOOR	FHV	FIRE HOSE VALVE	POWS	PROCESS COOLING WATER SUPPLY
AD	AREA DRAIN	PLA	FULL LOAD AMPS	PD	PRESSURE DROP (FEET OF WATER)
AE	AIR EXTRACTOR	FLR	FLOOR	PH	PERIMETER HEAT
AFF	ABOVE FINISHED FLOOR	FM	FLOW METER	PHR	PERIMETER HEAT RETURN
AHU	AIR HANDLING UNIT	FMS	FLOW MEASURING STATION	PHS	PERIMETER HEAT SUPPLY
ALT	ALTERNATE	FPM	FEET PER MINUTE	PNL	PANEL
AMP	AMPERE	FP	FIRE PUMP	PPM	PARTS PER MILLION
APD	AIR PRESSURE DROP	FPTU	FAN POWERED (AIR) TERMINAL UNIT	PRS	PRESSURE
AR	ARGON	FS	FLOOR SINK	PRV	PRESSURE REDUCING VALVE
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR-CONDITIONING ENGINEERS	FSEC	FOOD SERVICE EQUIPMENT CONTRACTOR	PSAN	PUMPED SANITARY
ASR	AUTOMATIC SPRINKLER RISER	FT	FEET	PST	PUMPED STORM
AUX	AUXILIARY	FTR	PINNED TUBE RADIATION	PS	POUNDS PER SQUARE INCH
AV	ACID VENT	FTV	FACE VELOCITY	PSIA	POUNDS PER SQUARE INCH – ABSOLUTE
AVTR	ACID VENT THROUGH ROOF	G	NATURAL GAS	PSIG	POUNDS PER SQUARE INCH – GAUGE
AW	ACID WASTE	GA	GAUGE	PW	PURIFIED WATER
		GAL	GALLON	PWR	PURIFIED WATER RETURN
BAS	BUILDING AUTOMATION SYSTEM	GRH	GRAVITY RELIEF HOOD	PWS	PURIFIED WATER SUPPLY
BCU	BLOWER COIL UNIT	GPH	GALLONS PER HOUR		
BDD	BACKDRAFT DAMPER	GPM	GALLONS PER MINUTE	(R)	RELOCATED
BFF	BELOW FINISHED FLOOR	H	HYDROGEN	RA	RETURN GRILLE OR REGISTER
BFP	BACKFLOW PREVENTER	HB	HOSE BIBB	RA	RETURN AIR
BHP	BRAKE HORSEPOWER	HC	HEATING COIL	RAT	RETURN AIR TEMPERATURE
BOD	BOTTOM OF DUCT	HD	HOT DRAIN	RC	RAIN CONDUCTOR
BOP	BOTTOM OF PIPE	HEPA	HIGH EFFICIENCY PARTICULATE ARRESTANCE	RCP	RADIANT CEILING PANEL
BTU	BRITISH THERMAL UNIT	HL	HIGH LIMIT	RD	ROOF DRAIN
BTUH	BRITISH THERMAL UNIT PER HOUR	HL	HIGH LIMIT	REQD	REQUIRED
BVC	REVERSE CONDUIT	HO	HAND/OFF/AUTO	REF	ROOF EXHAUST FAN
BWV	BACKWATER VALVE	HP	HEAT PUMP	RFN	RETURN FAN
		HP	HORSEPOWER	RL	RELATIVE HUMIDITY
C	COMMON	HPCH	HIGH PRESSURE DOMESTIC COLD WATER	RLFA	RELIEF AIR
CAP	CAPACITY	HPCH	HIGH PRESSURE DOMESTIC HOT WATER	RPW	REVOLUTIONS PER MINUTE
CAV	CONSTANT AIR VOLUME	HPCHWR	HIGH PRESSURE DOMESTIC HOT WATER RETURN	RPDA	REDUCED PRESSURE BACKFLOW PREVENTION DETECTION ASSY
CB	CATCH BASIN	HPL	HEAT PUMP LOOP	RPZA	REDUCED PRESSURE BACKFLOW PREVENTION ZONE ASSY
CB	COOLING COIL	HPLR	HEAT PUMP LOOP RETURN	RS	REFRIGERANT SUCTION
CD	COLD DECK	HPLS	HEAT PUMP LOOP SUPPLY	RTU	ROOFTOP UNIT
CD	CONDENSATE DRAIN	HR	HOUR		
CDI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED	HTG	HEATING	S	SUPPLY AIR DIFFUSER OR GRILLE
CFM	CUBIC FEET PER HOUR	HV	HEATING VENTILATING	SA	SOUND ATTENUATOR
CFM	CUBIC FEET PER MINUTE	HVAC	HEATING, VENTILATING, AIR CONDITIONING	SA	SUPPLY AIR
CH	CHILLER	HWH	HOT WATER HEATING	SAW	SANITARY WASTE
CHW	CHILLED WATER	HWHR	HOT WATER HEATING RETURN	SAT	SUPPLY AIR TEMPERATURE
CHWR	CHILLED WATER RETURN	HWS	HOT WATER HEATING SUPPLY	SCF	SECTION
CHWS	CHILLED WATER SUPPLY	HW	DOMESTIC HOT WATER	SCF	SUPPLY FAN
CLG	COOLING	HW(—#)	DOMESTIC HOT WATER (SPECIFIC TEMP °F)	SC	SINK
CND	CONDENSATE	HWR	DOMESTIC HOT WATER RETURN	SK	SINK
CND(—#)	CONDENSATE (SPECIFIC PSIG)	HX	HEAT EXCHANGER	SMR	SHOW MELT RETURN
CO	CLEAN OUT	HZ	HERTZ	SMU	SHOW MELT SUPPLY
CO2	CARBON DIOXIDE			SP	STATIC PRESSURE
CONT	CONTINUATION OR CONTINUED	IAQ	INDOOR AIR QUALITY	SPEC	SPECIFICATION
CONTR	CONTRACTOR	ID	INCHES DIAMETER	SPR	SPRINKLER
CONV	CONVECTOR	IE	INVERT ELEVATION	SQFT	SQUARE FOOT/SQUARE FEET
COP	COEFFICIENT OF PERFORMANCE	IH	INTAKE HOOD	S/S	START/STOP
CP	CIRCULATING PUMP	IN	INCHES	SS	SERVICE SINK
CRU	CONDENSATE RETURN UNIT	IR	INFRARED HEATER	ST	STORM
CSS	CINICAL SERVICE SINK	IW	INDIRECT WASTE	STD	STANDARD
CT	COOLING TOWER	JC	JANITOR'S CLOSET	STK	STACK
CUH	CABINET UNIT HEATER	JP	JOCKEY PUMP	STM	STEAM
CW	DOMESTIC COLD WATER			STM(—#)	STEAM (SPECIFIC PSIG)
CWF	DOMESTIC COLD WATER – FILTERED	KW	KILOWATT	S/W	SUMMER/WINTER
CWR	CONDENSER WATER RETURN	KWH	KILOWATT-HOUR	SW	SWITCH
CWS	CONDENSER WATER SUPPLY				
		LAT	LEAVING AIR TEMPERATURE	TC	TRANSFER GRILLE
D&T	DRIP AND TRAP	LAB	LABORATORY	TC	TEMPERATURE CONTROL
DA	DISCHARGE AIR	LAV	LAVATORY	TC	TEMPERING COIL
DAT	DISCHARGE AIR TEMPERATURE	LBS	POUNDS	TD	TEMPERATURE CONTROL PANEL
DB	DRY BULB	LDB	LEAVING DRY BULB	TD	TRENCH DRAIN
DDC	DIRECT DIGITAL CONTROL	LL	LOW LIMIT	TEMP	TEMPERATURE
DEG	DEGREE	LPC	LOW PRESSURE CONDENSATE	TEMP	TEMPORARY
DFU	DRAINAGE FIXTURE UNITS	LRA	LOCKED ROTOR AMPS	TH	TERMINAL HEATING
DIA	DIAMETER	LWB	LEAVING WET BULB	THA	TOTAL HEAT ABSORBED
DMPR	DAMPER	LWT	LEAVING WATER TEMPERATURE	THR	TERMINAL HEATING RETURN
D/N	DAY/NIGHT	MA	MIXED AIR	THR	TOTAL HEAT REJECTED
DN	DOWN	MAT	MIXED AIR TEMPERATURE	THS	TERMINAL HEATING SUPPLY
DNZ	DOWNSPOUT NOZZLE	MAU	MAKE-UP AIR UNIT	TSP	TOTAL STATIC PRESSURE
DS	DUCT SILENCER	MAX	MAXIMUM	TU	(AIR) TERMINAL UNIT
DT	DRAIN TILE	MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR	TV	TURNING VANES
DTC	DRAIN TILE CONNECTION	MCA	MECHANICAL CIRCUIT AMPACITY	TV	TYPICAL
DWH	DOMESTIC WATER HEATER	MCC	MOTOR CONTROL CENTER	UH	UNIT HEATER
DWG	DRAWING	MECH	MECHANICAL	UCL	UNDERWRITER'S LABORATORY
		MEZZ	MEZZANINE	UON	UNLESS OTHERWISE NOTED
(E)	EXISTING	MFR	MANUFACTURER	UR	URINAL
EA	EXHAUST GRILLE OR REGISTER	MH	MANHOLE	UV	UNIT VENTILATOR
EA	EACH	MIN	MINIMUM		
EAT	ENTERING AIR TEMPERATURE	MISC	MISCELLANEOUS	V	VALVE
EC	EXPANSION COMPENSATOR	MMBH	MILLION BRITISH THERMAL UNITS PER HOUR	V	VENT
ECUH	ELECTRIC CABINET UNIT HEATER	M/S	MOTOR STARTER	VAC	VACUUM
EDB	ENTERING DRY BULB	MTR	MOTOR	VAV	VARIABLE AIR VOLUME
EER	ENERGY EFFICIENCY RATIO	MANV	MANUAL AIR VENT	VB	VACUUM BREAKER
ESS	EMERGENCY EYE WASH / SHOWER	MVAC	MEDICAL VACUUM	VO	VOLUME DAMPER (MANUALLY ADJUSTABLE)
EEW	EMERGENCY EYE WASH	N	NITROGEN	VOL	VOLUME
EF	EXHAUST FAN	N2O	NITROUS OXIDE	VFC	VARIABLE FREQUENCY CONTROLLER
EF	EFFICIENCY	NC	NOISE CRITERIA	VFR	VENT THROUGH ROOF
EHC	ELECTRIC HEATING COIL	NC	NORMALLY CLOSED	VTU	VENTURI TERMINAL UNIT
EJ	EXPANSION JOINT	NCCT	NORMALLY CLOSED TIMED CLOSED	VUV	VERTICAL UNIT VENTILATOR
EL	ELEVATION	NCOT	NORMALLY CLOSED TIMED OPEN		
ELEC	ELECTRICAL	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION	W	WASTE
EMS	ENERGY MANAGEMENT SYSTEM	NOTO	NORMALLY OPEN TIMED OPEN	W&V	WASTE AND VENT
ERL	ENERGY RECOVERY LOOP	NOTO	NORMALLY OPEN TIMED OPEN	WAGD	WASTE ANESTHETIC GAS DISPOSAL
ERLRS	ENERGY RECOVERY LOOP RETURN	NO	NOT IN CONTRACT	WB	WET BULB
ERU	ENERGY RECOVERY UNIT	NOM	NOMINAL	WC	WATER CLOSET
ESH	EMERGENCY SHOWER	NPCW	NON POTABLE COLD WATER	WC	WATER COLUMN
ESP	EXTERNAL STATIC PRESSURE	O	OXYGEN	WCS	WATER GAUGE
EUH	ELECTRIC UNIT HEATER	OA	OUTSIDE AIR	WH	WALL HYDRANT
EWB	ENTERING WET BULB	OAT	OUTSIDE AIR TEMPERATURE	WMSD	WASHING MACHINE SUPPLY AND DRAIN BOX
EW	ELECTRIC WATER COOLER	OB	OUTLET BOX	WPD	WATER PRESSURE DROP
EWTR	ENTERING WATER TEMPERATURE	OBD	OPPOSED BLADE DAMPER	WT	WEIGHT
EXH	EXHAUST	OC	ON CENTER/CENTER TO CENTER		
		OD	OUTSIDE DIAMETER	XFMR	TRANSFORMER
		OED	OPEN ENDED DUCT		
		OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED		
		OFI	OWNER FURNISHED, OWNER INSTALLED		
		OL	OVERLOAD		
		ORC	OVERFLOW RAIN CONDUCTOR		
		ORD	OVERFLOW ROOF DRAIN		
		OS&Y	OUTSIDE SCREW AND YOKER		
		OV	OUTLET VELOCITY		
		OWS	OPERATOR WORKSTATION		
F	FIRE PROTECTION				
F	DEGREES FAHRENHEIT				
F&B	FACE AND BYPASS				
F&T	FLOAT AND THERMOSTATIC				
FA	FACE AREA				
FCU	FAN COIL UNIT				

TEMPERATURE CONTROL - PARTIAL SYMBOLS LIST

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	CARBON DIOXIDE SENSOR		OCCUPANCY SENSOR
	CARBON MONOXIDE SENSOR		PRESSURE TRANSMITTER
	DIFFERENTIAL PRESSURE TRANSMITTER		STATIC PRESSURE SENSOR OR PROBE
	FLOW METER		VALVE – 2 WAY CONTROL VALVE
	GUARD FOR STAT OR SENSOR		VALVE – 3 WAY CONTROL VALVE
	HUMIDISTAT OR HUMIDITY SENSOR (AS DEFINED ON TC DRAWINGS)		THERMOSTAT OR TEMPERATURE SENSOR (AS DEFINED ON TC DRAWINGS)

NOTE: LIST OF ADDITIONAL SYMBOLS & ABBREVIATIONS ASSOCIATED WITH TEMPERATURE CONTROLS ARE IDENTIFIED ON TC DRAWINGS.

MECHANICAL SYMBOL LIST




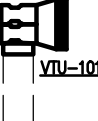











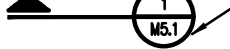
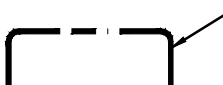
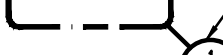


PIPING SYMBOLS		DUCTWORK SYMBOLS	
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	AIR VENT – AUTOMATIC		AIR TERMINAL UNIT
	AIR VENT – MANUAL		AIR TERMINAL UNIT WITH HEATING COIL
	BACKFLOW PREVENTER		VENTURI AIR TERMINAL UNIT
	CATCH BASIN		VENTURI AIR TERMINAL UNIT WITH HEATING COIL
	CIRCULATING PUMP		DAMPER – HORIZONTAL FIRE (EXISTING, NEW)
	CLEAN OUT – IN FLOOR		DAMPER – HORIZONTAL FIRE / SMOKE (EXISTING, NEW)
	CLEAN OUT – IN FLOOR		DAMPER – SMOKE (EXISTING, NEW)
	DIRECTION OF FLOW		DAMPER – VERTICAL FIRE (EXISTING, NEW)
	DIRECTION OF PITCH – DOWN		DAMPER – VERTICAL FIRE / SMOKE (EXISTING, NEW)
	FINNED TUBE RADIATION		DAMPER – BACK DRAFT
	FIRE PROTECTION – SIAMESE CONNECTION – FREE STANDING		DAMPER – MOTORIZED
	FIRE PROTECTION – SIAMESE CONNECTION – WALL MOUNTED		DAMPER – VOLUME (MANUALLY ADJUSTABLE)
	FIRE PROTECTION – SPRINKLER HEAD, CONCEALED		DIFFUSER – BLANK OFF
	FIRE PROTECTION – SPRINKLER HEAD, PENDANT		DIFFUSER – LINEAR SLOT
	FIRE PROTECTION – SPRINKLER HEAD, UPRIGHT		DIFFUSER – SQUARE OR RECTANGULAR
	FIRE PROTECTION – SPRINKLER HEAD, SIDEWALL		DUCT CROSS SECTION – SUPPLY
	FLOOR DRAIN		DUCT CROSS SECTION – RETURN
	FLOOR DRAIN – ELEVATION		DUCT CROSS SECTION – EXHAUST
	FLOOR DRAIN – FUNNEL, ELEVATION		DUCT – FLEXIBLE CONNECTION
	FLOW MEASURING DEVICE (FOR TEST AND BALANCING)		DUCT – FLEXIBLE DUCT
	FLOW SWITCH		DUCT TAKE-OFF – ROUND CONICAL
	FLOW METER		DUCT TAKE-OFF – RECTANGULAR WITH SHOE TAP
	HOSE BIBB		ELBOW – RECTANGULAR WITH TURNING VANES
	MANHOLE		ELBOW – RECTANGULAR / ROUND SMOOTH RADIUS
	OPEN SITE DRAIN		ELBOW DOWN – RECTANGULAR
	PIPE – ANCHOR		ELBOW DOWN – ROUND
	PIPE – CAP OR PLUG		ELBOW UP – RECTANGULAR
	PIPE – ELBOW DOWN		ELBOW UP – ROUND
	PIPE – ELBOW UP		FAN – AXIAL
	PIPE – EXPANSION JOINT OR COMPENSATOR		FAN – CENTRIFUGAL (ELEVATION)
	PIPE – FLANGE		HEATING COIL
	PIPE – HOSE AND BRAID FLEXIBLE CONNECTION		INCLINED DROP IN DIRECTION OF AIRFLOW
	PIPE – RUBBER FLEXIBLE CONNECTION		INCLINED RISE IN DIRECTION OF AIRFLOW
	PIPE – GUIDE		INTAKE OR RELIEF HOOD
	PIPE – TEE DOWN		REGISTER – RETURN OR EXHAUST
	PIPE – TEE UP		REGISTER – RETURN WITH BOOT
	PIPE – UNION		REGISTER – TRANSFER GRILLE
	PRESSURE AND TEMPERATURE TEST PLUG		ROOF EXHAUST FAN
	PRESSURE GAUGE AND COCK		TRANSITION – CONCENTRIC
	REDUCER – CONCENTRIC		TRANSITION – ECCENTRIC
	REDUCER – ECCENTRIC		UNIT HEATER – HORIZONTAL THROW
	ROOF/OVERFLOW DRAIN		UNIT HEATER – VERTICAL THROW
	STEAM TRAP – FLOAT AND THERMOSTATIC		
	STEAM TRAP – BUCKET		
	STRAINER		
	STRAINER WITH VALVE AND BLOW-OFF		
	THERMOMETER		
	TRAP		
	VALVE – ANGLE		
	VALVE – BALL		
	VALVE – BUTTERFLY		
	VALVE – BALANCE (I.E. BALANCE VALVE TO 0.5 GPM)		
	VALVE – COMBINATION BALANCE & FLOW MEASURING (I.E. BALANCE VALVE TO 0.5 GPM)		
	VALVE – CHECK		
	VALVE – SPRING CHECK		
	VALVE – GAS (MANUAL)		
	VALVE – GLOBE		
	VALVE – ISOLATION		
	VALVE – NEEDLE		
	VALVE – OS&Y		
	VALVE – PLUG		
	VALVE – PRESSURE REGULATING		
	VALVE – PRESSURE REDUCING		
	VALVE – PRESSURE RELIEF		
	VALVE – PRESSURE & TEMPERATURE RELIEF		
	VENT THROUGH ROOF		
	WALL HYDRANT		
	DOUBLE LINE PIPING SYMBOL		
	DOUBLE LINE DUCTWORK SYMBOL		

SYMBOL	DESCRIPTION
	FLANGE
	FLEX CONNECTION
	STRAINER – BASKET
	STRAINER – Y TYPE
	VALVE – 2 WAY CONTROL
	VALVE – 3 WAY CONTROL
	VALVE – BUTTERFLY
	VALVE – CHECK
	VALVE – DETECTOR CHECK
	VALVE – OS&Y HORIZONTAL STEM
	VALVE – OS&Y VERTICAL STEM

MECHANICAL DRAWING INDEX

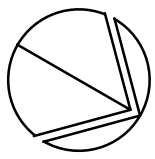
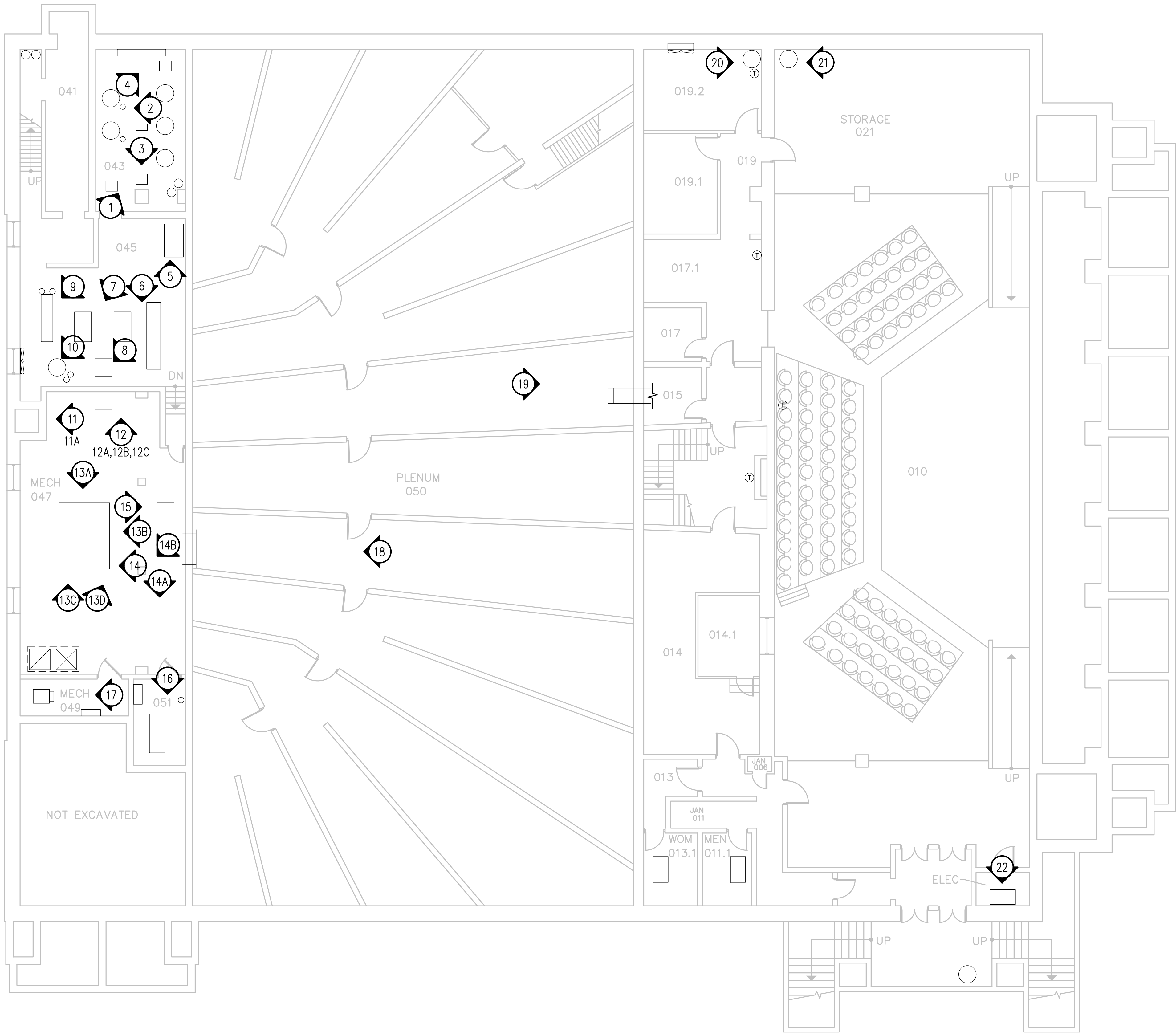
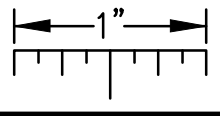
SHEET NO.	SHEET TITLE
M0.1	MECHANICAL STANDARDS AND DRAWING INDEX
M1.0	BASEMENT MECHANICAL PHOTO LOCATIONS
M1.1	FIRST FLOOR MECHANICAL PHOTO LOCATIONS
M1.2	SECOND FLOOR MECHANICAL PHOTO LOCATIONS
M1.3	THIRD FLOOR MECHANICAL PHOTO LOCATIONS
M2.0	BASEMENT MECHANICAL PLAN
M2.1	FIRST FLOOR MECHANICAL PLAN
M2.2	SECOND FLOOR MECHANICAL PLAN
M2.3	THIRD FLOOR MECHANICAL PLAN

STANDARD METHODS OF NOTATION

	SUPPLY DIFFUSER WITH SCHEDULE TAG "1", 10" DIAMETER NECK SIZE 350 CFM TYPICAL FOR 4
	RETURN REGISTER WITH SCHEDULE TAG "1", 22"x22" NECK SIZE 640 CFM TYPICAL FOR 2 EXHAUST REGISTER E DESIGNATION SIMILAR.
	AIR TERMINAL UNIT WITH HEATING COIL NO. 101 WITH SERVICE CLEARANCE SHOWN
	VENTURI AIR TERMINAL WITH HEATING COIL NO. 101 WITH SERVICE CLEARANCE SHOWN
	PIPE DIAMETER NOTATION ALL SIZES IN INCHES
	DUCT SIZE NOTATION ALL SIZES IN INCHES
	OVAL DUCT
	RECTANGULAR DUCT
	CONSTRUCTION KEY NOTE (NUMBER) OR DEMOLITION KEY NOTE (LETTER)
	EQUIPMENT DESIGNATION, (I.E. EXHAUST FAN NUMBER 1)
	PIPING RISER DESIGNATION (I.E. HOT WATER RISER NUMBER 1)
	NEW SYSTEM COMPONENT
	EXISTING SYSTEM COMPONENT TO REMAIN
	POINT OF NEW CONNECTION SYMBOL
	SECTION OR PLAN NUMBER
	SHEET WHERE SECTION IS DRAWN
	AREA OF ENLARGEMENT
	PLAN NUMBER
	SHEET WHERE ENLARGED PLAN IS DRAWN
	SECTION OR PLAN NUMBER

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THE FOLLOWING DIMENSION EQUALS  
ONE INCH WHEN PRINTED TO SCALE.



**BASEMENT MECHANICAL PHOTO LOCATIONS**

SCALE: 1/8" = 1' - 0"

Not For Construction

SHEET TITLE  
**BASEMENT MECHANICAL  
PHOTO LOCATIONS**

DATE  
01/17/19

ISSUE  
RETRO-COMMISSIONING

SHEET No.

**M1.0**

PROJECT TITLE  
**WAYNE STATE UNIVERSITY  
HILBERRY THEATRE**

WSU PROJECT NO.

**PBA**  
**Peter Bosso Associates Inc**  
CONSULTING ENGINEERS

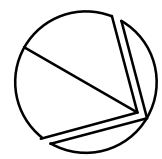
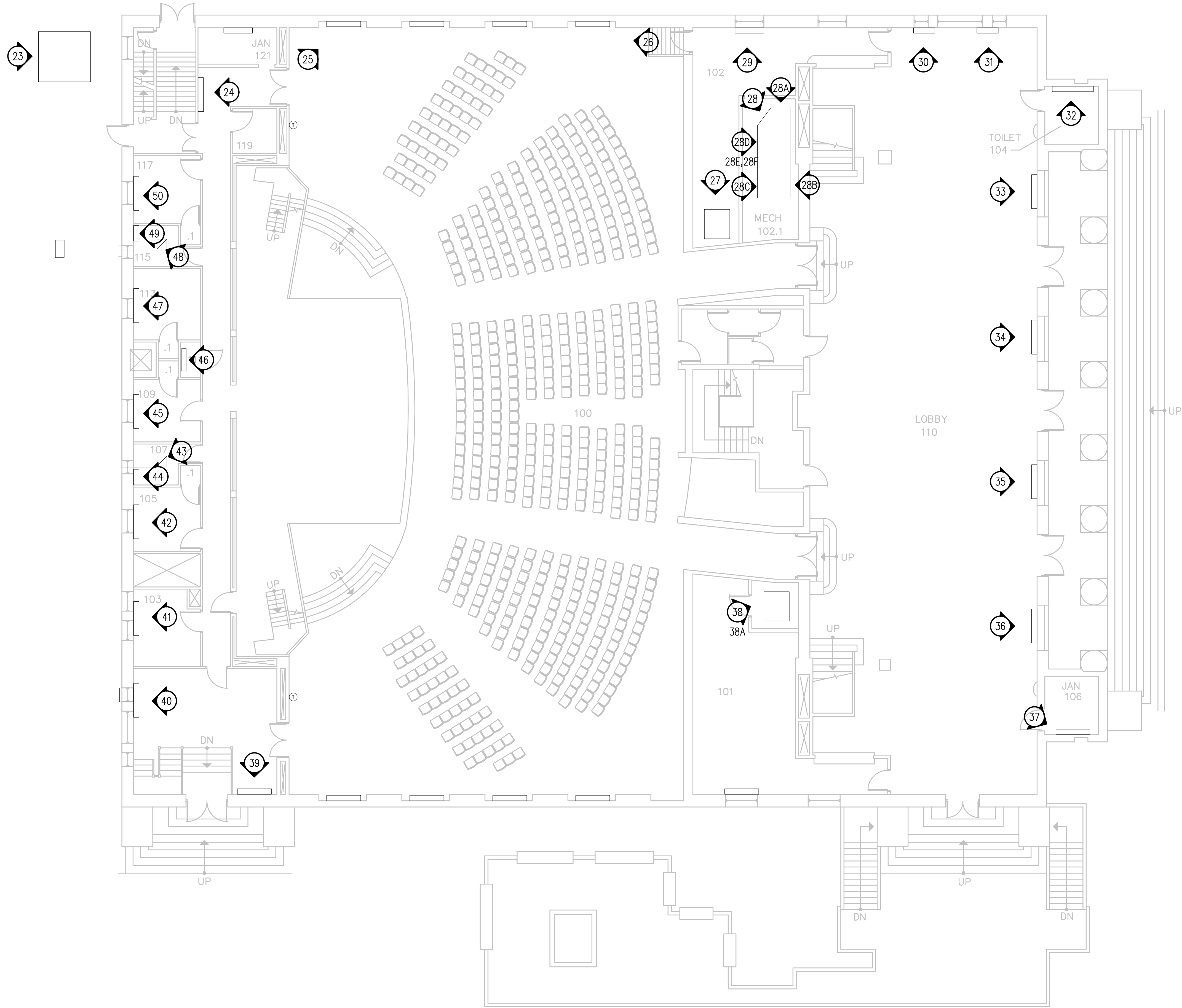
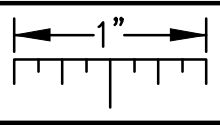
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THE FOLLOWING DIMENSION EQUALS  
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**FIRST FLOOR MECHANICAL PHOTO LOCATIONS**  
SCALE: 1/8" = 1' - 0"

Not For Construction  
SHEET TITLE  
FIRST FLOOR MECHANICAL  
PHOTO LOCATIONS  
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SHEET No.  
**M1.1**

PROJECT TITLE  
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HILBERRY THEATRE  
WSU PROJECT NO.

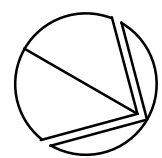
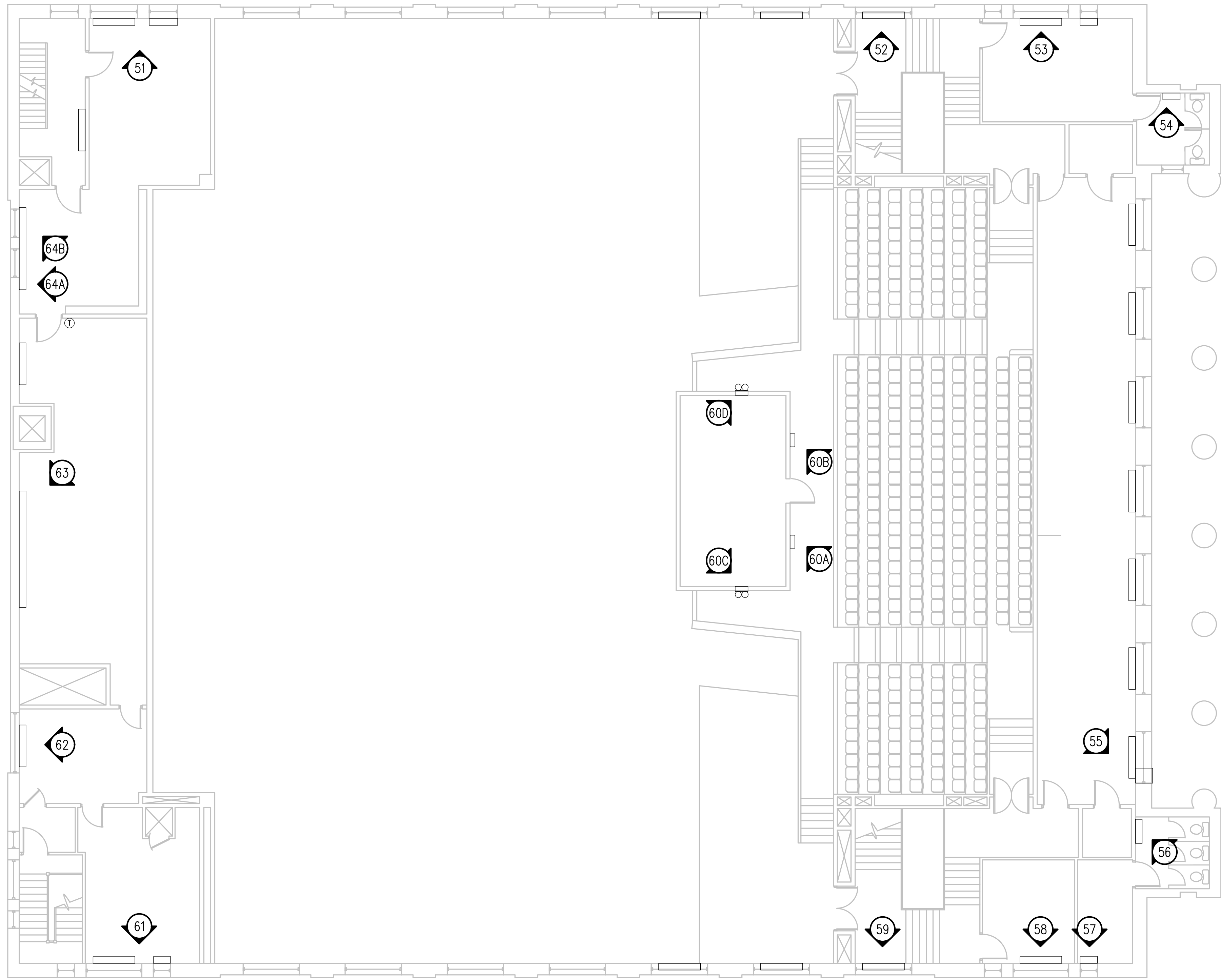
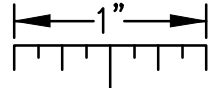
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**SECOND FLOOR MECHANICAL PHOTO LOCATIONS**

SCALE: 1/8" = 1' - 0"

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SECOND FLOOR MECHANICAL  
PHOTO LOCATIONS

DATE

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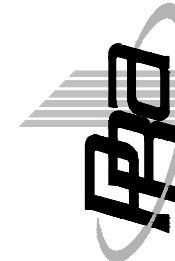
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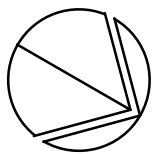
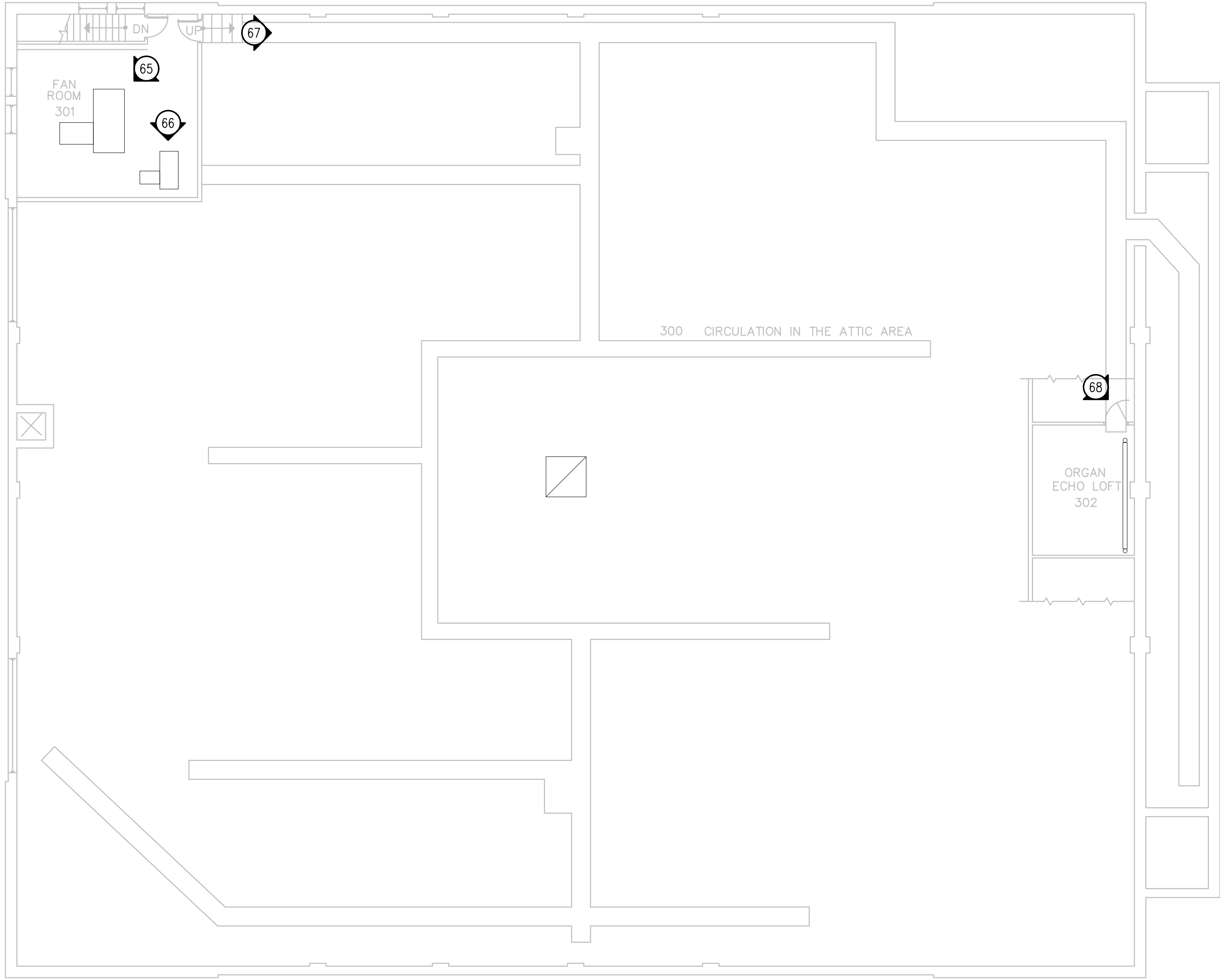
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69  
(ACROSS THE STREET)



**THIRD FLOOR MECHANICAL PHOTO LOCATIONS**

SCALE: 1/8" = 1' - 0"

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SHEET TITLE

THIRD FLOOR MECHANICAL  
PHOTO LOCATIONS

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**M1.3**

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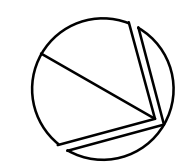
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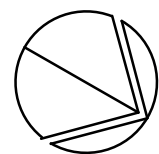
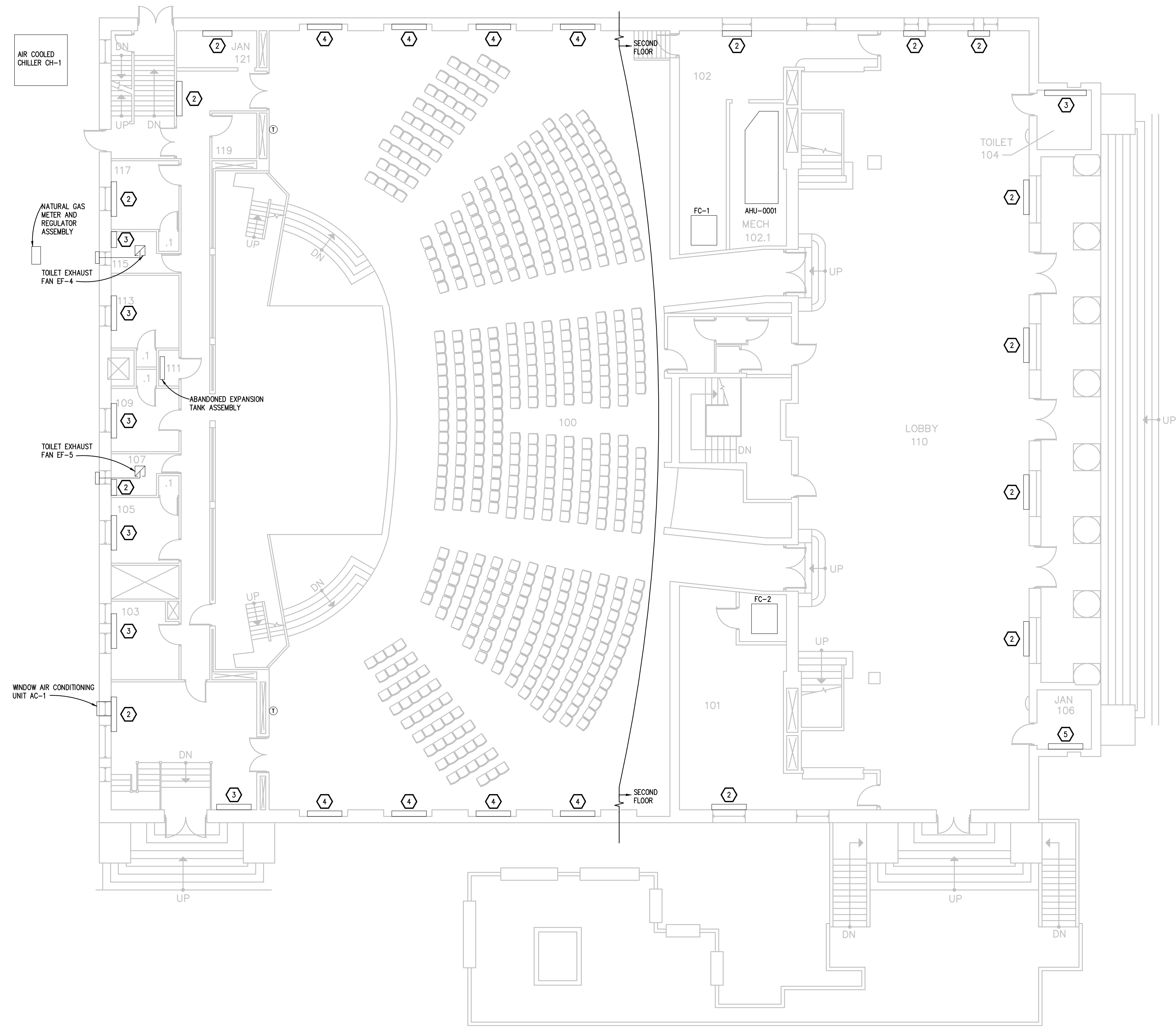
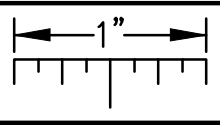
A horizontal scale bar with a double-headed arrow at the top labeled "1\". Below the arrow is a vertical line with eight tick marks on each side, creating nine equal segments. The entire scale bar is enclosed in a rectangular box.



**SCALE: 1/8" = 1' - 0"**

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**FIRST FLOOR MECHANICAL PLAN**  
SCALE: 1/8" = 1' - 0"

**EXISTING SYSTEM KEY NOTES:**

1. STEAM UNIT HEATER WITH FAN.
2. STEAM RADIATOR - ONE PIPE FLOOR OR WALL MOUNTED.
3. STEAM RADIATOR - ONE PIPE WITH SELF CONTAINED CONTROL VALVE FLOOR MOUNTED.
4. STEAM RADIATOR - TWO PIPE RECESSED OR WALL MOUNTED - PNEUMATIC CONTROL VALVE AND THERMOSTAT.
5. STEAM RADIATOR/CONVECTOR - ONE PIPE WALL OR CEILING MOUNTED.

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**FIRST FLOOR MECHANICAL  
PLAN**

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PROJECT TITLE  
**WAYNE STATE UNIVERSITY  
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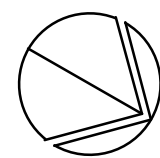
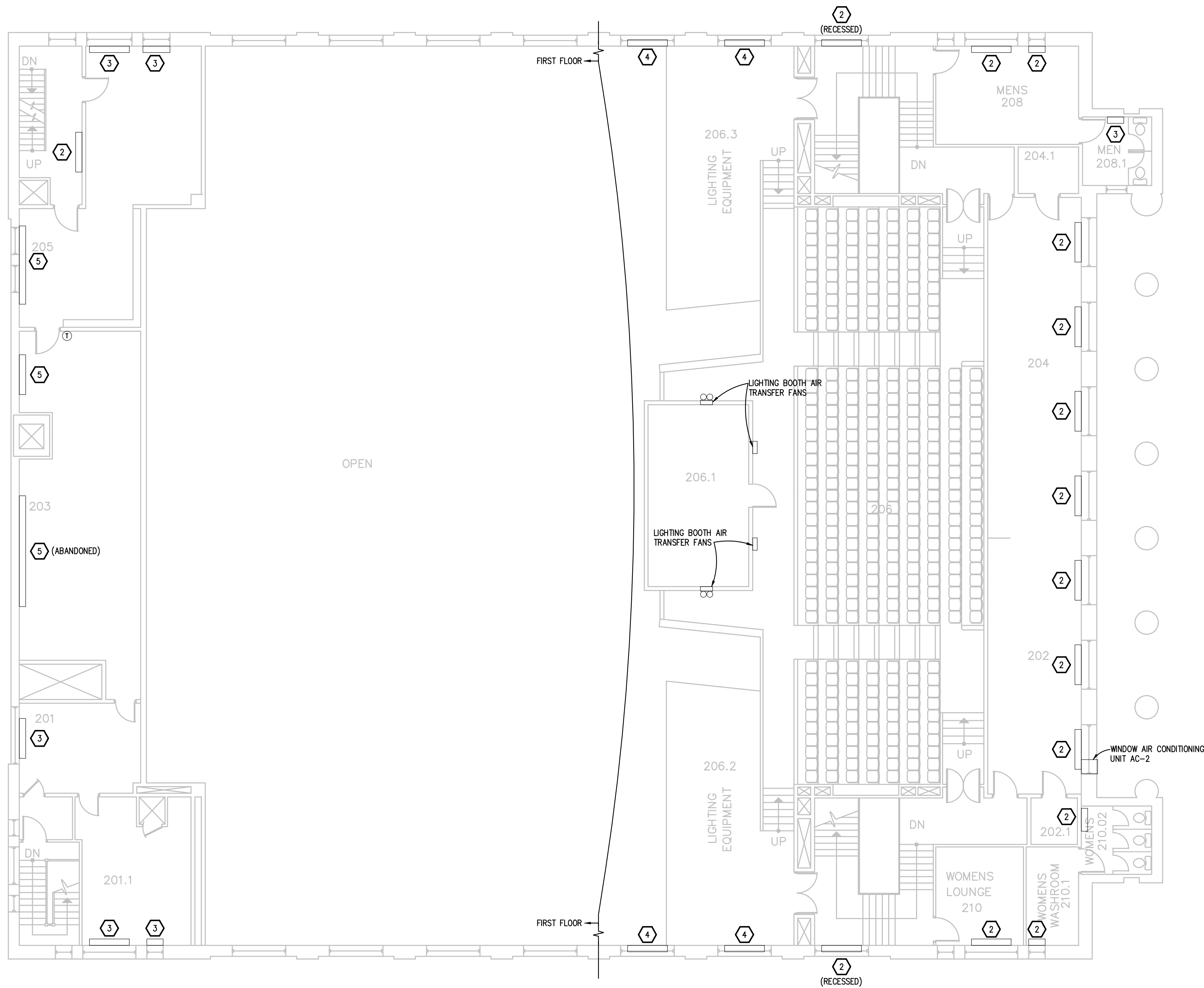
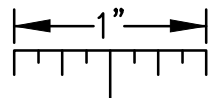
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**SECOND FLOOR MECHANICAL PLAN**

SCALE: 1/8" = 1' - 0"

**EXISTING SYSTEM KEY NOTES:**

1. STEAM UNIT HEATER WITH FAN.
2. STEAM RADIATOR - ONE PIPE FLOOR OR WALL MOUNTED.
3. STEAM RADIATOR - ONE PIPE WITH SELF CONTAINED CONTROL VALVE FLOOR MOUNTED.
4. STEAM RADIATOR - TWO PIPE RECESSED OR WALL MOUNTED - PNEUMATIC CONTROL VALVE AND THERMOSTAT.
5. STEAM RADIATOR/CONVECTOR - ONE PIPE WALL OR CEILING MOUNTED.

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SHEET TITLE  
**SECOND FLOOR MECHANICAL  
PLAN**

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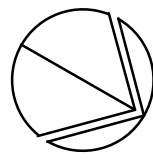
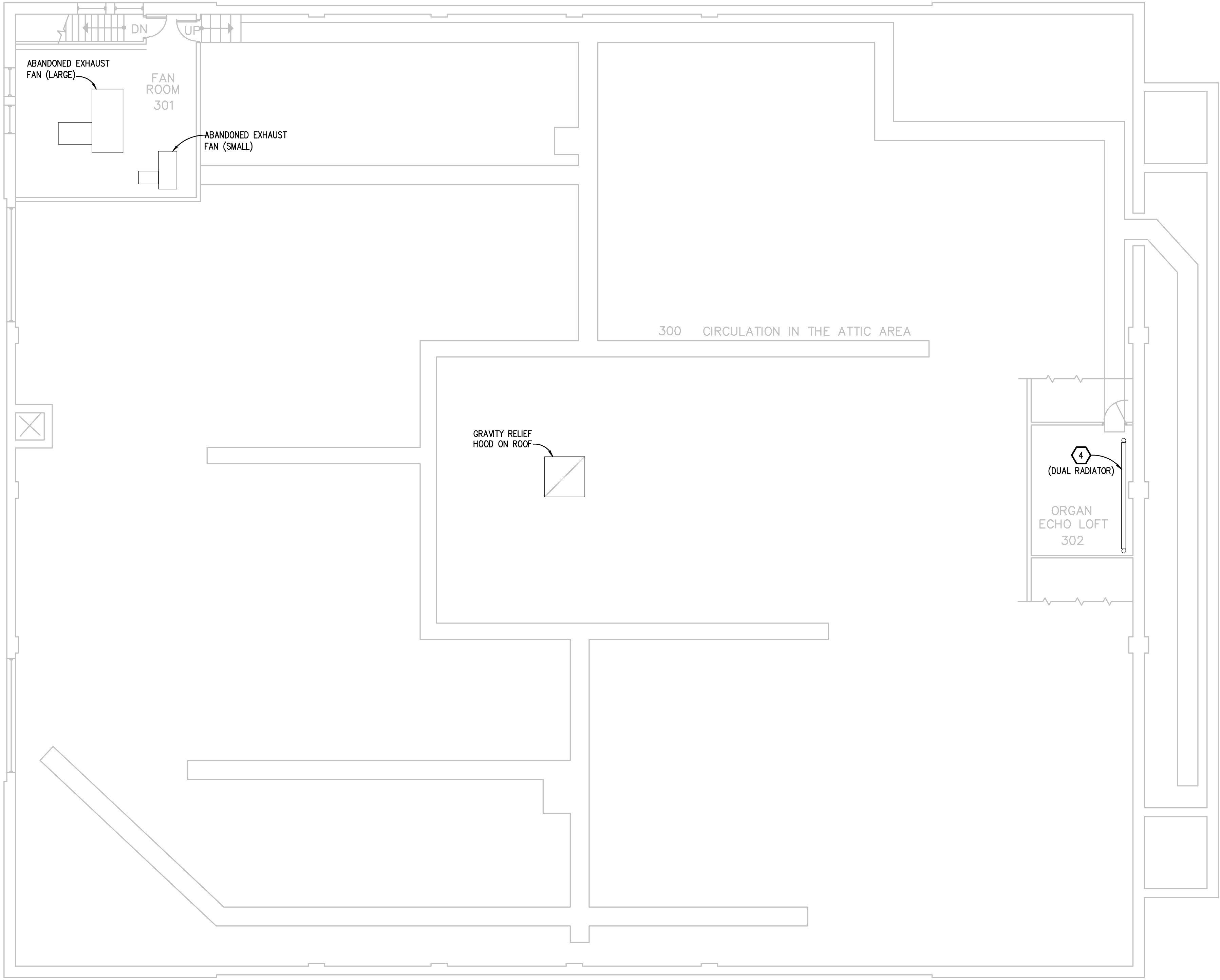
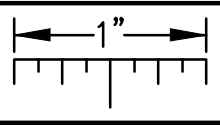
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**THIRD FLOOR MECHANICAL PLAN**

SCALE: 1/8" = 1' - 0"

**EXISTING SYSTEM KEY NOTES:**

1. STEAM UNIT HEATER WITH FAN.
2. STEAM RADIATOR – ONE PIPE FLOOR OR WALL MOUNTED.
3. STEAM RADIATOR – ONE PIPE WITH SELF CONTAINED CONTROL VALVE FLOOR MOUNTED.
4. STEAM RADIATOR – TWO PIPE RECESSED OR WALL MOUNTED – PNEUMATIC CONTROL VALVE AND THERMOSTAT.
5. STEAM RADIATOR/CONVECTOR – ONE PIPE WALL OR CEILING MOUNTED.

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**WAYNE STATE UNIVERSITY  
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WSU PROJECT NO.

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SHEET TITLE  
**THIRD FLOOR MECHANICAL  
PLAN**

DATE  
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**M2.3**

## **6. Electrical Photo Locations/Equipment Floor Plans**

ELECTRICAL SYMBOL LIST

(NOTE: SOME SYMBOLS AND ABBREVIATIONS SHOWN MAY NOT APPLY TO THIS PROJECT)

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
FX	FIXTURE TYPE	TWC	TWO-WAY COMMUNICATION SYSTEM CALL STATION
	LIGHTING FIXTURE	TWCD	TWO-WAY COMMUNICATION SYSTEM AUTO DIALER
	DIRECT/NDIRECT LIGHTING FIXTURE	TWCA	TWO-WAY COMMUNICATION SYSTEM ANNUNCIATOR & COMMUNICATION PANEL
	EMERGENCY FIXTURE	TWCP	TWO-WAY COMMUNICATION SYSTEM POWER SUPPLY WITH BATTERY BACK-UP
	EMERGENCY FIXTURE	TWCDP	TWO-WAY COMMUNICATION SYSTEM AUTO DIALER POWER SUPPLY WITH BATTERY BACK-UP
	NIGHT LIGHTING FIXTURE	RGP	REMOTE GENERATOR ANNUNCIATOR PANEL
FX-NL	LIGHTING FIXTURE	ATS	AUTOMATIC TRANSFER SWITCH
	WALL MOUNTED LIGHTING FIXTURE	UPS	UN-INTERRUPTIBLE POWER SUPPLY
	LIGHTING FIXTURE	CSX	LOW VOLTAGE CONTROL STATION "X" INDICATES TYPE
	DIRECTIONAL LIGHTING FIXTURE		SINGLE/DUPLEX RECEPTACLE
	PENDANT LIGHTING FIXTURE		SINGLE/DUPLEX RECEPTACLE CONTROLLED BY AUTOMATIC CONTROL DEVICE/SYSTEM
	WALL SCONCE		QUAD RECEPTACLE
	LIGHTING TRACK		ABOVE COUNTER DUPLEX RECEPTACLE (SIMILAR FOR TAMPER RESISTANT, QUADS, EMERGENCY, USB AND GFCI RECEPTACLES)
	TRACK LIGHTING FIXTURE		DUPLEX RECEPTACLE-GROUND FAULT CIRCUIT INTERRUPTER
	POLE MOUNTED LIGHTING FIXTURE		DUPLEX EMERGENCY RECEPTACLE
	POLE MOUNTED LIGHTING FIXTURE - POST TOP		DUPLEX TAMPER RESISTANT RECEPTACLE
	BOLLARD LIGHTING FIXTURE		QUAD TAMPER RESISTANT RECEPTACLE
	EMERGENCY LIGHTING UNIT		ABOVE COUNTER DUPLEX TAMPER RESISTANT RECEPTACLE
	EXIT LIGHTING FIXTURE WITH DIRECTIONAL ARROWS (SHADED AREA INDICATES FACE)		DUPLEX UPS RECEPTACLE
	EXIT LIGHTING FIXTURE WITH DIRECTIONAL ARROWS (SHADED AREA INDICATES FACE)		DUPLEX RECEPTACLE WITH 2 USB PORTS
	EXIT LIGHTING FIXTURE - WALL MOUNTED		4 PORT USB CHARGING STATION
	EMERGENCY LOAD TRANSFER DEVICE		CEILING MOUNTED DUPLEX RECEPTACLE
	AUTOMATIC LOAD CONTROL RELAY		POWER POLE
	LIGHTING CONTROL DEVICE - REFER TO LIGHTING CONTROL SCHEDULE		SPECIAL RECEPTACLE - REFER TO ELECTRICAL STANDARD SCHEDULES
	ROOM CONTROL DESIGNATION - REFER TO LIGHTING CONTROL SCHEDULE		MULTI-OUTLET RACEWAY
	SINGLE POLE TOGGLE SWITCH		MULTI-SERVICE DROP SEE ELECTRICAL DETAILS AND DIAGRAMS SHEET "X" INDICATES TYPE
	TWO POLE TOGGLE SWITCH		INTERCOM OUTLET
	3 WAY TOGGLE SWITCH		SPEAKER
	4 WAY TOGGLE SWITCH		SPEAKER - WALL MOUNTED
	KEY OPERATED SWITCH		MICROPHONE
	3 WAY KEY OPERATED SWITCH		VOLUME CONTROL/STATION SELECTOR
	4 WAY KEY OPERATED SWITCH		SIGNALING BELL
	DIMMER SWITCH		SINGLE FACE CLOCK - CEILING MOUNTED
	3 WAY DIMMER SWITCH		SINGLE FACE CLOCK - WALL MOUNTED
	DIMMER OCCUPANCY SENSOR SWITCH		DOUBLE FACE CLOCK - CEILING MOUNTED
	LOW VOLTAGE DIMMER SWITCH		DOUBLE FACE COMBINATION CLOCK/SPEAKER CEILING MOUNTED
	PILOT SWITCH		DOUBLE FACE CLOCK - WALL MOUNTED
			DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
			TIME CLOCK
			CONTACTOR
			PHOTOCELL
			TWIST TIMER

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
CP	CONTROL PANEL	SC	SINGLE FACE CLOCK - CEILING MOUNTED
	MOTOR	SW	SINGLE FACE CLOCK - WALL MOUNTED
VFC	VARIABLE FREQUENCY CONTROLLER.	DC	DOUBLE FACE CLOCK - CEILING MOUNTED
	MANUAL CONTROLLER	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER CEILING MOUNTED
	MAGNETIC CONTROLLER	DC	DOUBLE FACE CLOCK - WALL MOUNTED
	COMBINATION MAGNETIC CONTROLLER	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	NON-FUSIBLE DISCONNECT SWITCH	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	FUSIBLE DISCONNECT SWITCH	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	ENCLOSED CIRCUIT BREAKER	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	PUSH BUTTON STATION	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	JUNCTION BOX	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	HARD WIRE POWER CONNECTION	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
DP	AUTOMATIC DOOR CONTROLLER	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
PP	AUTOMATIC DOOR PUSH PAD OPERATOR	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	GROUND ROD	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	GROUND CONNECTION	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	CONDUIT SLEEVE WITH BUSHINGS LENGTH AS REQUIRED "X" INDICATES CONDUIT SIZE	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	CONDUIT UP	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	CONDUIT DOWN	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	EMPTY BOX FOR FUTURE TELECOMMUNICATION OUTLET	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	ABOVE COUNTER EMPTY BOX FOR FUTURE TELECOMMUNICATION OUTLET	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	EMPTY BOX FOR FUTURE CEILING MOUNTED TELECOMMUNICATION OUTLET "X" INDICATES TYPE	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	ABOVE COUNTER TELECOMMUNICATION OUTLET "X" INDICATES TYPE	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	TELECOMMUNICATION CEILING MOUNTED OUTLET "X" INDICATES TYPE	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	TELECOMMUNICATION BACKBOARD	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	TELECOMMUNICATION GROUNDING BUS BAR	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	TELECOMMUNICATION MAIN GROUNDING BUS BAR	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	INTERCOM OUTLET	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	SPEAKER	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	SPEAKER - WALL MOUNTED	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	MICROPHONE	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	VOLUME CONTROL/STATION SELECTOR	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	SIGNALING BELL	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	SINGLE FACE CLOCK - CEILING MOUNTED	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	SINGLE FACE CLOCK - WALL MOUNTED	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	DOUBLE FACE CLOCK - CEILING MOUNTED	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	DOUBLE FACE COMBINATION CLOCK/SPEAKER CEILING MOUNTED	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	DOUBLE FACE CLOCK - WALL MOUNTED	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	TIME CLOCK	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	CONTACTOR	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	PHOTOCELL	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED
	TWIST TIMER	DC	DOUBLE FACE COMBINATION CLOCK/SPEAKER WALL MOUNTED

REFER TO ELECTRICAL STANDARD SCHEDULES

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	SECURITY CAMERA	EMU	ELECTRONIC METERING UNIT
MD	MOTION DETECTOR	A	AMMETER
	SECURITY KEY SWITCH	V	VOLTMETER
DC	DOOR CONTACT	AS	AMMETER SWITCH
KP	KEY PAD	VS	VOLTMETER SWITCH
CR	ACCESS CONTROL STATION	SPD	SURGE PROTECTIVE DEVICE
DB	DURESS PUSH BUTTON STATION	CR	CONTROL RELAY
DE	DELAYED EGRESS	TDR	TIME DELAY RELAY
REX	REQUEST TO EXIT STATION		THERMAL OVERLOAD RELAY
	CIRCUIT BREAKER		NORMALLY OPEN CONTACTS
	DRAWOUT CIRCUIT BREAKER MANUALLY/ OPERATED		NORMALLY CLOSED CONTACTS
	DRAWOUT CIRCUIT BREAKER ELECTRICALLY/ OPERATED		N.O. PUSH BUTTON SINGLE CIRCUIT
	SWITCH		N.C. PUSH BUTTON SINGLE CIRCUIT
	AUTOMATIC OR MANUAL TRANSFER SWITCH		CABLE VAULT "X-X" INDICATES TYPE
	FUSE		BRANCH CIRCUIT PANELBOARD
	TRANSFORMER		LOAD CENTER
	CURRENT TRANSFORMER		MOTOR CONTROL CENTER
	POTENTIAL TRANSFORMER		TRANSFORMER
	LIGHTNING ARRESTOR		DISTRIBUTION PANEL
	PANELBOARD "X" INDICATES PANELBOARD NAME		GROUND BUS
	GROUND		PLUG IN BUSWAY
	STRESS CONE TERMINATION		FEEDER BUSWAY
	SECURITY KEY INTERLOCK		
	ENGINE GENERATOR		
	UTILITY METER		
	ELECTRONIC METERING UNIT		
	AMMETER		
	VOLTMETER		
	AMMETER SWITCH		
	VOLTMETER SWITCH		
	SURGE PROTECTIVE DEVICE		
	CONTROL RELAY		
	TIME DELAY RELAY		
	THERMAL OVERLOAD RELAY		
	NORMALLY OPEN CONTACTS		
	NORMALLY CLOSED CONTACTS		
	N.O. PUSH BUTTON SINGLE CIRCUIT		
	N.C. PUSH BUTTON SINGLE CIRCUIT		
	CABLE VAULT "X-X" INDICATES TYPE		
	BRANCH CIRCUIT PANELBOARD		
	LOAD CENTER		
	MOTOR CONTROL CENTER		
	TRANSFORMER		
	DISTRIBUTION PANEL		
	GROUND BUS		
	PLUG IN BUSWAY		
	FEEDER BUSWAY		

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
F	MANUAL FIRE ALARM BOX	SD	SMOKE DETECTOR
SD	SMOKE DETECTOR	DD	DUCT SMOKE DETECTOR
CO	CARBON MONOXIDE DETECTOR	RT	REMOTE TEST STATION (FOR DUCT DETECTOR)
TD	THERMAL DETECTOR	BD	PROJECTED BEAM DETECTOR
BD	PROJECTED BEAM DETECTOR	F	FIRE ALARM BELL
F	FIRE ALARM AUDIBLE NOTIFICATION APPLIANCE	F	FIRE ALARM AUDIBLE NOTIFICATION APPLIANCE
XX	FIRE ALARM VISUAL NOTIFICATION APPLIANCE "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd	XX	FIRE ALARM VISUAL NOTIFICATION APPLIANCE "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
XX	FIRE ALARM COMBINATION VISUAL/ AUDIBLE "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd	XX	FIRE ALARM COMBINATION VISUAL/ AUDIBLE "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
XX	FIRE ALARM VISUAL NOTIFICATION APPLIANCE CEILING MOUNTED "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd	XX	FIRE ALARM VISUAL NOTIFICATION APPLIANCE CEILING MOUNTED "XX" INDICATES CANDELA RATING IF NO RATING SHOWN, APPLIANCE IS 15cd
F	FIREFIGHTERS PHONE JACK	F	FIREFIGHTERS PHONE JACK
FACP	FIRE ALARM CONTROL PANEL	FACP	FIRE ALARM CONTROL PANEL
FAA	FIRE ALARM ANNUNCIATOR PANEL	FAA	FIRE ALARM ANNUNCIATOR PANEL
NAC	NOTIFICATION APPLIANCE CIRCUIT EXTENDER PANEL	NAC	NOTIFICATION APPLIANCE CIRCUIT EXTENDER PANEL
IM	ADDRESSABLE MONITORING MODULE	IM	ADDRESSABLE MONITORING MODULE
CM	ADDRESSABLE CONTROL MODULE	CM	ADDRESSABLE CONTROL MODULE
TS	TAMPER SWITCH	TS	TAMPER SWITCH
FS	FLOW SWITCH	FS	FLOW SWITCH
DR	MAGNETIC DOOR RELEASE	DR	MAGNETIC DOOR RELEASE

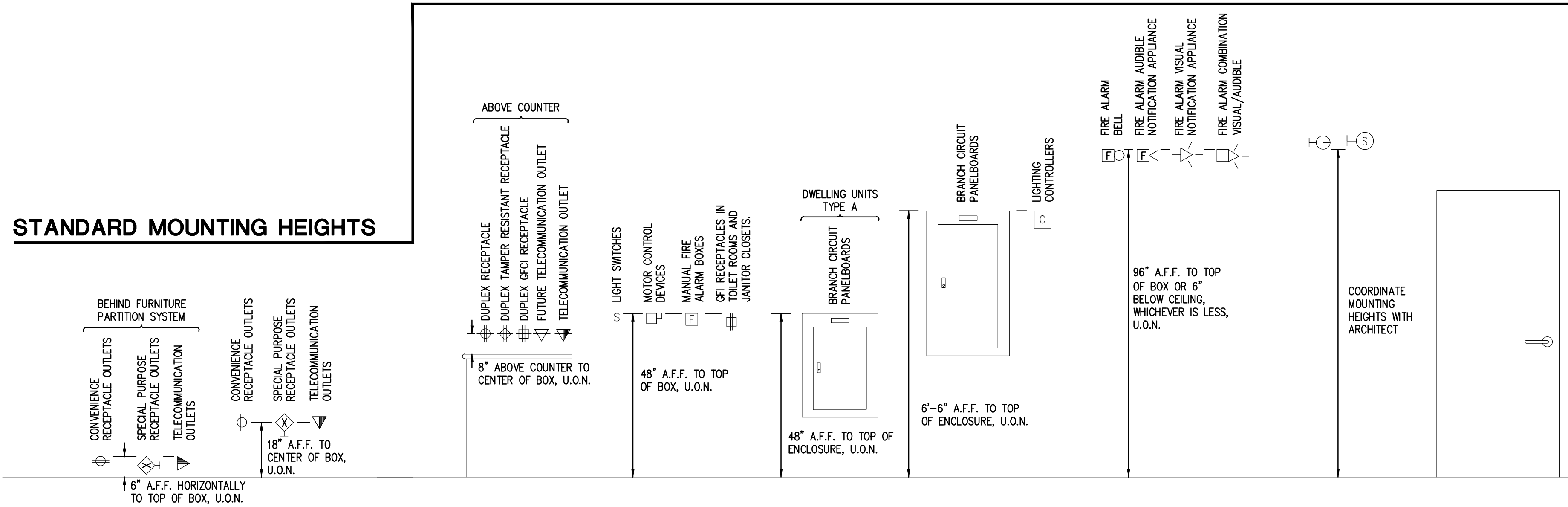
ELECTRICAL DRAWING INDEX

SHEET NO.	SHEET TITLE
E0.1	ELECTRICAL STANDARDS AND DRAWING INDEX
E3.0	BASEMENT POWER PLAN AND PHOTO LOCATIONS
E3.1	FIRST FLOOR POWER PLAN AND PHOTO LOCATIONS
E3.2	SECOND FLOOR POWER PLAN AND PHOTO LOCATIONS
E3.3	THIRD FLOOR POWER PLAN AND PHOTO LOCATIONS
E5.1	ONE LINE DIAGRAM

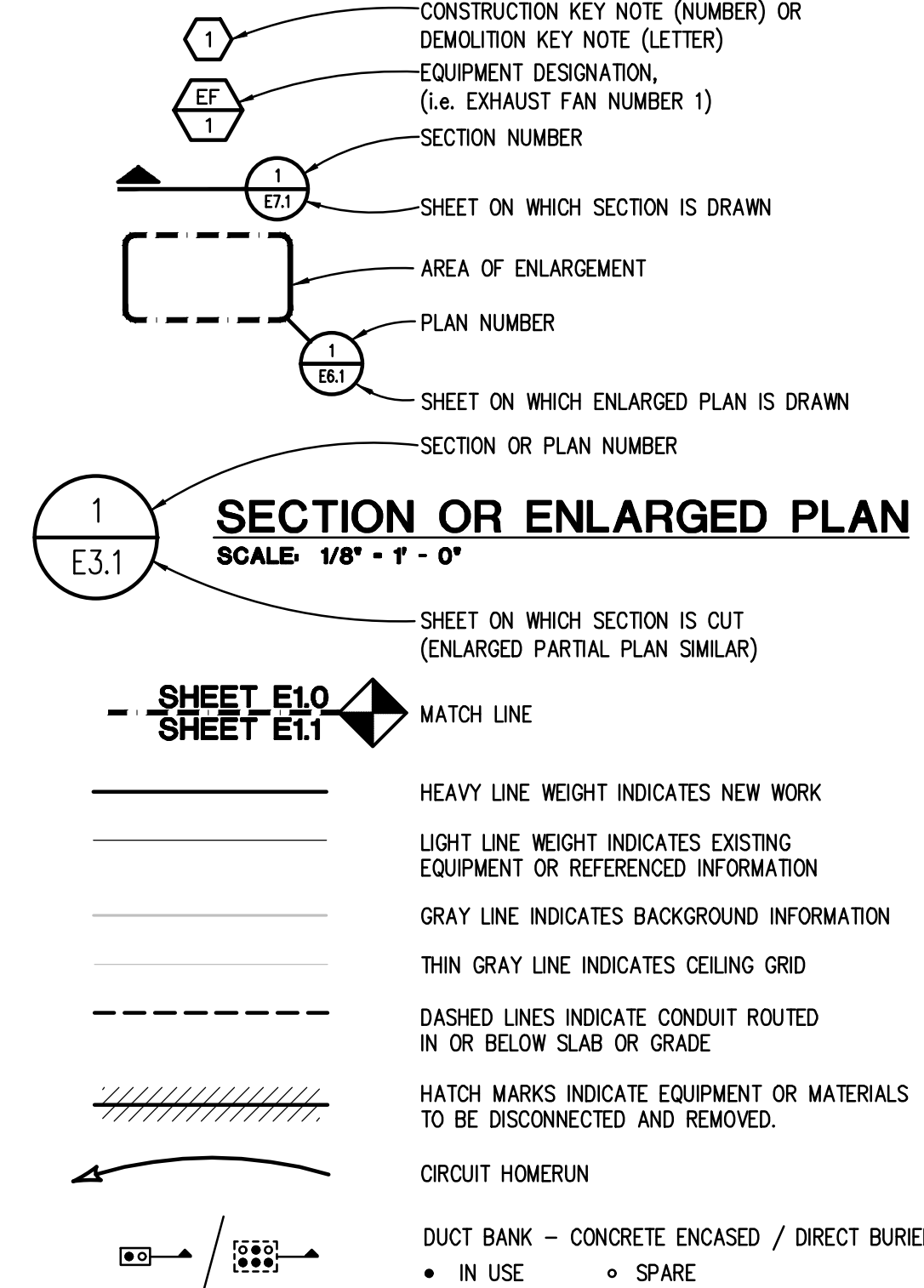
ELECTRICAL ABBREVIATION LIST

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
A	AMPERES	KV	KILOVOLT	P	POLE
AF	AMPERES FRAME (BREAKER RATING)	KVA	KILOVOLT - AMPERES	PB	PUSHBUTTON STATION
AFCI	ARC FAULT CIRCUIT INTERRUPTER	KW	KILOWATT	PH	PHASE
A.F.F.	ABOVE FINISH FLOOR	KWH	KILOWATT - HOURS	PT	POTENTIAL TRANSFORMER
AIC	AMPS INTERRUPTING CAPACITY	LA	LIGHTNING ARRESTOR	PDP	POWER DISTRIBUTION PANEL
AL	AUDIENCE LEFT	LP	LIGHTING PANEL	RECEPT.	RECEPTACLE
AR	AUDIENCE RIGHT	LDP	LIGHTING DISTRIBUTION PANEL	RDP	RECEPTACLE DISTRIBUTION PANEL
AT	AMPERES TRIP (BREAKER SETTING)	MAX	MAXIMUM	RP	RECEPTACLE PANEL
ATS	AUTOMATIC TRANSFER SWITCH	MCB	MAIN CIRCUIT BREAKER	RSC	RIGID STEEL CONDUIT
AUX	AUXILIARY	MCC	MOTOR CONTROL CENTER	SCHED	SCHEDULE
BKR	BREAKER	MDP	MAIN DISTRIBUTION PANEL	SW	SWITCH
BPS	BOLTED PRESSURE SWITCH	MECH	MECHANICAL	SWBD	SWITCHBOARD
C	CONDUIT	MIN	MINIMUM	SWGR	SWITCHGEAR
CB	CIRCUIT BREAKER	MISC.	MISCELLANEOUS	TB	TERMINAL BOX
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	MLO	MAIN LUGS ONLY	TELECOM	TELECOMMUNICATIONS
CKT	CIRCUIT	MOUNTD	MOUNTING	TR	TAMPER RESISTANT
CT	CURRENT TRANSFORMER	MTR	MOTOR	TBT	TELEPHONE TERMINAL BACKBOARD
DEMO	DEMOLITION	N	NEUTRAL	TYP	TYPICAL
DM	DIMENSION	NC	NORMALLY CLOSED	U.O.N.	UNLESS OTHERWISE NOTED
DISC	DISCONNECT	NEC	NATIONAL ELECTRICAL CODE	US	UPSTAGE
DP	DISTRIBUTION PANEL	NF	NON-FUSIBLE	V	VOLTS
DS	DOWNSTAGE	NIC	NOT IN CONTRACT	W	WIRE OR WATTS
DWG	DRAWING	NL	NIGHT LIGHT	WG	WIRE GUARD
EBU	EMERGENCY BATTERY UNIT	NO	NORMALLY OPEN	WP	WEATHERPROOF
EC	ELECTRICAL CONTRACTOR	NTS	NOT TO SCALE	XFMR	TRANSFORMER
ELEC	ELECTRICAL	OC	ON CENTER	XP	EXPLOSION PROOF
EM/ EMERG	EMERGENCY	OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED	(E)	EXISTING
EMT	ELECTRICAL METALLIC TUBING	OFI	OWNER FURNISHED, OWNER INSTALLED	(R)	RELOCATED
EO	ELECTRICALLY OPERATED				
EPO	EMERGENCY POWER OFF				
EWG	ELECTRIC WATER COOLER				
EXIST	EXISTING				
FA	FIRE ALARM				
FLA	FULL LOAD AMPS				
FLR	FLOOR				
FOH	FRONT OF HOUSE				
FSEC	FOOD SERVICE EQUIPMENT CONTRACTOR				
FU	FUSE				
G/GRD/EG	GROUND				
GFCI	GROUND FAULT CIRCUIT INTERRUPTER				
GFP	GROUND FAULT PROTECTION				
HOA	HAND-OFF-AUTO				
HP	HORSEPOWER				
HV	HIGH VOLTAGE				
HZ	HERTZ				
IG	ISOLATED GROUND				
JB	JUNCTION BOX				

STANDARD MOUNTING HEIGHTS

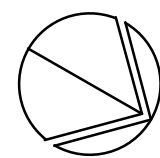
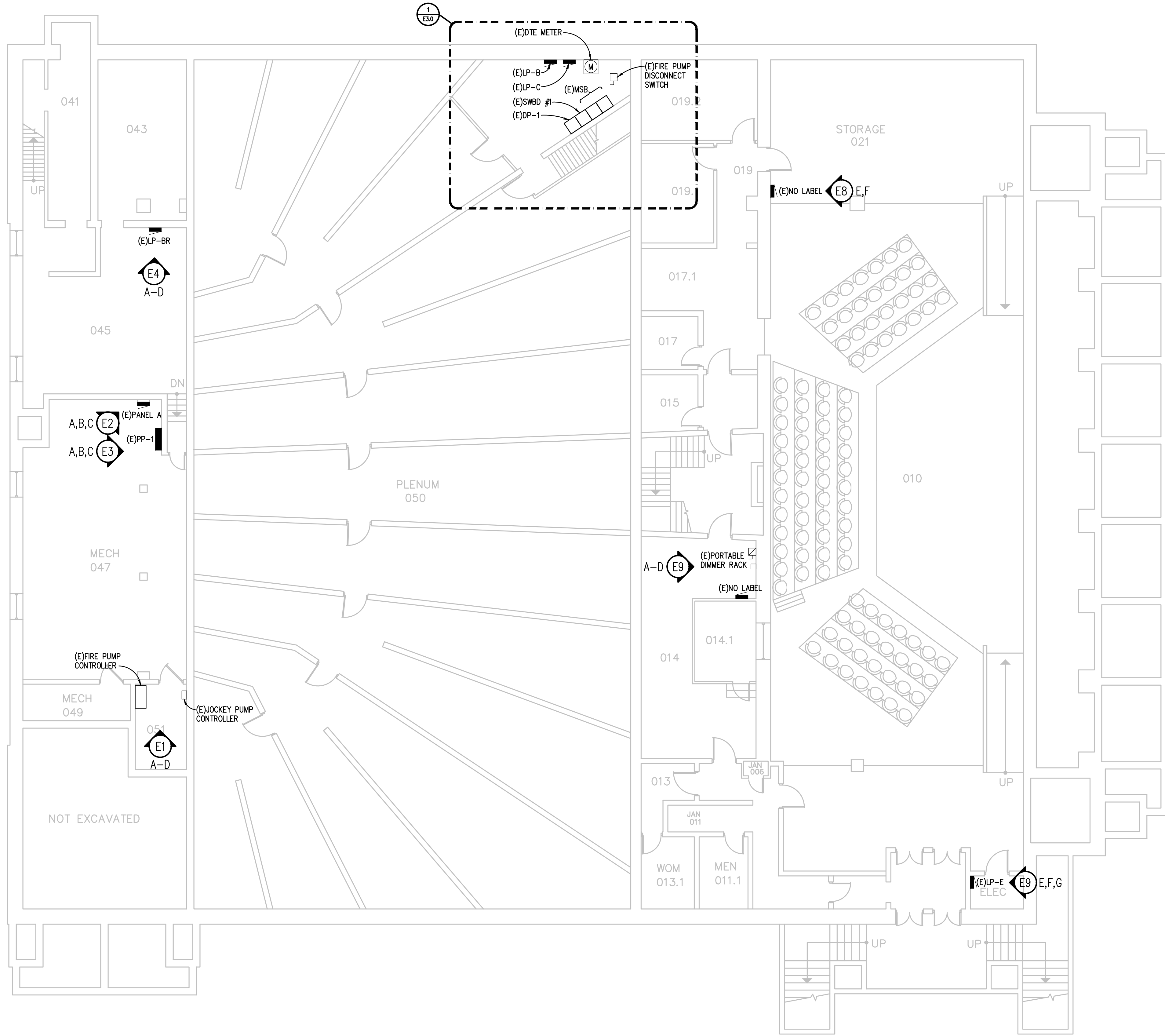
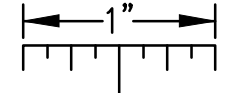


STANDARD METHODS OF NOTATION



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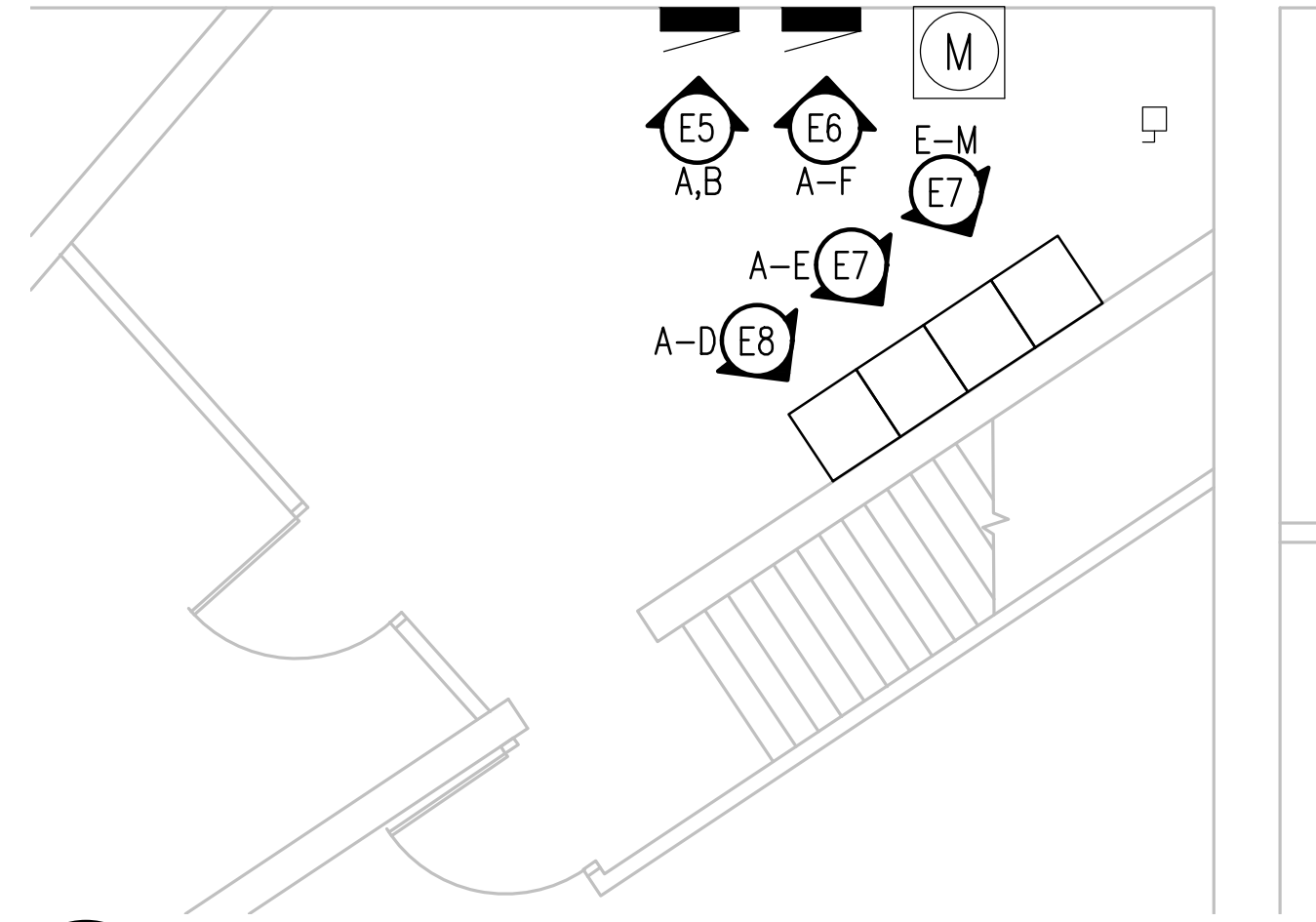
### BASEMENT POWER PLAN AND PHOTO LOCATIONS

SCALE: 1/8" = 1' - 0"

1  
E3.0

### ENLARGED BASEMENT PHOTO LOCATION

SCALE: 1/8" = 1' - 0"



Not For Construction

SHEET TITLE  
BASEMENT POWER PLAN AND  
PHOTO LOCATIONS

DATE  
01/17/19

ISSUE  
RETRO-  
COMMISSIONING

SHEET No.

E3.0

PROJECT TITLE  
WAYNE STATE UNIVERSITY  
HILBERRY THEATRE

WSU PROJECT NO.

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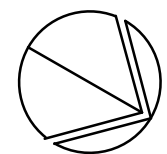
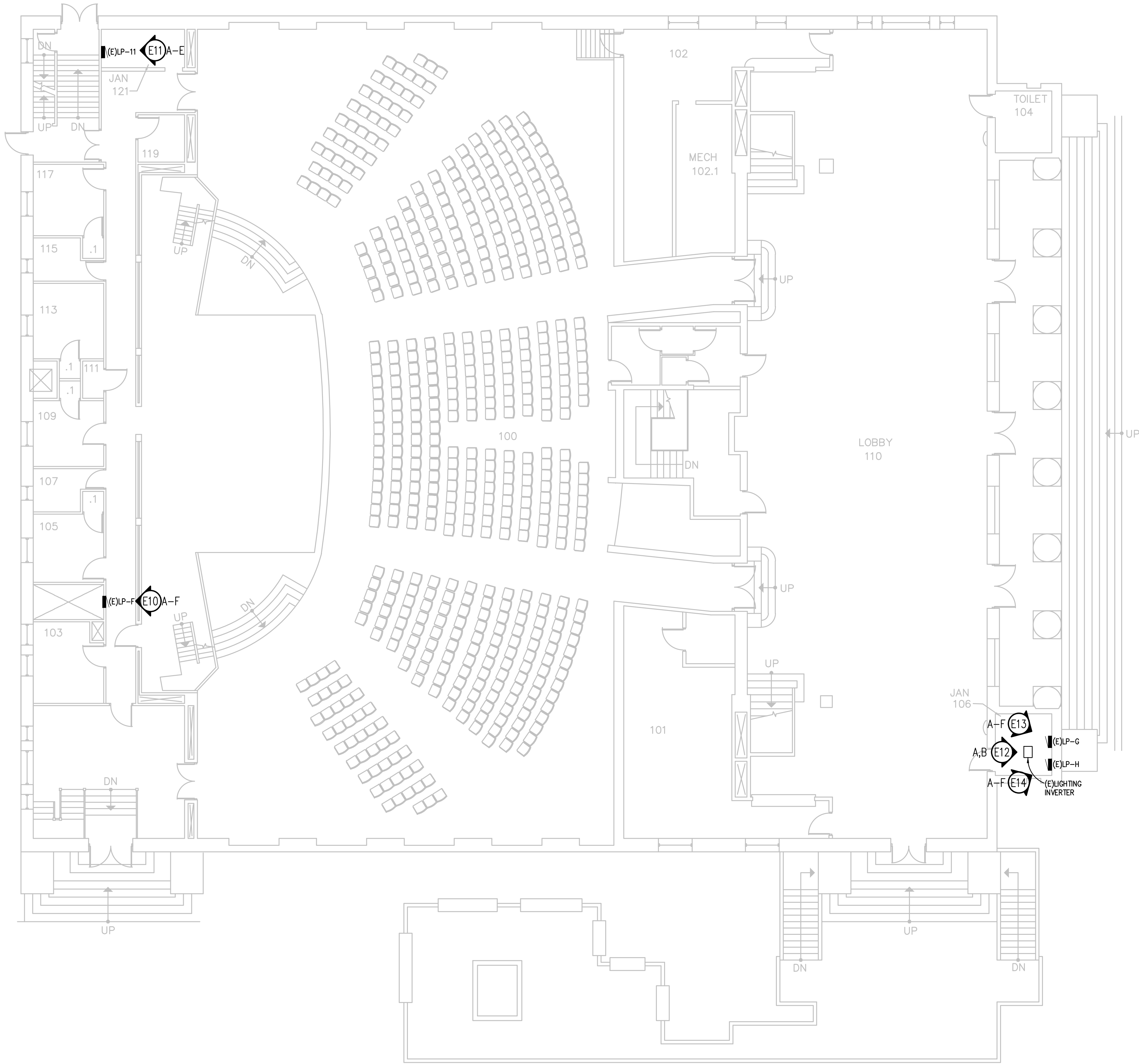
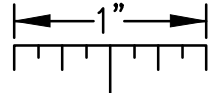
5345 Livernois, Suite 100  
Troy, Michigan 48068-3276  
Tel: 248-879-5666 Fax: 248-879-0007  
www.PeterBassoAssociates.com  
PBA Project No. 2018.0465 PH1

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THE FOLLOWING DIMENSION EQUALS  
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**FIRST FLOOR POWER PLAN AND PHOTO LOCATIONS**

SCALE: 1/8" = 1' - 0"

Not For Construction

SHEET TITLE

FIRST FLOOR POWER PLAN  
AND PHOTO LOCATIONS

DATE

01/17/19

ISSUE

RETRO-  
COMMISSIONING

SHEET No.

**E3.1**

PROJECT TITLE

WAYNE STATE UNIVERSITY  
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WSU PROJECT NO.



Peter Basso Associates Inc.  
CONSULTING ENGINEERS

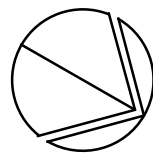
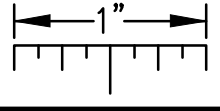
5345 Livernois, Suite 100  
Troy, Michigan 48068-3276  
Tel: 248-875-5666 Fax: 248-875-0007  
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PBA Project No. 2018.0465 PH1

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THE FOLLOWING DIMENSION EQUALS  
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**SECOND FLOOR POWER PLAN AND PHOTO LOCATIONS**

SCALE: 1/8" = 1' - 0"

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SHEET TITLE  
**SECOND FLOOR POWER PLAN  
AND PHOTO LOCATIONS**

DATE  
01/17/19

ISSUE  
RETRO-  
COMMISSIONING

SHEET No.

**E3.2**

PROJECT TITLE  
**WAYNE STATE UNIVERSITY  
HILBERRY THEATRE**

WSU PROJECT NO.

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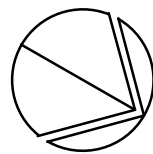
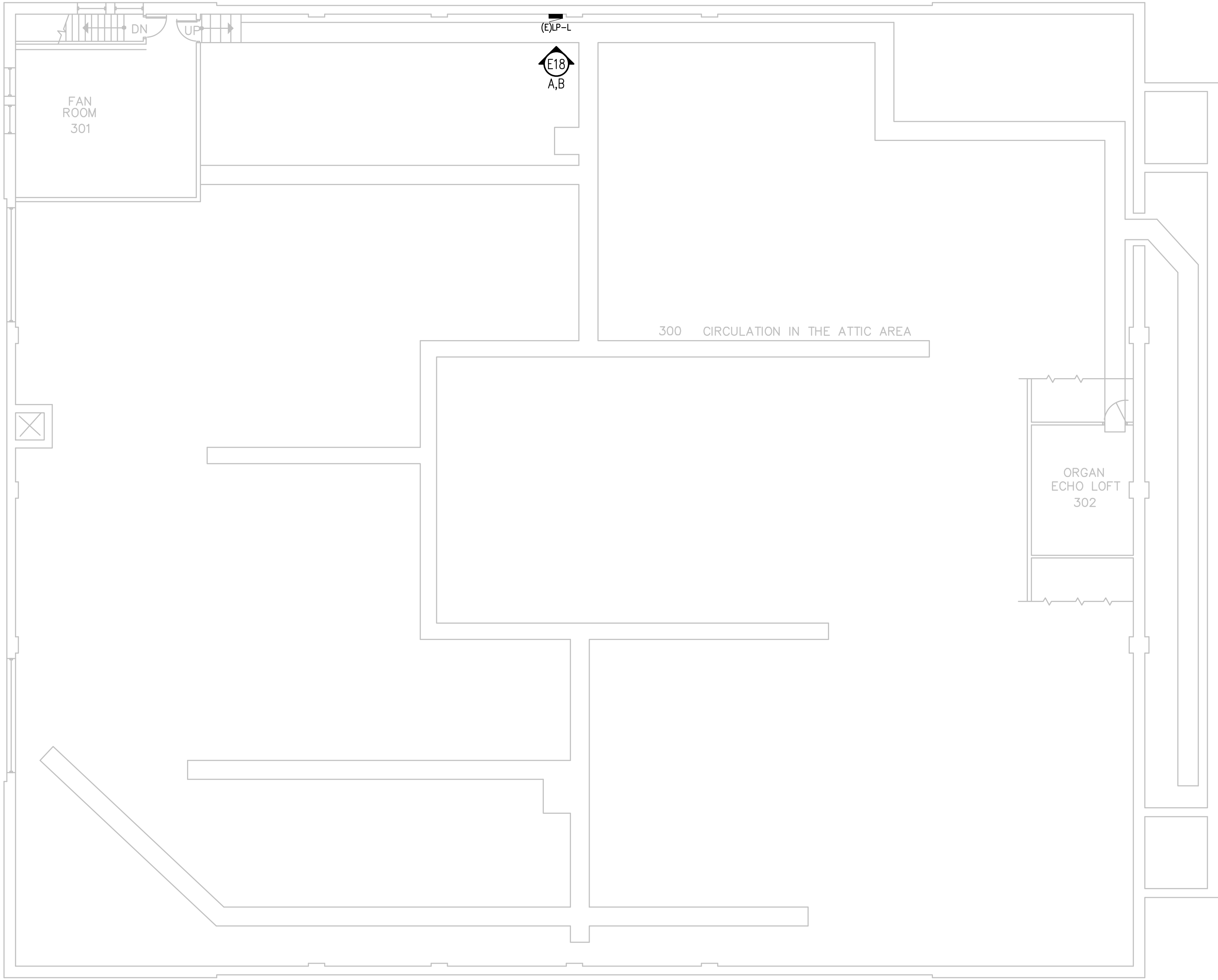
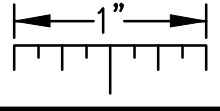
5145 Livernois, Suite 100  
Troy, Michigan 48068-3276  
Tel: 248-875-5666 Fax: 248-875-0007  
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PBA Project No. 2018.0465 PH1

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THE FOLLOWING DIMENSION EQUALS  
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**THIRD FLOOR POWER PLAN AND PHOTO LOCATIONS**

SCALE: 1/8" = 1' - 0"

Not For Construction

SHEET TITLE

THIRD FLOOR POWER PLAN  
AND PHOTO LOCATIONS

DATE

01/17/19

ISSUE

RETRO-  
COMMISSIONING

SHEET No.

**E3.3**

PROJECT TITLE

WAYNE STATE UNIVERSITY  
HILBERRY THEATRE

WSU PROJECT NO.



**Peter Basso Associates Inc**  
CONSULTING ENGINEERS

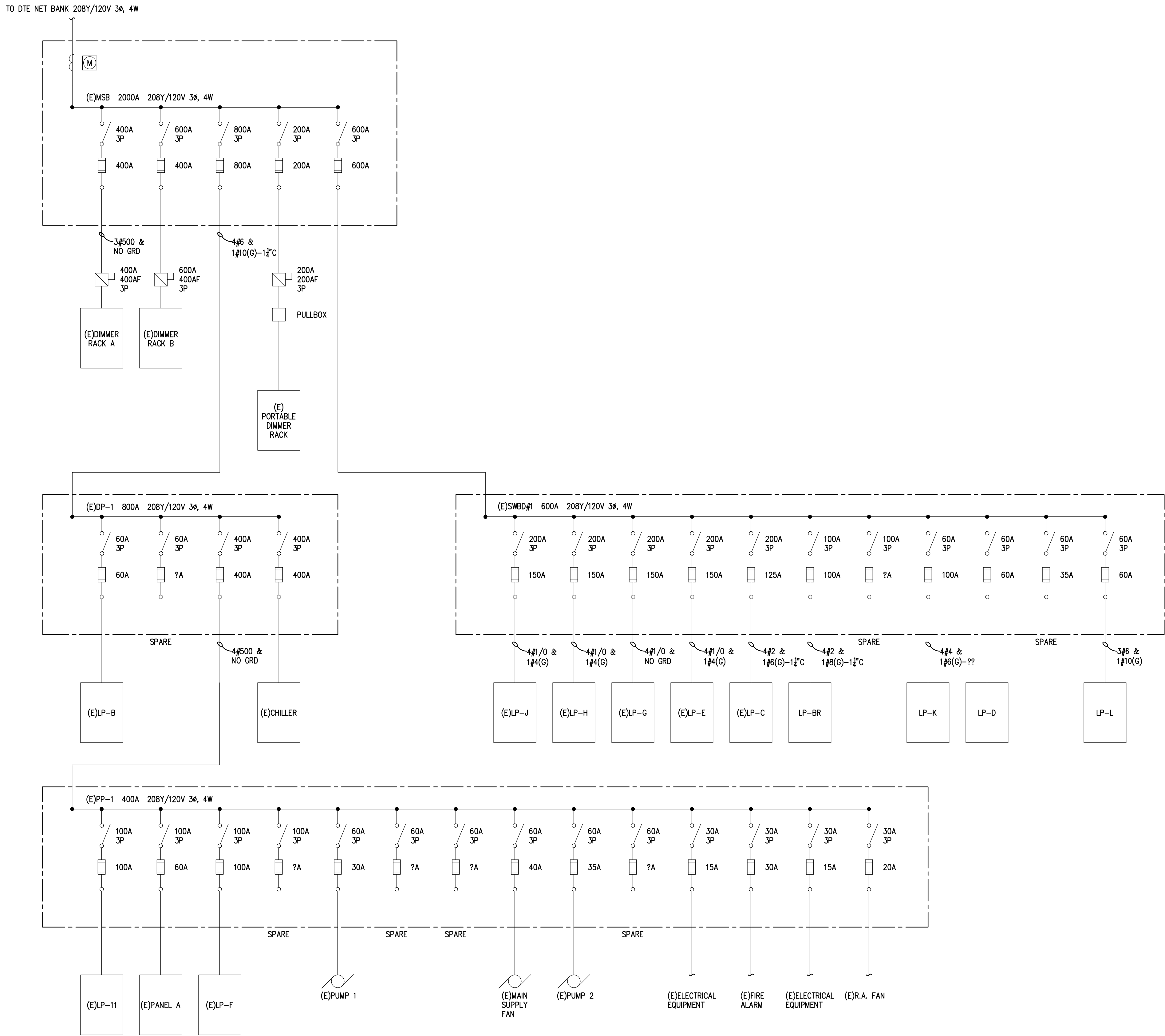
5345 Livernois, Suite 100  
Troy, Michigan 48068-3276  
Tel: 248-875-5666 Fax: 248-875-0077  
www.PeterBassoAssociates.com  
PBA Project No. 2018.0465 PH1

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## **7. APPENDIX**

### **7.1 - Thermographic Inspection**

### **7.2 - Mechanical Photos**

### **7.3 - Electrical Photos**

## **7.1 - Thermographic Inspection**

January 11, 2019

Brian Perttunen  
Edgewood Electric, LLC  
3633 Michigan Ave.; Suite 1  
Detroit, MI 48216

Dear Mr. Perttunen,

**Subject: Thermographic Inspection – Hillberry Theater WSU**

On January 8, 2019 POWER PLUS Engineering, Inc. personnel performed thermographic inspection throughout your Hillberry Theater facility in Detroit, Michigan.

Throughout testing, multiple deficiencies were identified. These deficiencies are outlined below. See the attached reports for further details.

<u>Equipment ID</u>	<u>Remarks/Recommendations</u>
<b>Main Elec. Rm. – LP-C Panel</b>	<b>Merc 30A breaker is overheating. The load was checked and found acceptable. Cables were found loose and tightened. Equipment continued to overheat. Recommend replacing the breaker.</b>
<b>Second Floor – LP-J Panel</b>	<b>SR stage works breaker is overheating. Recommend checking connections and replacing breaker if necessary.</b>
<b>Second Floor – LP-F Panel</b>	<b>Circuits #24 &amp; #28 are overheating. Recommend checking the connections and replacing equipment if necessary.</b>
<b>Boiler Room Panle LP-BR</b>	<b>Supply Fan Breaker Circuits #25, #27, and #29 are overheating. Recommend checking connections and replacing equipment if necessary.</b>
<b>Portable Dimmer Rack</b>	<b>AØ fuse clip and disconnect are overheating. Recommend checking connections and replacing equipment if necessary.</b>

**The price to repair these issues can be priced and performed upon customer request.**

All remaining equipment passed testing per NETA specifications. See the attached summary for further details.

If you have any questions regarding this report please feel free to contact me at (248) 344-0200 or on my cell (248) 563-7334.

Sincerely,

**POWER PLUS Engineering, Inc.**

Sam Mancuso

Engineering Manager

## THERMOGRAPHIC SUMMARY

<b>CUSTOMER</b>	Edgewood Electric	<b>DATE</b>	1/8/2019
<b>LOCATION</b>	Hillberry Theater	<b>INSPECTOR</b>	J.S.L.
<b>JOB NUMBER</b>	82-0910	<b>ASSISTANT</b>	A.D.

EQUIPMENT ID	PROBLEMS FOUND
DP-1 (3 Buckets, 1 Spare)	None
SWBD #1 (11 Buckets)	None
M-SWBD	None
LP-C Panel	Yes, See IR Report #1
LP-B Panel	None
400 Amp Square D Disc.	None
LP-H Panel	None
Unmarked Panel Next To LP-H	None
LP-K Panel	None
LP-J Panel	Yes, See IR Report #2
Disc. Rack A	None
Disc. Rack B	None
LP-11 Panel	None
LP-F Panel	Yes, See IR Report #3

**COMMENTS**

**THERMOGRAPHIC SUMMARY**

<b>CUSTOMER</b>	Edgewood Electric	<b>DATE</b>	1/8/2019
<b>LOCATION</b>	Hillberry Theater	<b>INSPECTOR</b>	J.S.L.
<b>JOB NUMBER</b>	82-0910	<b>ASSISTANT</b>	A.D.

EQUIPMENT ID	PROBLEMS FOUND
LP-L Panel	None
LP-BR Panel	Yes, See IR Report #4
Panel A	None
QMB Distribution Panel	None
Basement Unmarked Panel	None
LP-E Panel	None
200 Amp Disc. for Lighting	Yes, See IR Report #5

**COMMENTS** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## THERMOGRAPHIC REPORT

<b>CUSTOMER NAME:</b>	Edgewood Electric	<b>LOCATION:</b>	Main Elec. Rm.
<b>SITE NAME:</b>	Hillberry Theater	<b>EQUIPMENT ID:</b>	LP-C Panel
<b>CITY, STATE &amp; ZIP:</b>	Detroit, MI 48202	<b>SEVERITY:</b>	Intermediate



IR000005.IS2



Visible Light Image

### Main Image Markers

Name	Temperature	Emissivity
Hot	41.1°C	0.95
P0	31.0°C	0.95
P1	29.5°C	0.95
P2	39.7°C	0.95

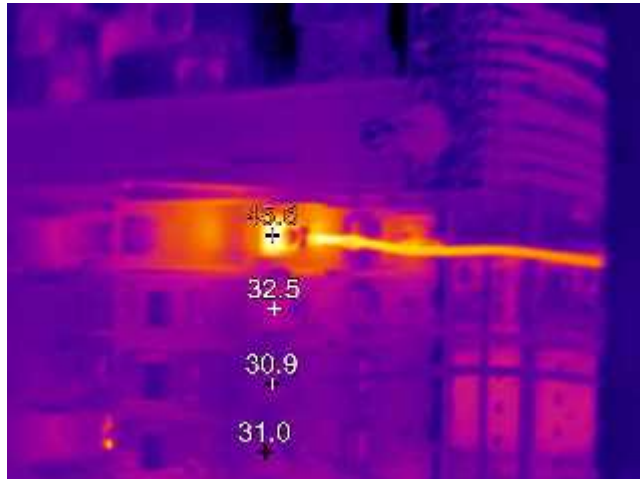
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File name	IR000005.IS2
Emissivity	0.95
Image Range	25.3°C to 41.1°C
Camera Model	Fluke Ti32
IR Sensor Size	320 x 240

<b>PROBLEM:</b>	Merc 30A breaker is overheating.
<b>RECOMMENDATION:</b>	Replace breaker.
<b>INSPECTOR:</b>	J.S.L.
<b>ASSISTANT:</b>	A.D.
<b>CORRECTIVE ACTION TAKEN:</b>	Checked load and it was acceptable. Cables were loose. These were tightened and equipment continued to overheat.

## THERMOGRAPHIC REPORT

<b>CUSTOMER NAME:</b>	Edgewood Electric	<b>LOCATION:</b>	Second Floor
<b>SITE NAME:</b>	Hillberry Theater	<b>EQUIPMENT ID:</b>	LP-J Panel
<b>CITY, STATE &amp; ZIP:</b>	Detroit, MI 48202	<b>SEVERITY:</b>	Intermediate



IR000006.IS2



Visible Light Image

### Main Image Markers

Name	Temperature	Emissivity
Hot	45.6°C	0.95
P0	32.5°C	0.95
P1	30.9°C	0.95
P2	31.0°C	0.95

### Image Info

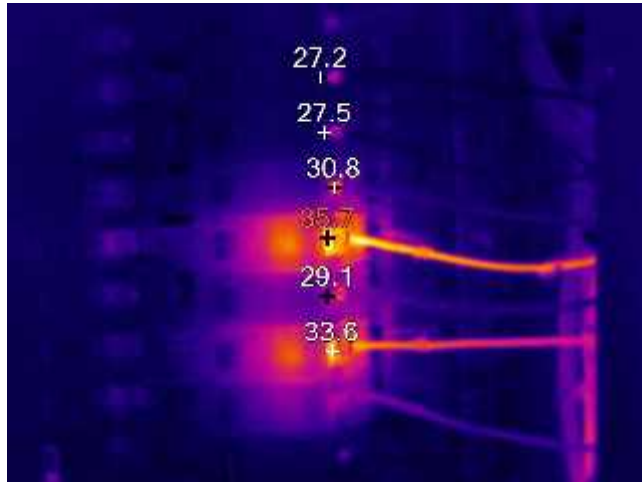
File name	IR000006.IS2
Emissivity	0.95
Image Range	26.2°C to 45.6°C
Camera Model	Fluke Ti32
IR Sensor Size	320 x 240

<b>PROBLEM:</b>	SR stage works breaker is overheating.
<b>RECOMMENDATION:</b>	Check connections and replace equipment if necessary.
<b>INSPECTOR:</b>	J.S.L.
<b>ASSISTANT:</b>	A.D.
<b>CORRECTIVE ACTION TAKEN:</b>	N/A



## THERMOGRAPHIC REPORT

<b>CUSTOMER NAME:</b>	Edgewood Electric	<b>LOCATION:</b>	Second Floor
<b>SITE NAME:</b>	Hillberry Theater	<b>EQUIPMENT ID:</b>	LP-F Ckt. #24 & #28
<b>CITY, STATE &amp; ZIP:</b>	Detroit, MI 48202	<b>SEVERITY:</b>	Minor



IR000007.IS2



Visible Light Image

### Main Image Markers

Name	Temperature	Emissivity
Hot	35.7°C	0.95
P0	33.6°C	0.95
P1	29.1°C	0.95
P2	30.8°C	0.95
P3	27.5°C	0.95
P4	27.2°C	0.95

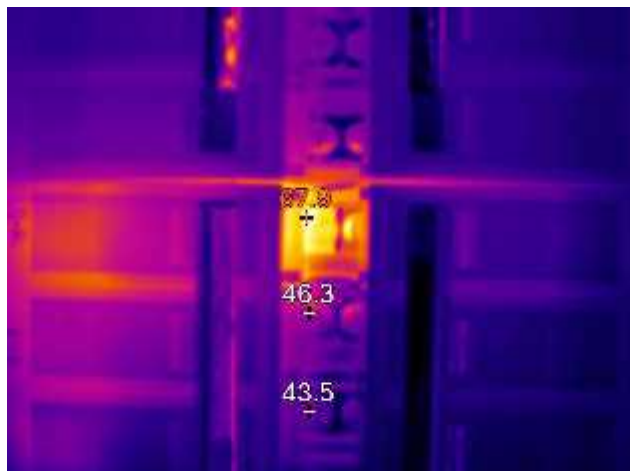
### Image Info

File name	IR000007.IS2
Emissivity	0.95
Image Range	26.5°C to 35.7°C
Camera Model	Fluke Ti32
IR Sensor Size	320 x 240

<b>PROBLEM:</b>	Circuit #24 and #28 are overheating.
<b>RECOMMENDATION:</b>	Check connections and replace breaker if necessary.
<b>INSPECTOR:</b>	J.S.L.
<b>ASSISTANT:</b>	A.D.
<b>CORRECTIVE ACTION TAKEN:</b>	N/A

## THERMOGRAPHIC REPORT

<b>CUSTOMER NAME:</b>	Edgewood Electric	<b>LOCATION:</b>	Boiler Room Panel LP-BR
<b>SITE NAME:</b>	Hillberry Theater	<b>EQUIPMENT ID:</b>	Supply Fan Bkr. Ckt. 25, 27, 29
<b>CITY, STATE &amp; ZIP:</b>	Detroit, MI 48202	<b>SEVERITY:</b>	Intermediate



IR000008.IS2



Visible Light Image

### Main Image Markers

Name	Temperature	Emissivity
Hot	67.9°C	0.95
P0	46.3°C	0.95
P1	43.5°C	0.95

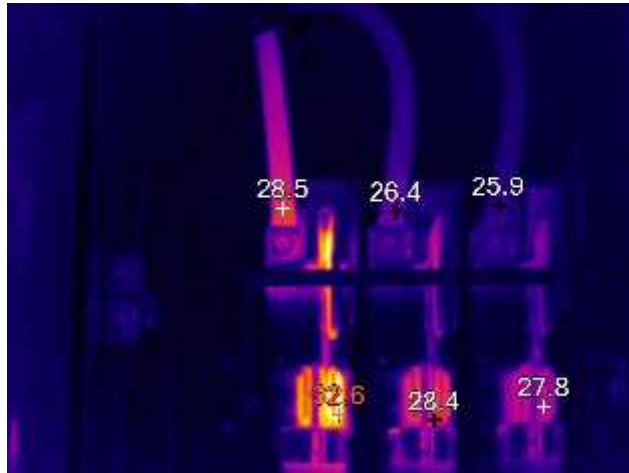
### Image Info

File name	IR000008.IS2
Emissivity	0.95
Image Range	37.6°C to 67.9°C
Camera Model	Fluke Ti32
IR Sensor Size	320 x 240

<b>PROBLEM:</b>	Bolt on buss is overheating.
<b>RECOMMENDATION:</b>	Check connections and replace equipment if necessary.
<b>INSPECTOR:</b>	J.S.L.
<b>ASSISTANT:</b>	A.D.
<b>CORRECTIVE ACTION TAKEN:</b>	N/A

## THERMOGRAPHIC REPORT

<b>CUSTOMER NAME:</b>	Edgewood Electric	<b>LOCATION:</b>	Portable Dimmer Rack
<b>SITE NAME:</b>	Hillberry Theater	<b>EQUIPMENT ID:</b>	Potable Dimmer Rack
<b>CITY, STATE &amp; ZIP:</b>	Detroit, MI 48202	<b>SEVERITY:</b>	Minor



IR000009.IS2



Visible Light Image

### Main Image Markers

Name	Temperature	Emissivity
Hot	32.6°C	0.95
P0	28.4°C	0.95
P1	27.8°C	0.95
P2	28.5°C	0.95
P3	26.4°C	0.95
P4	25.9°C	0.95

### Image Info

File name	IR000009.IS2
Emissivity	0.95
Image Range	24.9°C to 32.6°C
Camera Model	Fluke Ti32
IR Sensor Size	320 x 240

<b>PROBLEM:</b>	AØ fuse clip and disconnect is overheating.
<b>RECOMMENDATION:</b>	Check connections and replace equipment if necessary.
<b>INSPECTOR:</b>	J.S.L.
<b>ASSISTANT:</b>	A.D.
<b>CORRECTIVE ACTION TAKEN:</b>	Load checked and is acceptable. (65 nom Amps)

## **7.2 – Mechanical Photos**

## Appendix 7.2. Mechanical Photos



001 Boilers B-1 to 3



003 Boiler Control Panel



002 Domestic Water Heater WH-1 and 2



004 Combustion Air Unit



## Appendix 7.2 – Mechanical Photos



005 Boiler Feedwater Unit



006 Chiller Heat Exchanger



007 Chilled Water Pumps P-1 and 2



008 Steam Condensate Receiver



## Appendix 7.2. Mechanical Photos



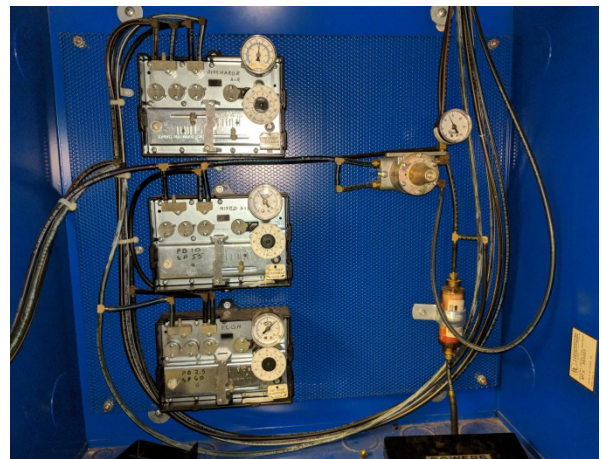
009 Condensate Transfer Tank



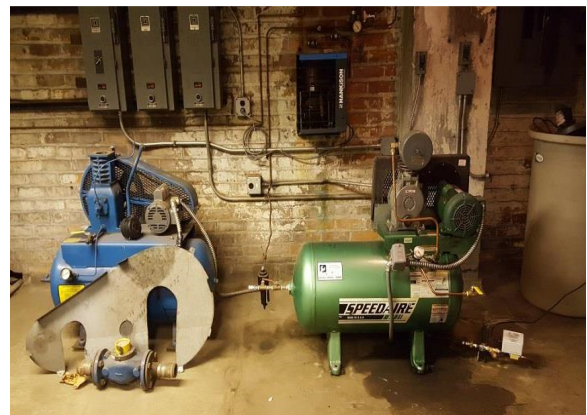
011 Pneumatic Control Panel



010 Chilled Water Tank



011A - TC-2.2 - 2.3 - 2.4 AHU-2 Control Panel



012 Pneumatic Control Air Compressor



## Appendix 7.2. Mechanical Photos



012A - TC-2.1 AHU-2 EP Switch



012B - TC-2.7 Chilled Water Temperature Sensor



012C - HVAC-2.14 Return Fan Disconnect



013A AHU-002 Filter Section



013B AHU-002 Fan Coil Section



013C AHU-002 Fan Coil Section



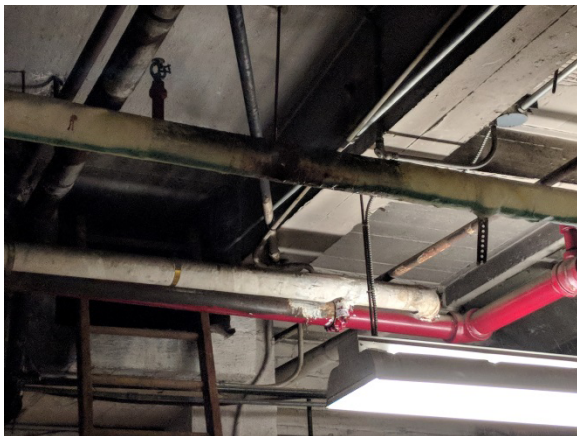
## Appendix 7.2. Mechanical Photos



013D - HVAC-2.12 AHU-2 Supply Fan



014 AHU-002 Damper Controls



014A HTG-1.1 Steam Pipe Leak



014B HTG-1.1 Steam Pipe Leak



015 AHU-003 Return Fan

## Appendix 7.2 – Mechanical Photos



016 Fire Pump and Jockey Pump



017 Abandoned Fan



018 Return Air Plenum



019 Abandoned Unit Heater



## Appendix 7.2 – Mechanical Photos



020 Sump Pump 1



021 Sump Pump 2



022 Sump Pump 3 Controller



023 Chiller Air Cooled Condenser

## Appendix 7.2 – Mechanical Photos



024 Radiator



025 Radiator



026 Radiator



027 FCU-1



## Appendix 7.2 – Mechanical Photos



028A AHU-001



028A - TC-1.1 AHU-1 Return Air



028B - TC-1.2 AHU-1 Bypass Damper Control



028C - TC-1.3 AHU-1 Heating Coil Control



028D - HVAC-1.4 AHU-1 Drain Pan



028E - HVAC-1.8 AHU-1 Heating Coil



## Appendix 7.2 – Mechanical Photos



028F - HVAC-1.9 AHU-1 Leaking HC Isolation Valve



029 Radiator



030 Radiator



031 Radiator



032 Radiator



033 Radiator

## Appendix 7.2 – Mechanical Photos



034 Radiator



035 Radiator



036 Radiator



037 Radiator



038 FC-2



038A - FC-2.2 FC-2.3 - FC-2 Fan



## Appendix 7.2 – Mechanical Photos



039 Radiator



040 Radiator



041 Radiator



042 Radiator



043 Exhaust Fan-4



044 Radiator



## Appendix 7.2 – Mechanical Photos



045 Radiator



046 Abandoned Exp Tank



047 Radiator



048 Exhaust Fan-3



049 Radiator



050 Radiator

## Appendix 7.2 – Mechanical Photos



051 Radiator



052 Radiator Recessed



053 Radiator



054 Radiator



055 AC-2



056 Radiator



## Appendix 7.2 – Mechanical Photos



057 Radiator



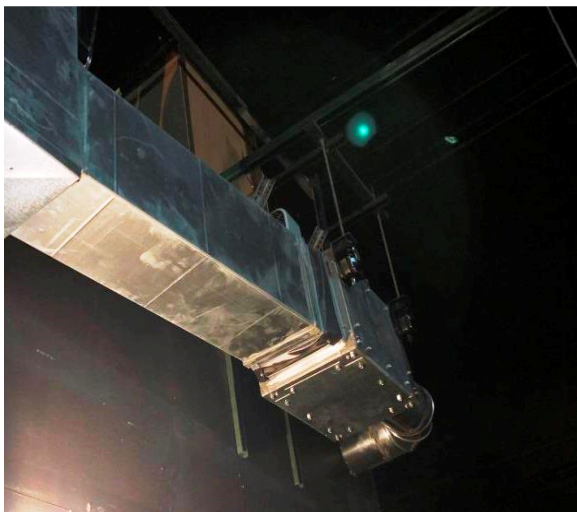
058 Radiator



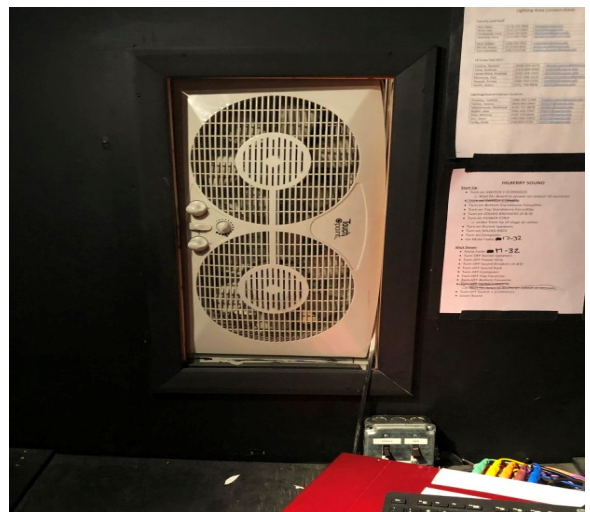
059 Radiator



060A Light Boot Fan

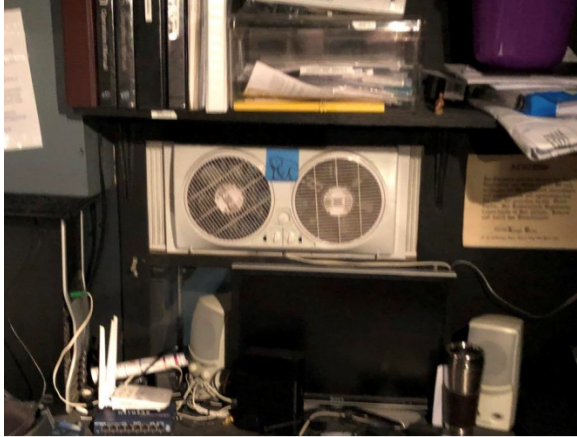


060B Light Boot Fan



060C Light Boot Fan

## Appendix 7.2 – Mechanical Photos



060D Light Boot Fan



061 Radiator



062 Radiator



063 Radiator



064A Radiator



064B Radiator



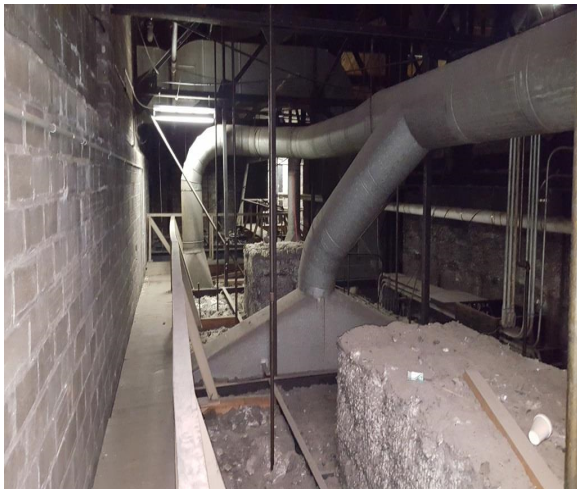
## Appendix 7.2 – Mechanical Photos



065 Abandoned Exhaust Fan



066 Abandoned Exhaust Fan



067 Exhaust Duct Level 3



068 Radiator



069 Relief Hood - Roof

## **7.3 – Electrical Photos**

## Appendix 7.3 – Electrical Photos



E1A Fire and Jockey Pump



E1B Fire and Jockey Pump



E1C Fire and Jockey Pump



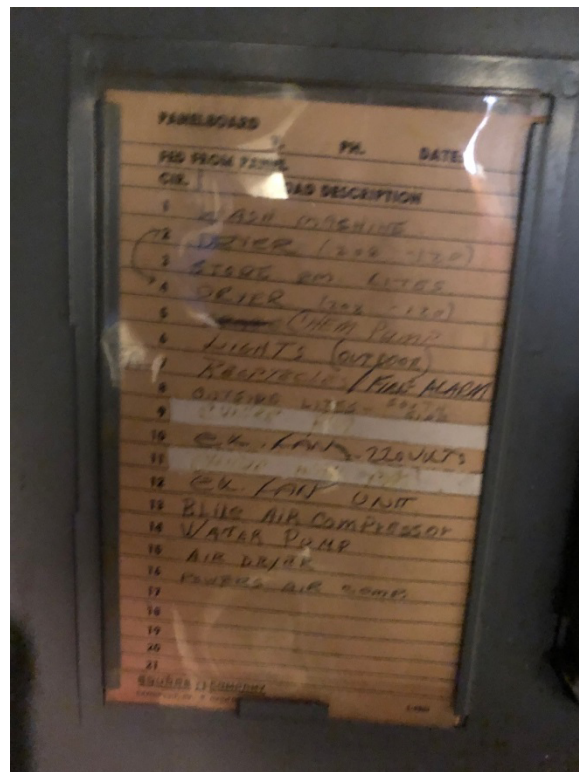
E1D Fire and Jockey Pump



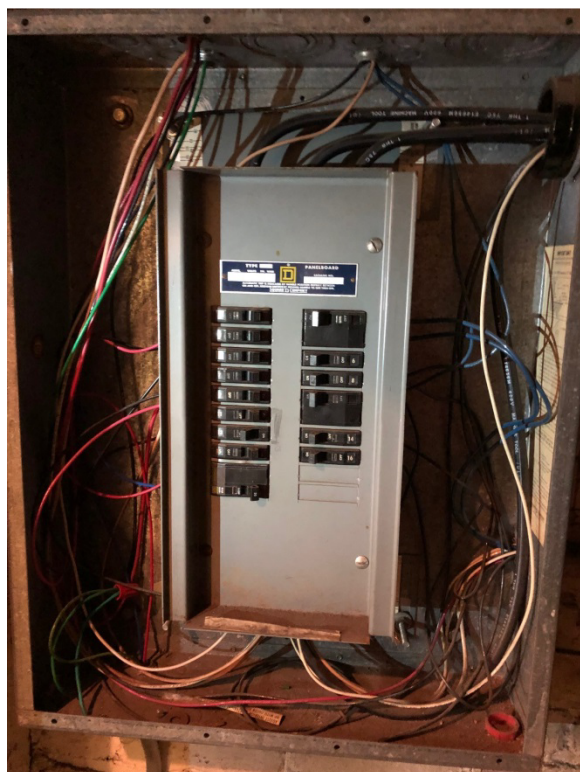
## Appendix 7.3 – Electrical Photos



E2A Panel A



E2B Panel A



E2C Panel A



E3A PP



## Appendix 7.3 – Electrical Photos



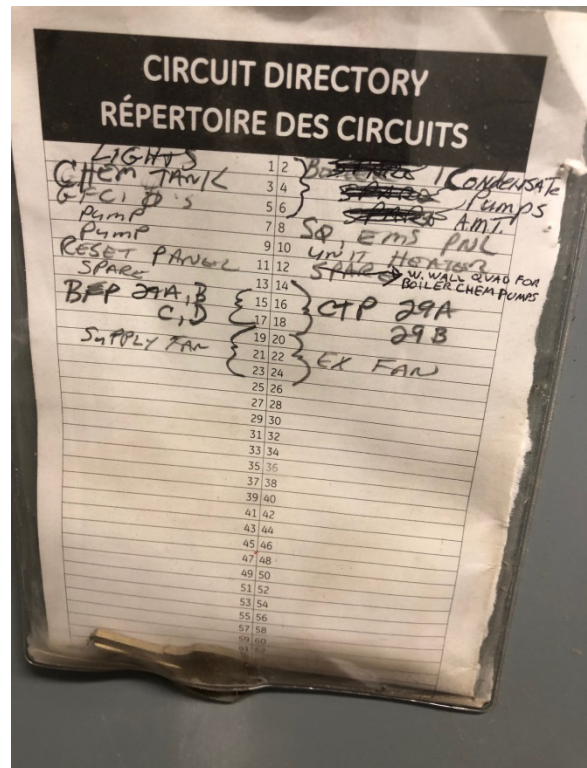
E3B PP



E3C PP



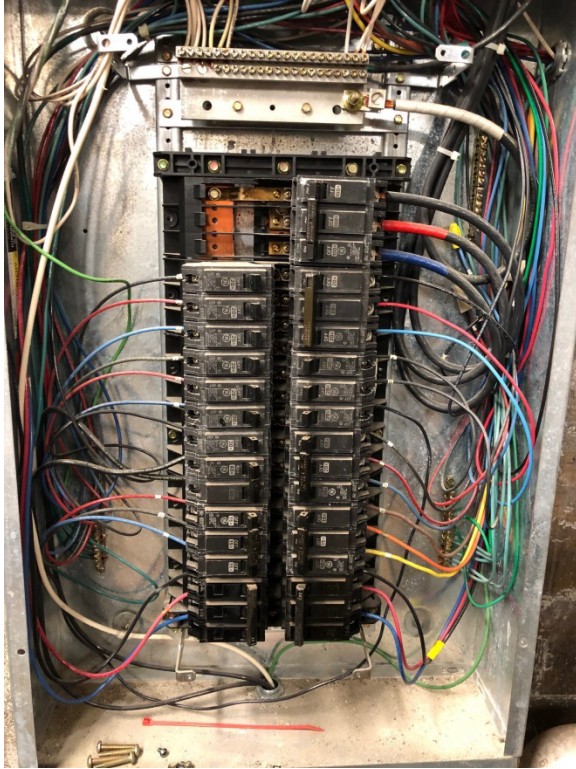
E4A LP-BR



E4B LP-BR



## Appendix 7.3 – Electrical Photos



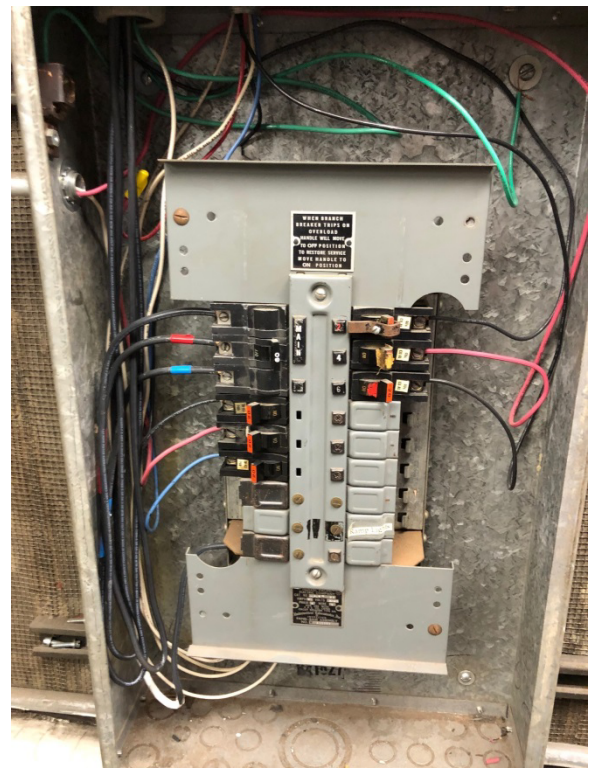
E4C LP-BR



E4D LP-BR



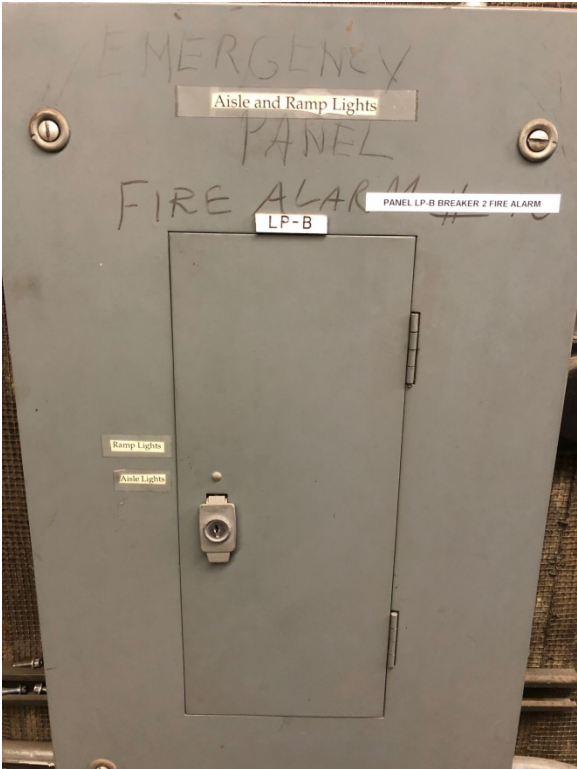
E5A LP-B



E5B LP-B



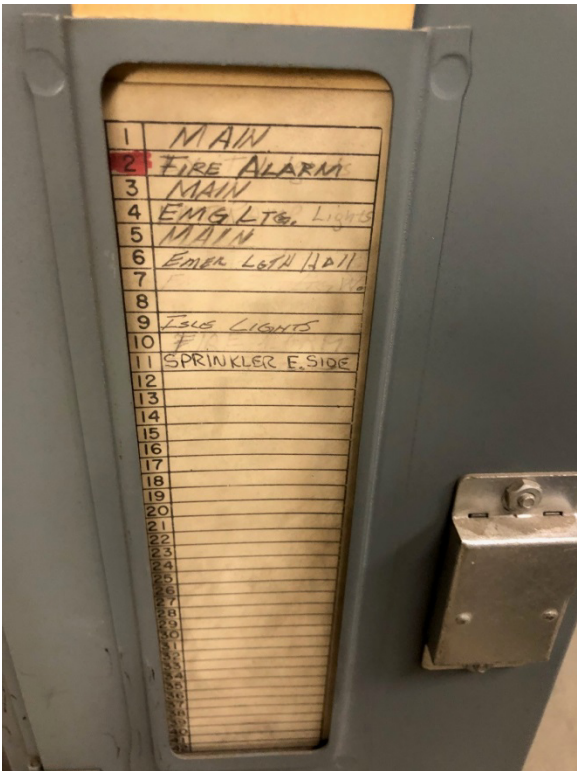
Appendix 7.3 – Electrical Photos



E6A LP-C



E6B LP-C

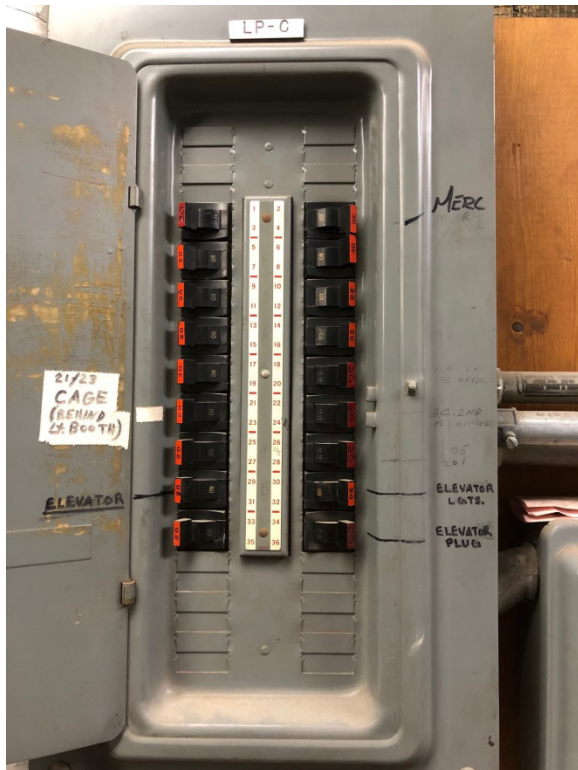


E6C LP-C

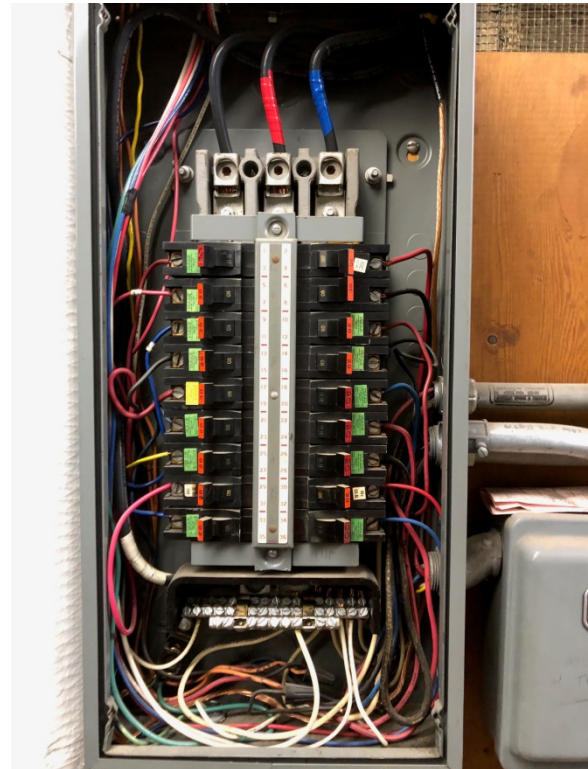


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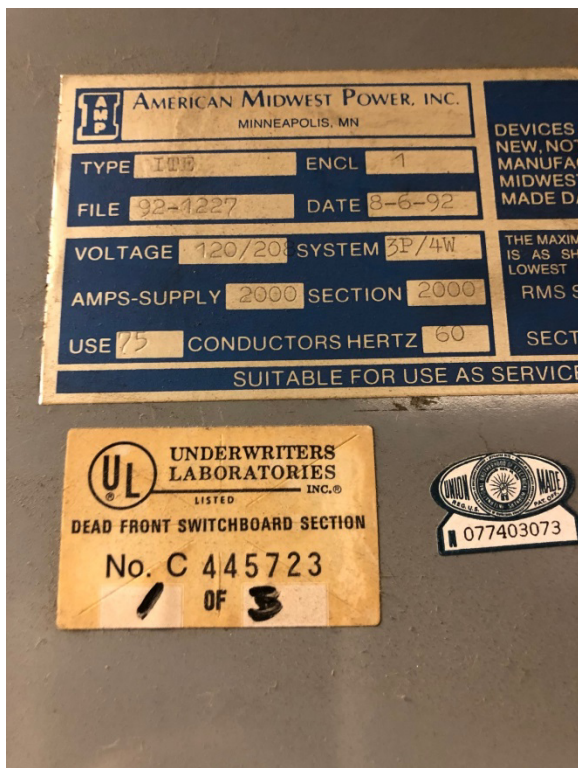
## Appendix 7.3 – Electrical Photos



E6E LP-C



E6F LP-C



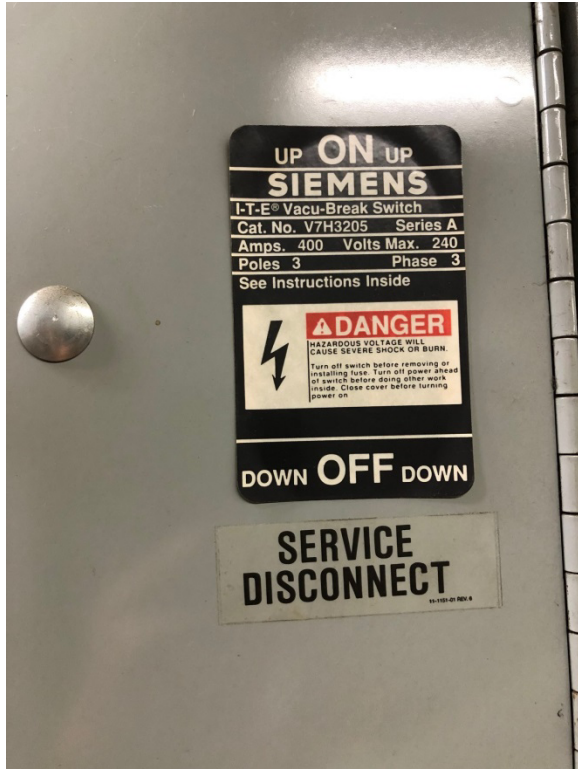
E7F-MSB



E7G-MSB



## Appendix 7.3 – Electrical Photos



E7H-MSB



E7I-MSB



E7J-MSB



E7K-MSB

## Appendix 7.3 – Electrical Photos



E7L-MSB



E7M-MSB



E7A-MSB SWBD #1



E7B-MSB SWBD #1



## Appendix 7.3 – Electrical Photos



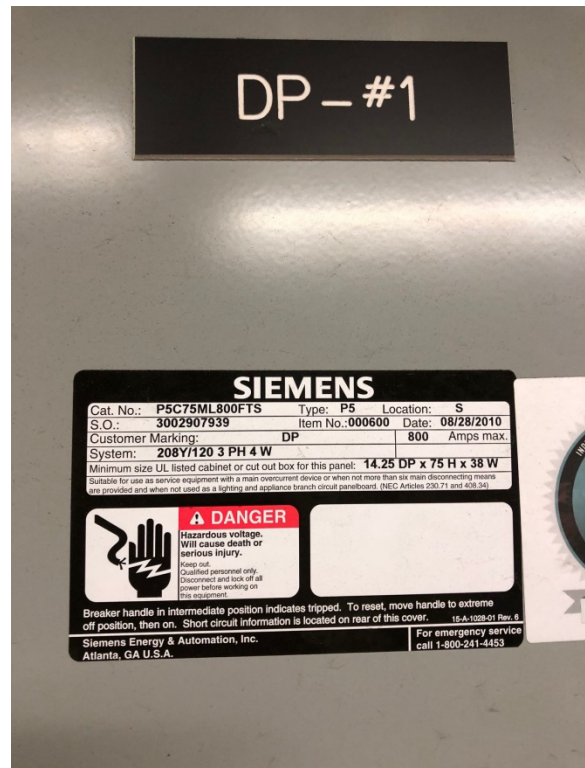
E7C-MSB SWBD #1



E7D-MSB SWBD #1



E7E-MSB SWBD #1



E8A DP-1

## Appendix 7.3 – Electrical Photos



E8B DP-1



E8C DP-1



E8D DP-1



E8E Panel in Basement Near Sump



## Appendix 7.3 – Electrical Photos



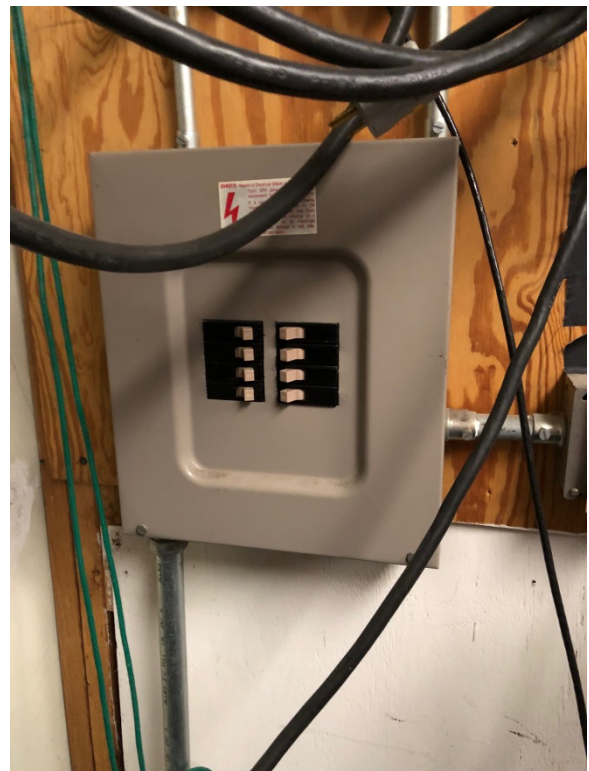
E8F Panel in Basement Near Sump



E9A Dimmer Rack Basement



E9B Dimmer Rack Basement



E9C Dimmer Rack Basement

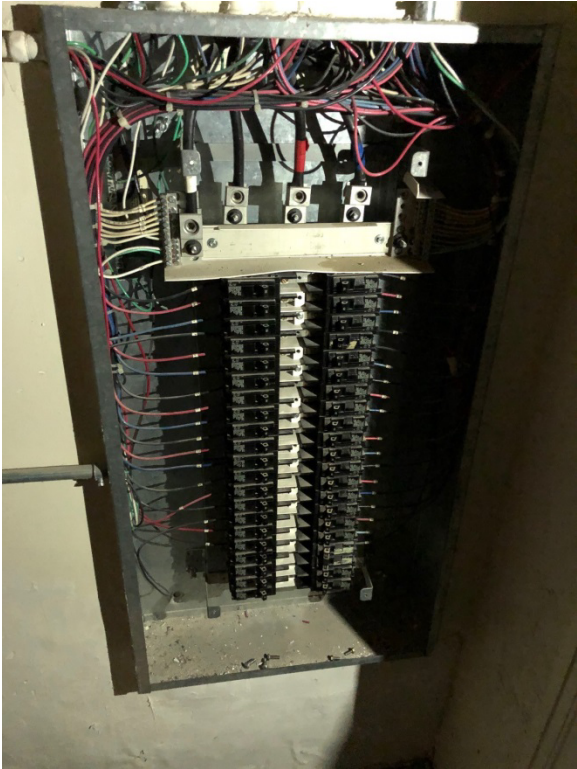
Appendix 7.3 – Electrical Photos



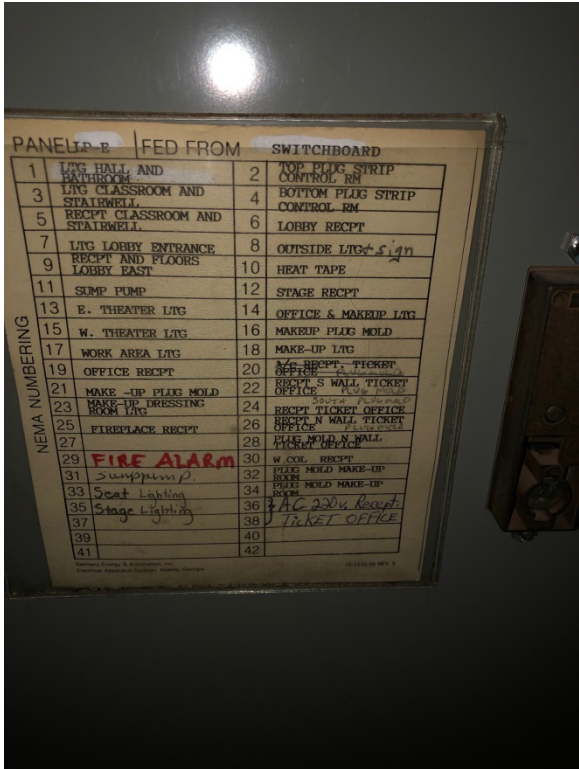
E9D Dimmer Rack Basement



E9E LP-E



E9F LP-E



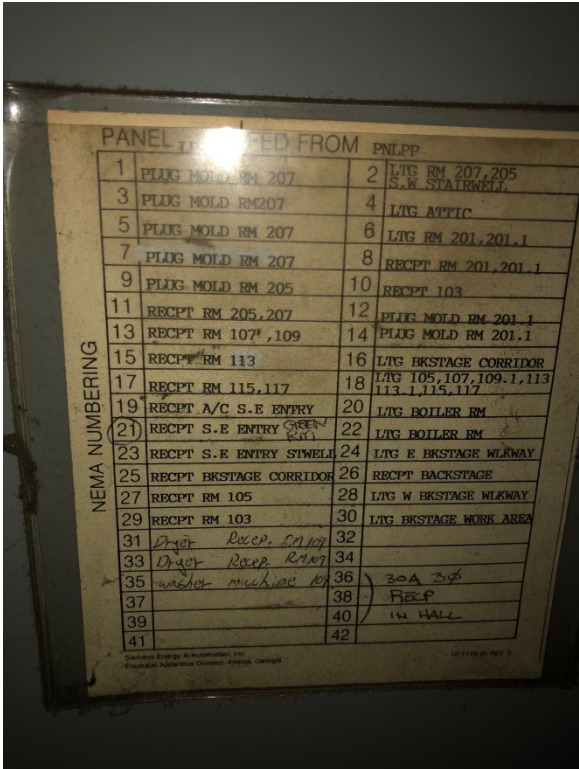
E9G LP-E



Appendix 7.3 – Electrical Photos



E10A LP-F



E10B LP-F



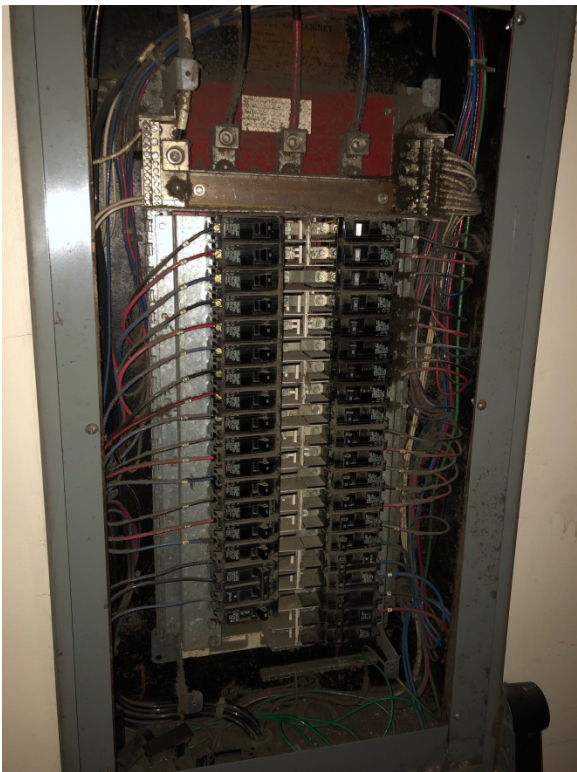
E10C LP-F



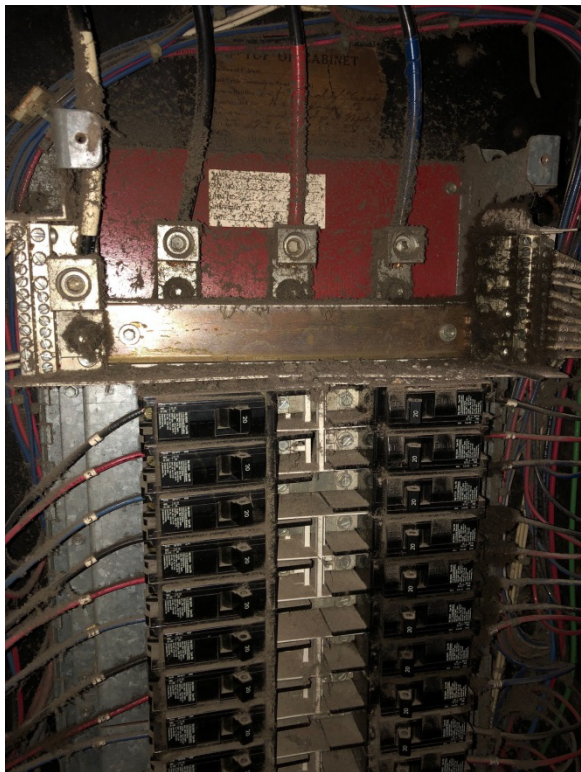
E10D LP-F



Appendix 7.3 – Electrical Photos



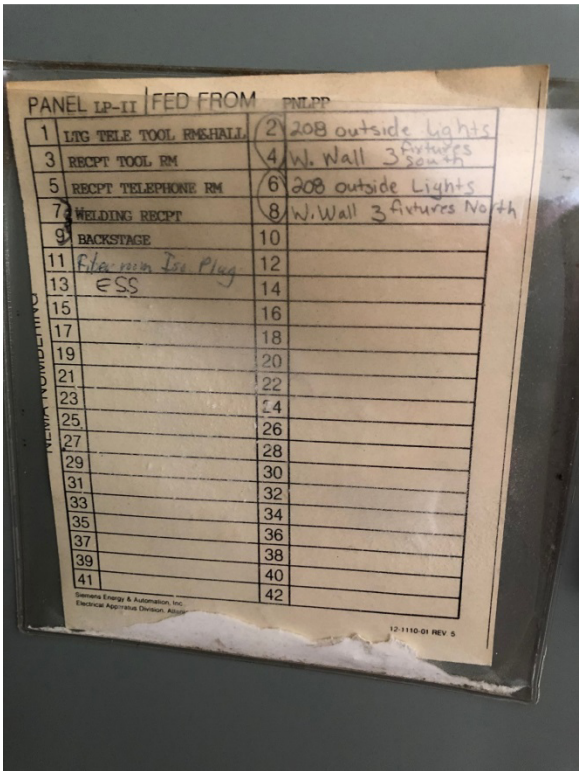
E10E LP-F



E10F LP-F



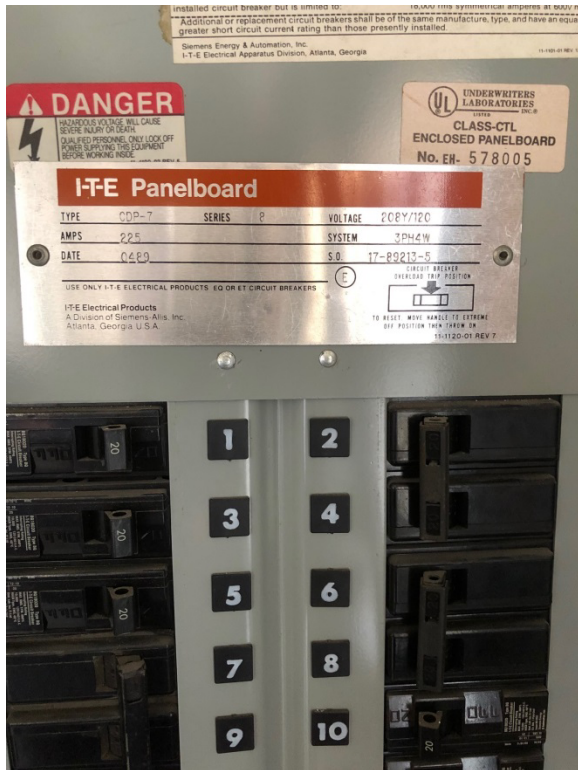
E11A LP-11



E11B LP-11



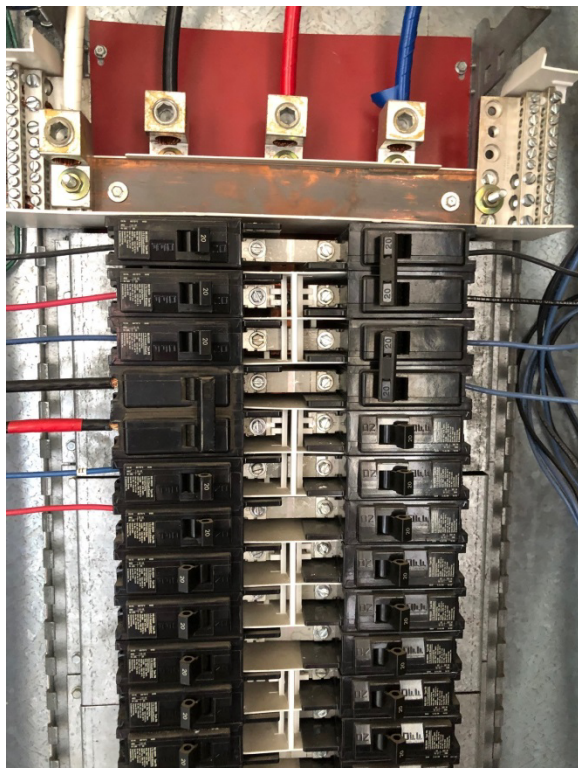
## Appendix 7.3 – Electrical Photos



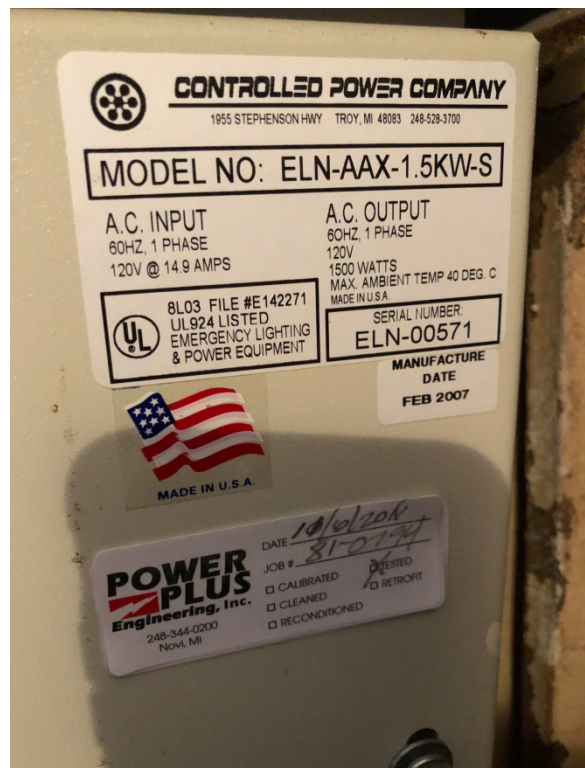
E11C LP-11



E11D LP-11



E11E LP-11



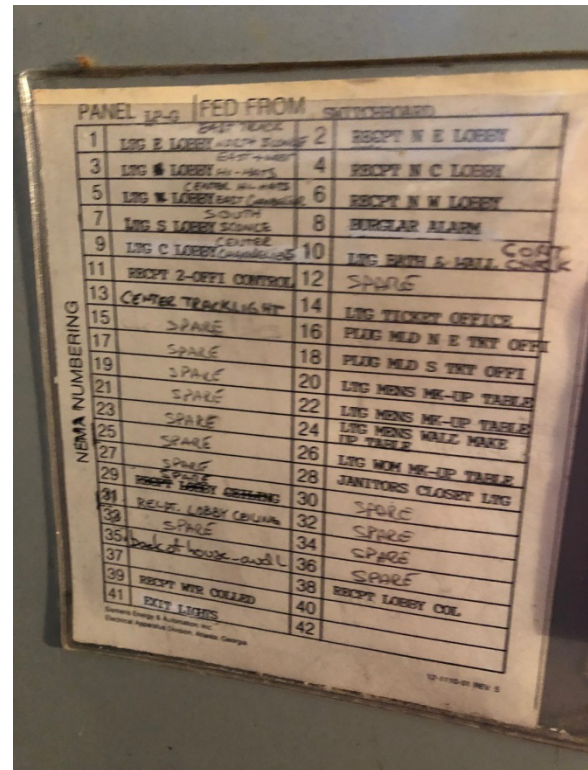
E12A Inverter



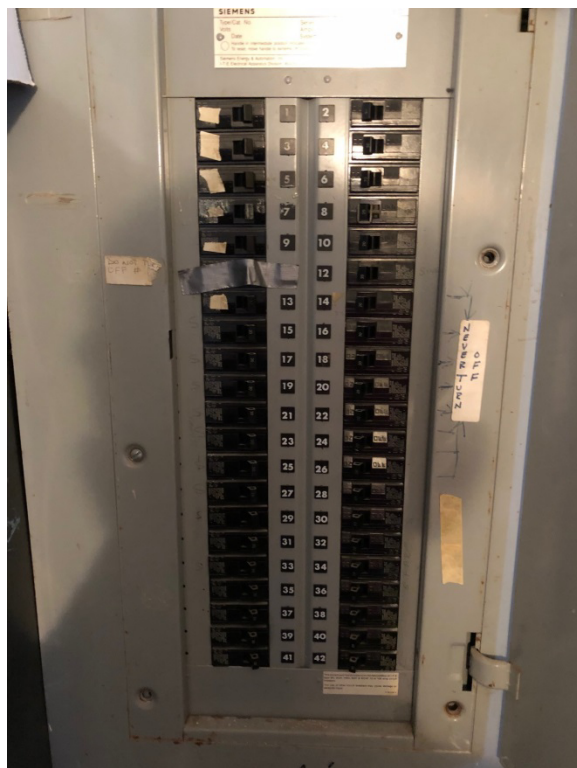
## Appendix 7.3 – Electrical Photos



E12B Inverter



E13A LP-G

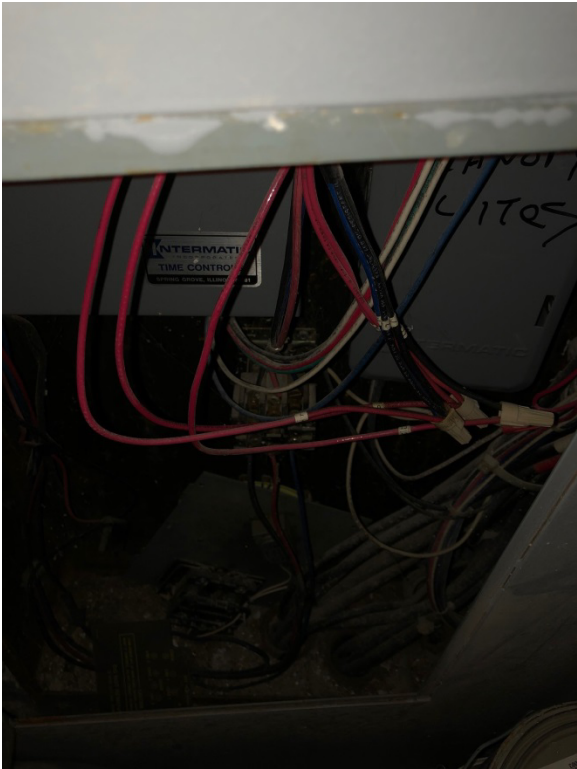


E13B LP-G

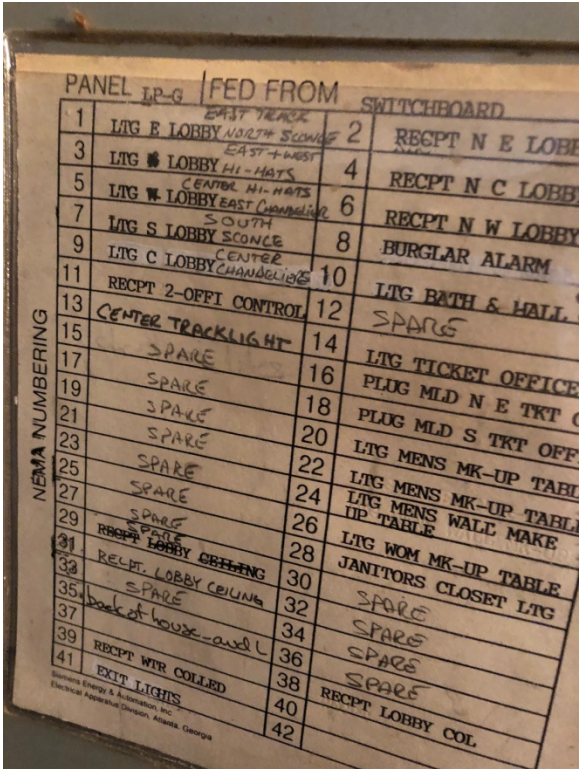


E13C LP-G

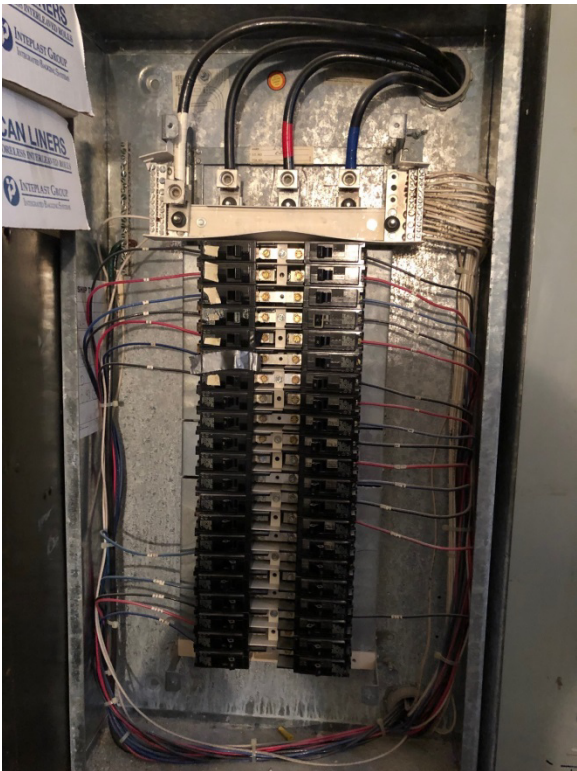
Appendix 7.3 – Electrical Photos



E13D LP-G



E13E LP-G



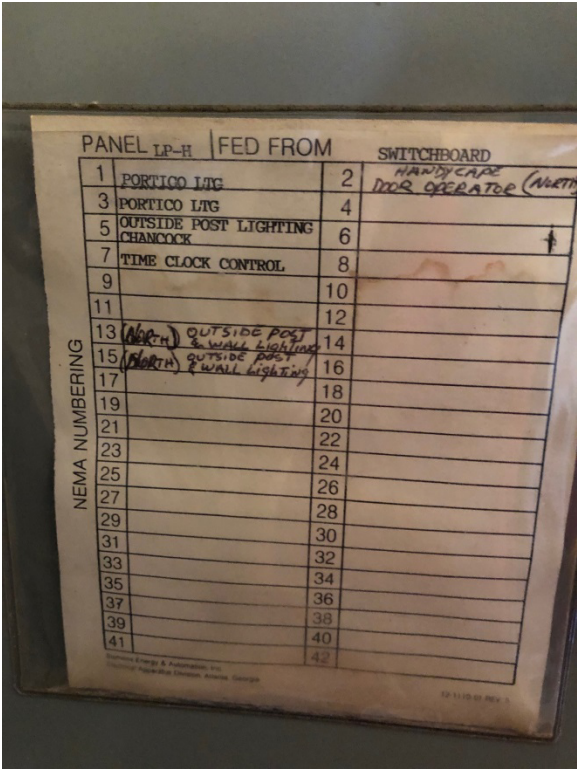
E13F LP-G



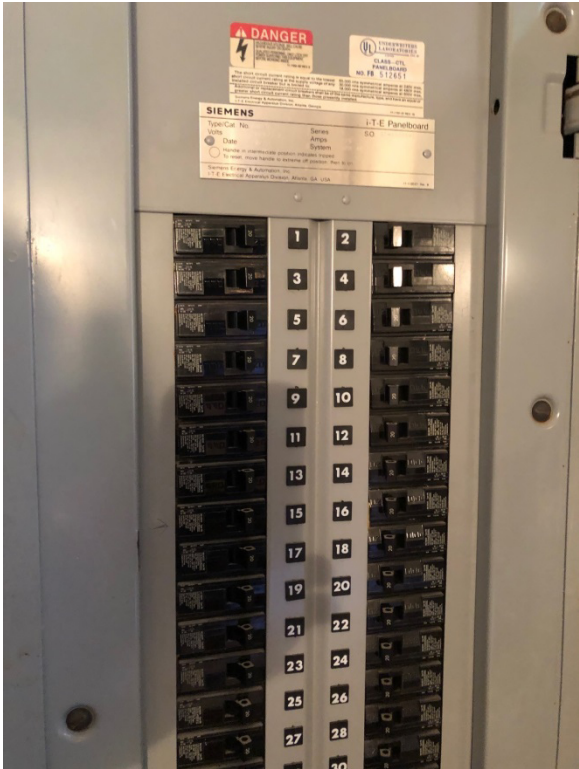
E14A LP-H



Appendix 7.3 – Electrical Photos



E14B LP-H



E14C LP-H



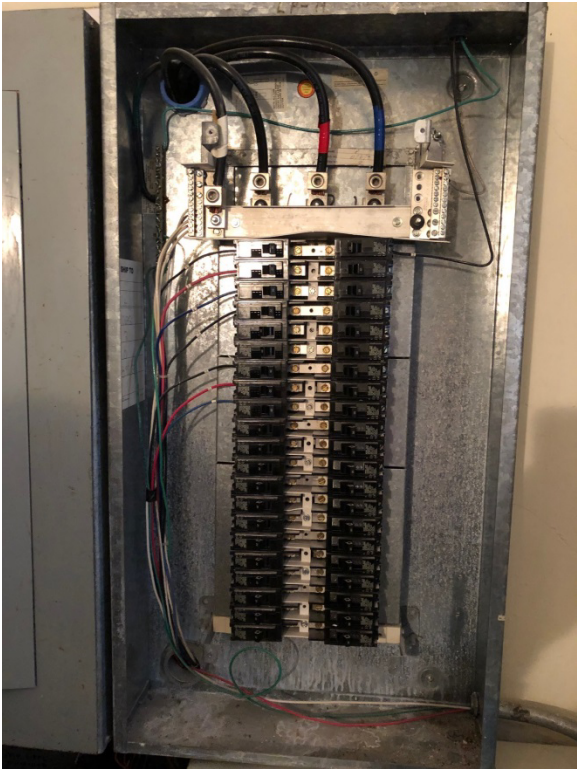
E14D LP-H



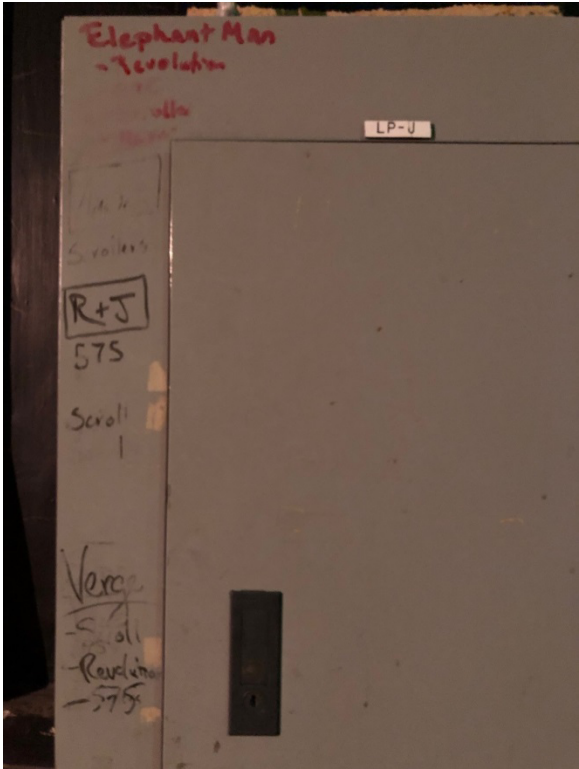
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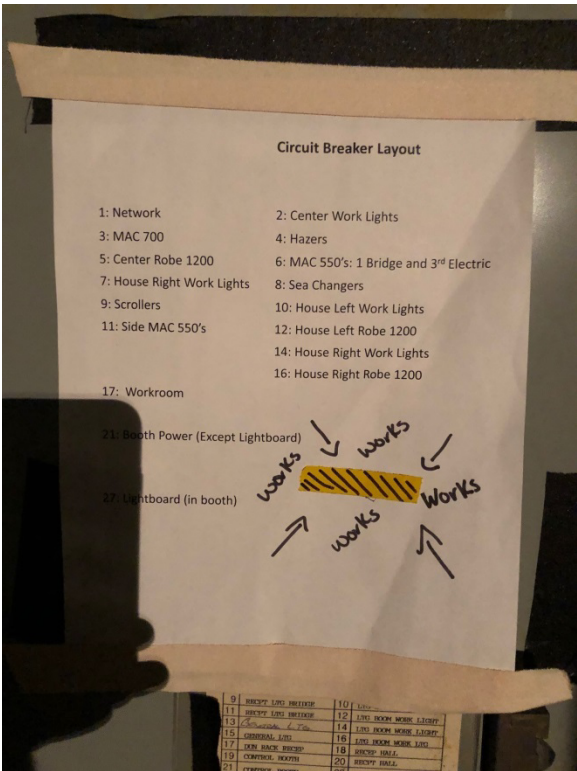
Appendix 7.3 – Electrical Photos



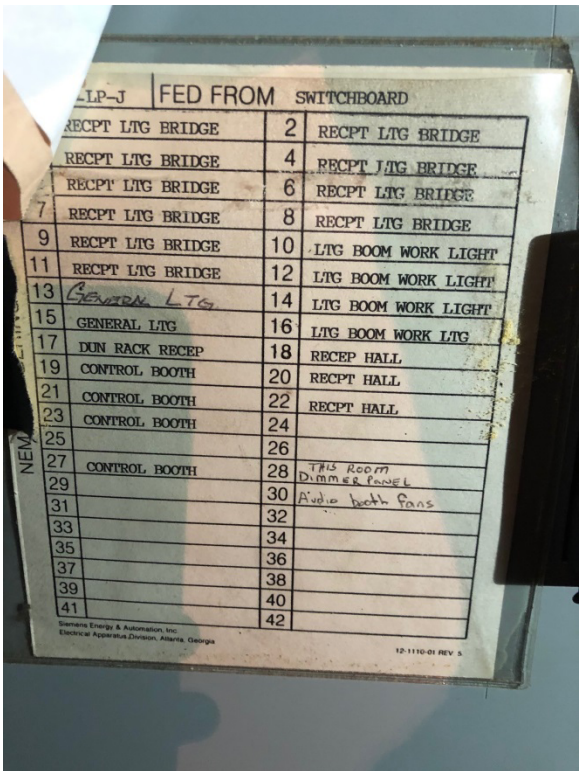
E14F LP-H



E15A LP-J



E15B LP-J



E15C LP-J

## Appendix 7.3 – Electrical Photos



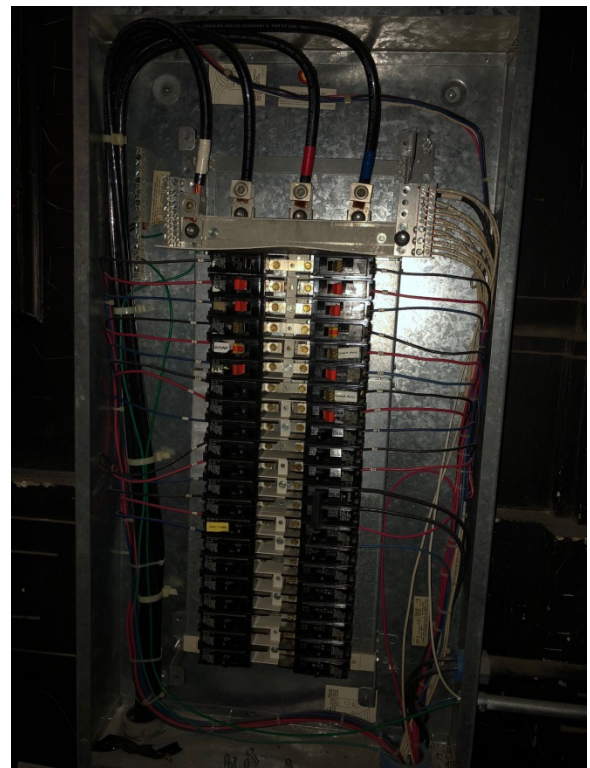
E15D LP-J



E15E LP-J



E15F LP-J



E15G LP-J



## Appendix 7.3 – Electrical Photos



E16A Dimming Rack Disconnects



E16B Dimming Rack Disconnects

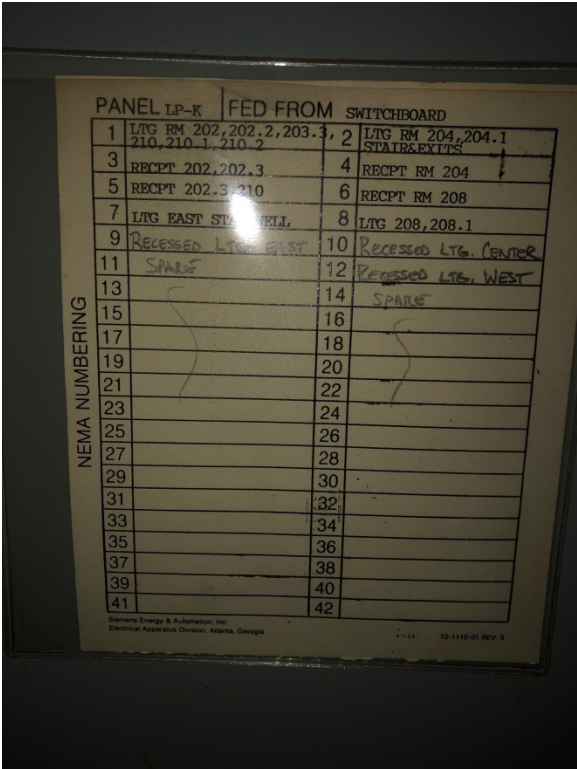


E16C Dimming Rack Disconnects

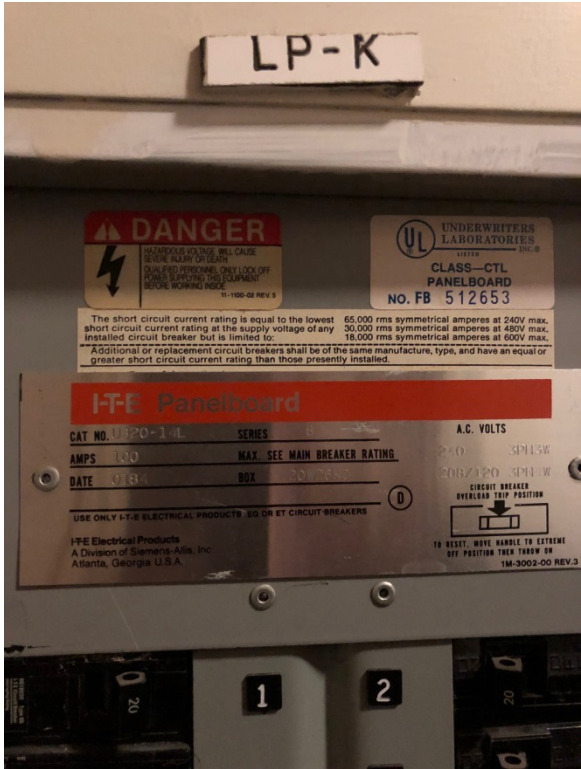


E17A LP-K

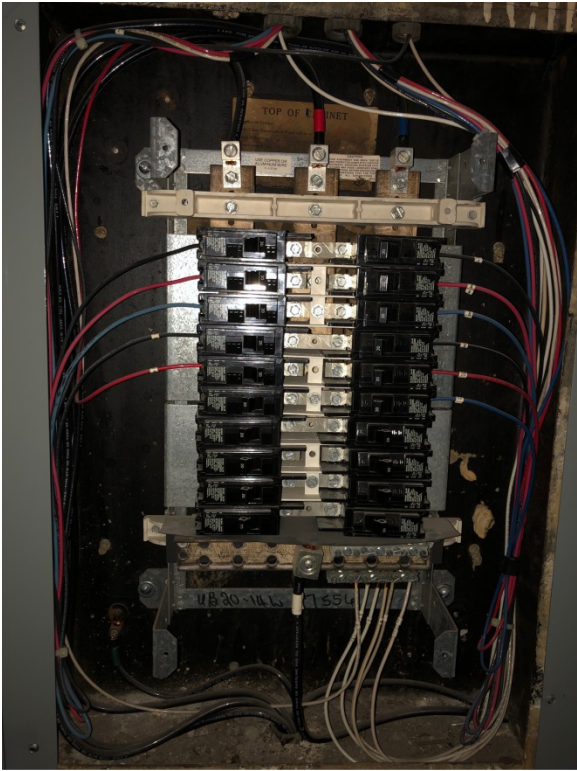
Appendix 7.3 – Electrical Photos



E17B LP-K



E17C LP-K



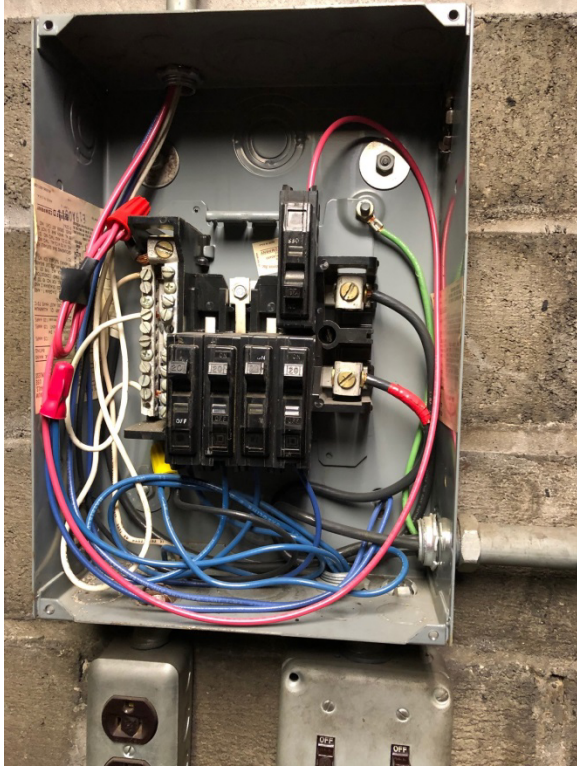
E17D LP-K



E18A LP-L



## Appendix 7.3 - Electrical Photos



E18B LP-L

## **8. - APPENDIX – PHASE 2 WORK**

### **8.1 – Mechanical Schematic Diagrams**

#### **8.1a – Cover Sheet Drawing Index**

#### **8.1b M6.1 Heating System Diagram (Existing Steam Boiler)**

#### **8.1c - M6.2 Cooling System Diagram (Existing Chilled Water)**

#### **8.1d – M6.3 Air Handling Systems Diagrams**

#### **8.1e – M6.4 Air Handling Systems Diagrams**

### **8.2 – Electrical Metering Report**

### **8.3 - Functional Test Fire Alarm Report**

### **8.4 - Functional Test Emergency Lighting Report**

## **8.1 – Mechanical Schematic Diagrams**

# WAYNE STATE UNIVERSITY HILBERRY THEATRE

WSU PROJECT NO. 2019.0465.01

Issued for Final Report 05/20/19



Facilities Planning & Management  
Design & Construction Services  
5454 Cass Ave.  
Detroit MI 48202



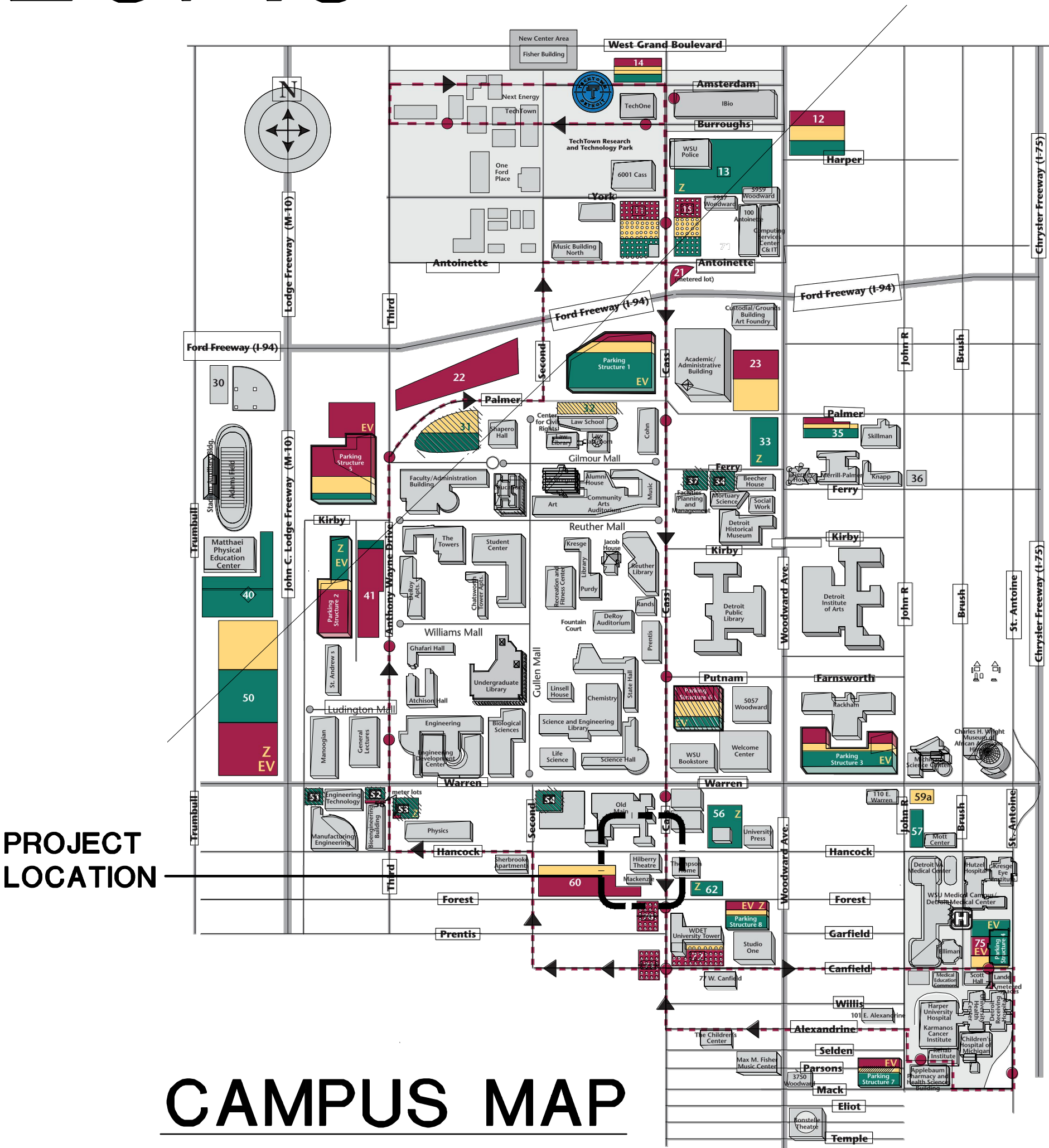
Peter Basso Associates Inc  
CONSULTING ENGINEERS

5145 Livernois, Suite 100  
Troy, Michigan 48098-3276  
Tel: 248-879-5666  
Fax: 248-879-0007

www.PeterBassoAssociates.com  
PBA Project No.: 2018.0465 PH2

**MECHANICAL DRAWING INDEX**

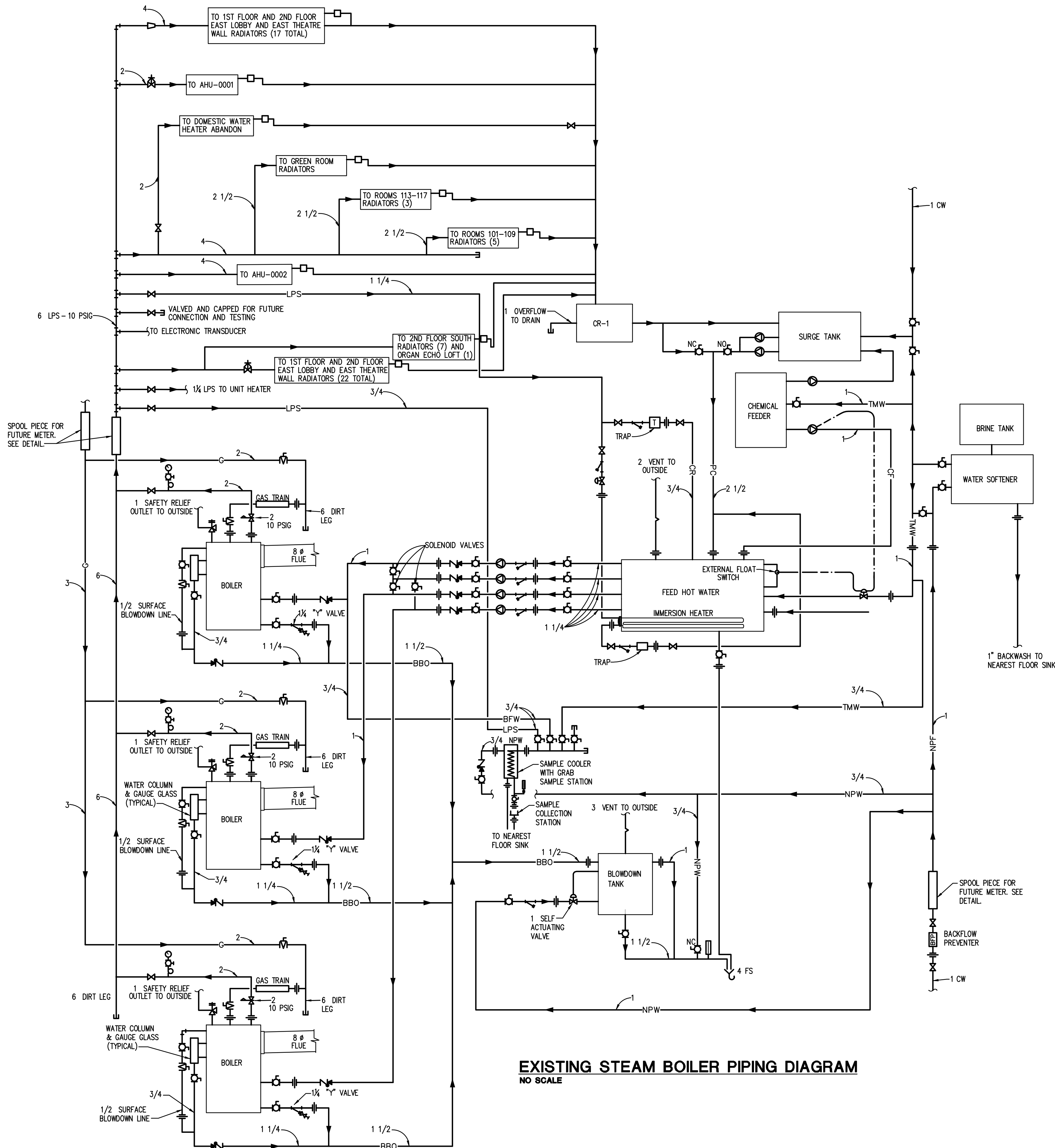
SHEET NO.	SHEET TITLE
M6.1	HEATING SYSTEM DIAGRAM
M6.2	COOLING SYSTEM DIAGRAM
M6.3	AIR HANDLING SYSTEMS DIAGRAMS
M6.4	AIR HANDLING SYSTEMS DIAGRAMS



CAMPUS MAP



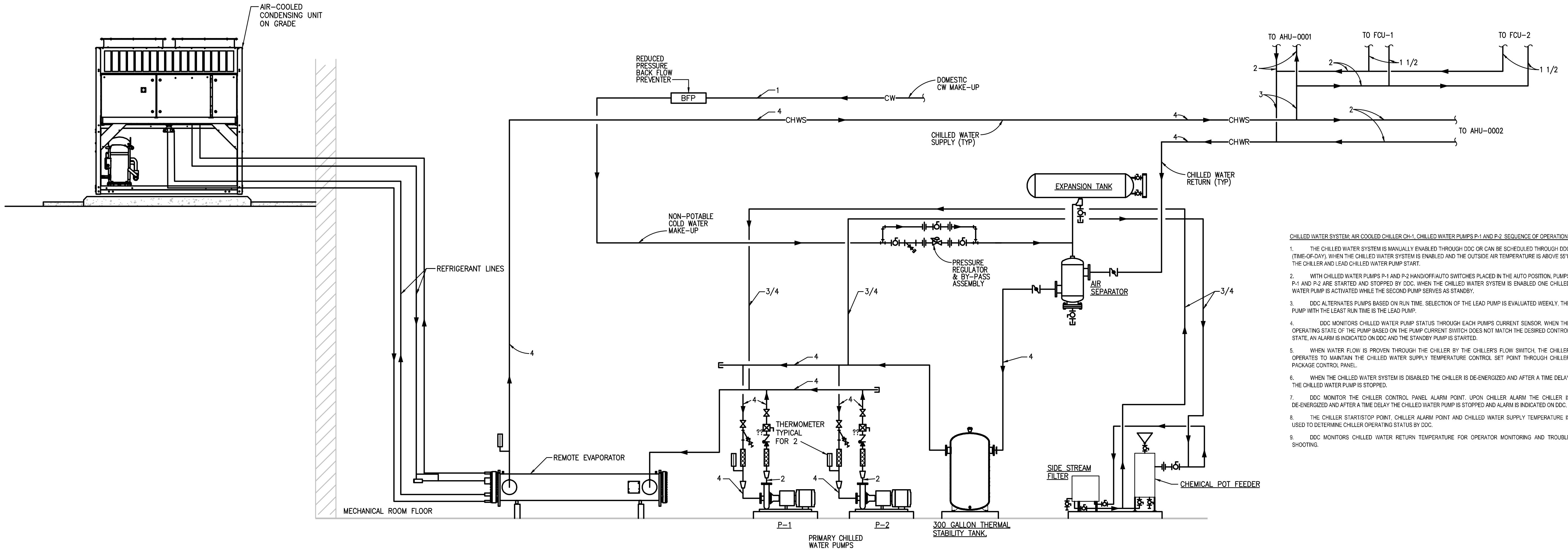
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STEAM BOILERS - B-1, B-2 AND B-3 SEQUENCE OF OPERATION

1. WITH THE BOILERS LOCAL/OFFREMOTE SWITCHES IN THE REMOTE POSITION, UPON MANUAL START OF THE BOILER SYSTEM, THE MICROPROCESSOR-BASED BOILER SEQUENCING CONTROLLER AUTOMATICALLY SEQUENCES THE BOILERS ON/OFF OPERATION AND MODULATES THE BOILERS FIRING RATE CONTROL TO MEET THE STEAM DEMAND, BASED ON THE COMMON STEAM HEADER PRESSURE CONTROL SET POINT. THE STEAM HEADER PRESSURE CONTROL SET POINT IS OPERATOR ADJUSTABLE THROUGH THE BOILER SEQUENCING CONTROLLER.
2. THROUGH BOILER SEQUENCING CONTROLLER, BOILER STAGING/MODULATION IS OPERATOR SELECTABLE AS EITHER 'UNISON' (BOILERS FIRING AT SAME RATE) OR 'SERIES' (LOADING ONE BOILER AT A TIME) WITH AUTO-SHIFT LOGIC TO EQUALIZE BOILER RUN TIMES AND MINIMIZE BOILER CYCLING.
3. BOILER SEQUENCING CONTROLLER UTILIZES BOTH STEAM HEADER PRESSURE AND BOILER FIRING RATE PERCENTAGE TO START AND STOP BOILER AND MINIMIZE THE NUMBER OF BOILERS IN OPERATION. BOILER SEQUENCING CONTROLLER STARTS/STOPS BOILERS WHENEVER STEAM HEADER PRESSURE IS OUTSIDE THE ADJUSTABLE PRESSURE LIMIT BAND FOR LONGER THAN AN ADJUSTABLE TIME PERIOD. TO MINIMIZE VARIATIONS IN HEADER PRESSURE, THE BOILER SEQUENCING CONTROLLER STARTS OR STOPS THE NEXT BOILER BASED ON THE OPERATING BOILERS FIRING RATE(S) OVER AN ADJUSTABLE TIME DELAY. PRIOR TO DISABLING A BOILER THE BOILER SEQUENCING CONTROLLER WILL REDUCE THE BOILER FIRING RATE TO MINIMUM TO PREVENT THE ACCUMULATION OF FUEL IN THE BOILER.
4. WHEN A BOILER IS INDEXED TO START, THE BOILER CONTROL PANEL OPENS THE BOILER COMBUSTION AIR DAMPER. WHEN THE COMBUSTION AIR DAMPER IS OPEN AS SENSED BY THE DAMPER END SWITCH, THE BOILER IS ALLOWED TO FIRE. IF THE BOILER COMBUSTION AIR DAMPER FAILS TO OPEN AS SENSED BY THE DAMPER END SWITCH, THE BOILER SHUTS DOWN, COMBUSTION AIR ALARM IS INDICATED AT THE BOILER CONTROL PANEL AND AT THE BOILER SEQUENCING CONTROLLER AND A COMMON BOILER ALARM IS INDICATED ON DDC.
5. INDIVIDUAL BOILER CONTROL PANEL THROUGH THE BOILER WATER LEVEL FLOAT SWITCH STARTS AND STOPS THE ASSOCIATED SURGE TANK BOILER WATER TRANSFER PUMP TO MAINTAIN THE BOILER WATER LEVEL.
6. WHEN THE BOILER LOW WATER FLOAT SWITCH SET POINT IS REACH; THE BOILER CONTROL PANEL SHUTS DOWN THE BOILER. A LOW WATER ALARM IS INDICATED AT THE BOILER CONTROL PANEL AND AT THE BOILER SEQUENCING CONTROLLER AND A COMMON BOILER ALARM IS INDICATED ON DDC.
7. WHEN THE BOILER AUXILIARY LOW WATER FLOAT SWITCH SET POINT IS REACH; THE BOILER CONTROL PANEL SHUTS DOWN THE BOILER. A LOW WATER ALARM IS INDICATED AT THE BOILER CONTROL PANEL AND AT THE BOILER SEQUENCING CONTROLLER AND A COMMON BOILER ALARM IS INDICATED ON DDC.
8. WHEN THE BOILER HIGH PRESSURE SET POINT IS REACH SENSED BY THE BOILER PRESSURE SENSOR; THE BOILER CONTROL PANEL SHUTS DOWN THE BOILER. A HIGH PRESSURE ALARM IS INDICATED AT THE BOILER CONTROL PANEL AND AT THE BOILER SEQUENCING CONTROLLER AND A COMMON BOILER ALARM IS INDICATED ON DDC.
9. BOILER CONTINUALLY MEASURES/MONITORS CONDUCTIVITY. WHEN CONDUCTIVITY LEVEL EXCEEDS THE CONTROL SET POINT THE ELECTRIC CONDUCTIVITY BLOW-DOWN CONTROL VALVE OPENS TO DRAIN CONDENSATE THROUGH THE BLOW-DOWN COOLER.
10. WITH THE BOILER LOCAL/OFFREMOTE SWITCH IN THE LOCAL POSITION; BOILER ON/OFF OPERATION AND BURNER MODULATION IS CONTROLLED BY THE BOILER PRESSURE SENSOR THROUGH THE BOILER CONTROL PANEL.
11. ON/OFF STATUS OF EACH BOILER IS INDICATED ON THE BOILER CONTROL PANEL, BOILER SEQUENCING CONTROLLER AND AT DDC.

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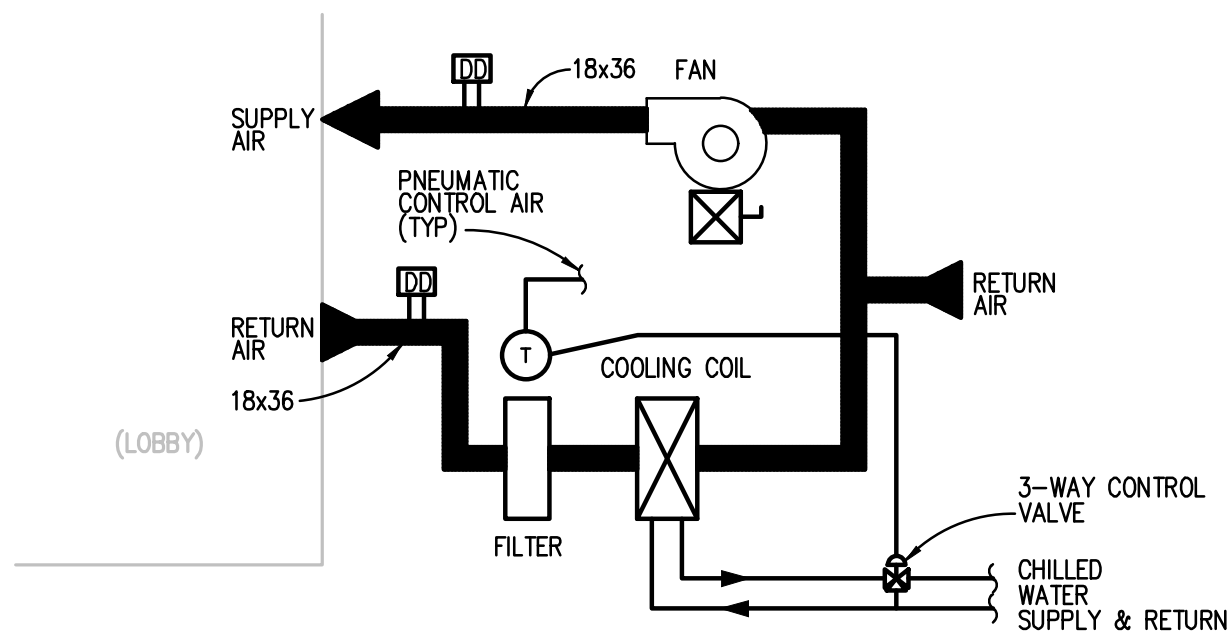


EXISTING CHILLED WATER PIPING DIAGRAM  
NO SCALE

CHILLED WATER SYSTEM- AIR COOLED CHILLER CH-1, CHILLED WATER PUMPS P-1 AND P-2, SEQUENCE OF OPERATION

1. THE CHILLED WATER SYSTEM IS MANUALLY ENABLED THROUGH DDC OR CAN BE SCHEDULED THROUGH DDC (TIME-OF-DAY). WHEN THE CHILLED WATER SYSTEM IS ENABLED AND THE OUTSIDE AIR TEMPERATURE IS ABOVE 55°F THE CHILLER AND LEAD CHILLED WATER PUMP START.
2. WITH CHILLED WATER PUMPS P-1 AND P-2 HANDOFF/AUTO SWITCHES PLACED IN THE AUTO POSITION, PUMPS P-1 AND P-2 ARE STARTED AND STOPPED BY DDC. WHEN THE CHILLED WATER SYSTEM IS ENABLED ONE CHILLED WATER PUMP IS ACTIVATED WHILE THE SECOND PUMP SERVES AS STANDBY.
3. DDC ALTERNATES PUMPS BASED ON RUN TIME. SELECTION OF THE LEAD PUMP IS EVALUATED WEEKLY, THE PUMP WITH THE LEAST RUN TIME IS THE LEAD PUMP.
4. DDC MONITORS CHILLED WATER PUMP STATUS THROUGH EACH PUMPS CURRENT SENSOR. WHEN THE OPERATING STATE OF THE PUMP BASED ON THE PUMP CURRENT SWITCH DOES NOT MATCH THE DESIRED CONTROL STATE, AN ALARM IS INDICATED ON DDC AND THE STANDBY PUMP IS STARTED.
5. WHEN WATER FLOW IS PROVEN THROUGH THE CHILLER BY THE CHILLER'S FLOW SWITCH, THE CHILLER OPERATES TO MAINTAIN THE CHILLED WATER SUPPLY TEMPERATURE CONTROL SET POINT THROUGH CHILLER PACKAGE CONTROL PANEL.
6. WHEN THE CHILLED WATER SYSTEM IS DISABLED THE CHILLER IS DE-ENERGIZED AND AFTER A TIME DELAY THE CHILLED WATER PUMP IS STOPPED.
7. DDC MONITOR THE CHILLER CONTROL PANEL ALARM POINT. UPON CHILLER ALARM THE CHILLER IS DE-ENERGIZED AND AFTER A TIME DELAY THE CHILLED WATER PUMP IS STOPPED AND ALARM IS INDICATED ON DDC.
8. THE CHILLER START/STOP POINT, CHILLER ALARM POINT AND CHILLED WATER SUPPLY TEMPERATURE IS USED TO DETERMINE CHILLER OPERATING STATUS BY DDC.
9. DDC MONITORS CHILLED WATER RETURN TEMPERATURE FOR OPERATOR MONITORING AND TROUBLE SHOOTING.

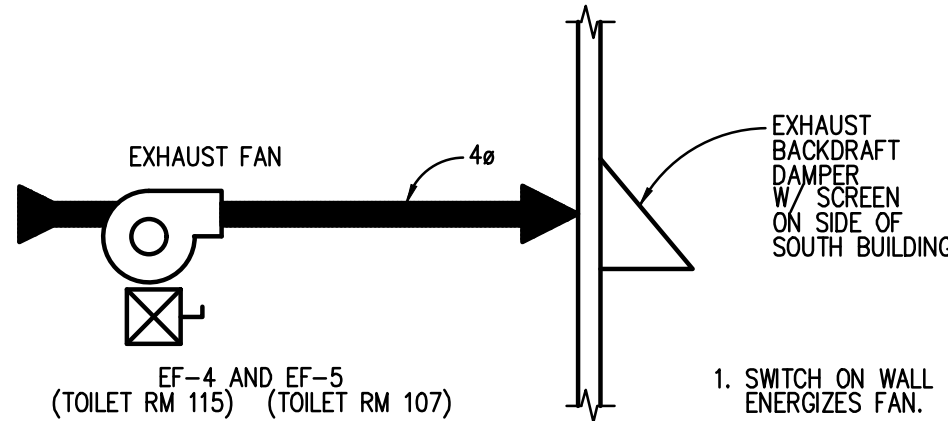
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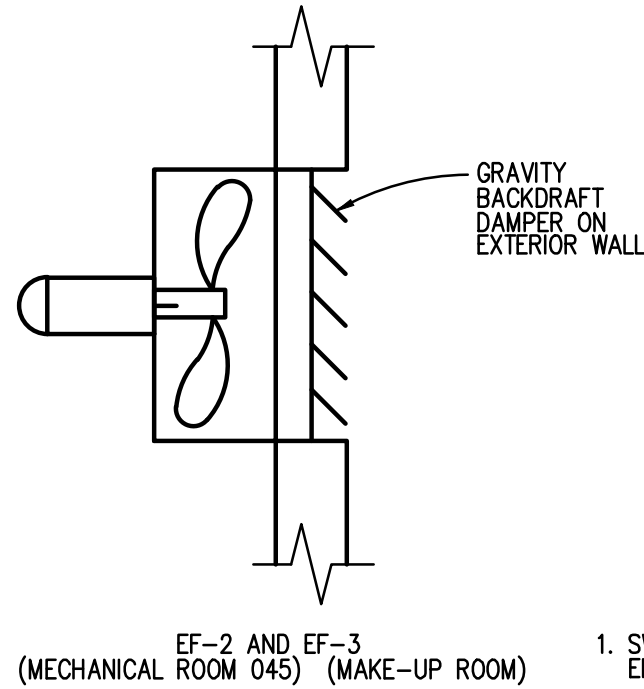
FAN COIL UNIT-FC-1 & FC-2 SEQUENCE OF OPERATION

- FAN COIL UNIT SUPPLY FAN IS MANUALLY STARTED AND STOP BY LOCAL DISCONNECT SWITCH.
- COOLING MODE: PNEUMATIC RETURN AIR TEMPERATURE SENSOR MODULATES THE CHILLED WATER COOLING COIL PNEUMATIC 3-WAY CONTROL VALVE TO MAINTAIN THE RETURN AIR TEMPERATURE CONTROL SET POINT.

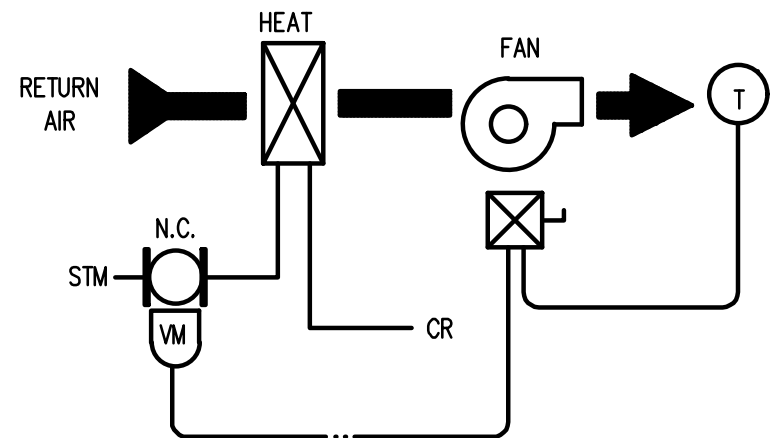
**FAN COIL UNIT CONTROL DIAGRAM**  
NO SCALE



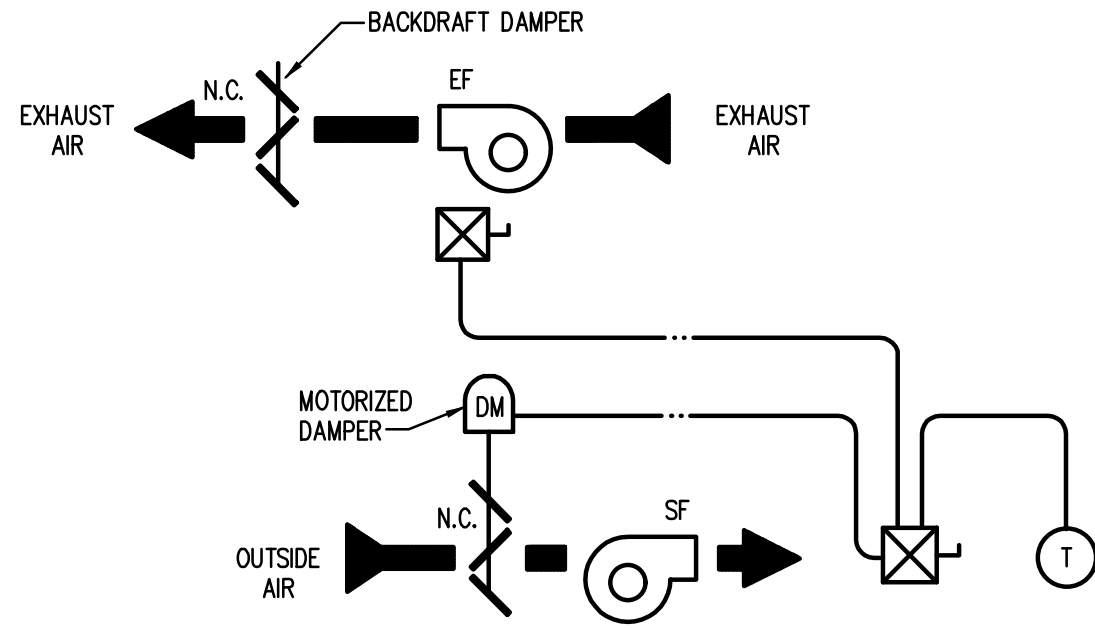
**EXISTING TOILET ROOM EXHAUST**  
NO SCALE



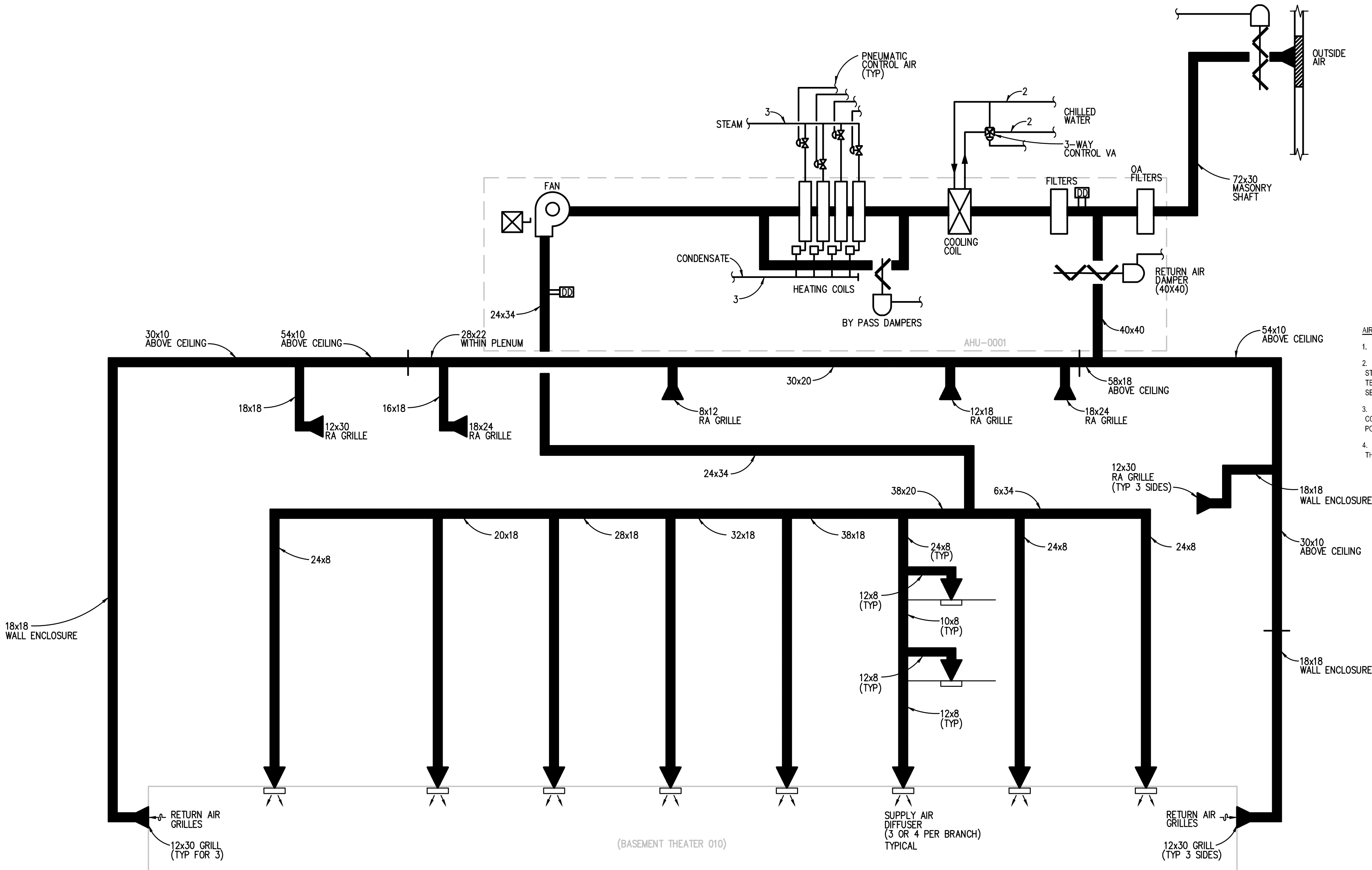
**EXISTING SPACE EXHAUST FAN**  
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**UNIT HEATER CONTROL DIAGRAM**  
NO SCALE



**EQUIPMENT ROOM VENTILATION**  
NO SCALE



**EXISTING AIR HANDLING UNIT AHU-0001 CONTROL DIAGRAM**  
NO SCALE

REVISION

**WAYNE STATE UNIVERSITY**

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PBA Project No. 2018.0465 PH2

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Peter Basso Associates Inc  
CONSULTING ENGINEERS

PROJECT TITLE  
**WAYNE STATE UNIVERSITY  
HILBERRY THEATRE**

SHEET TITLE  
**AIR HANDLING SYSTEMS  
DIAGRAMS**

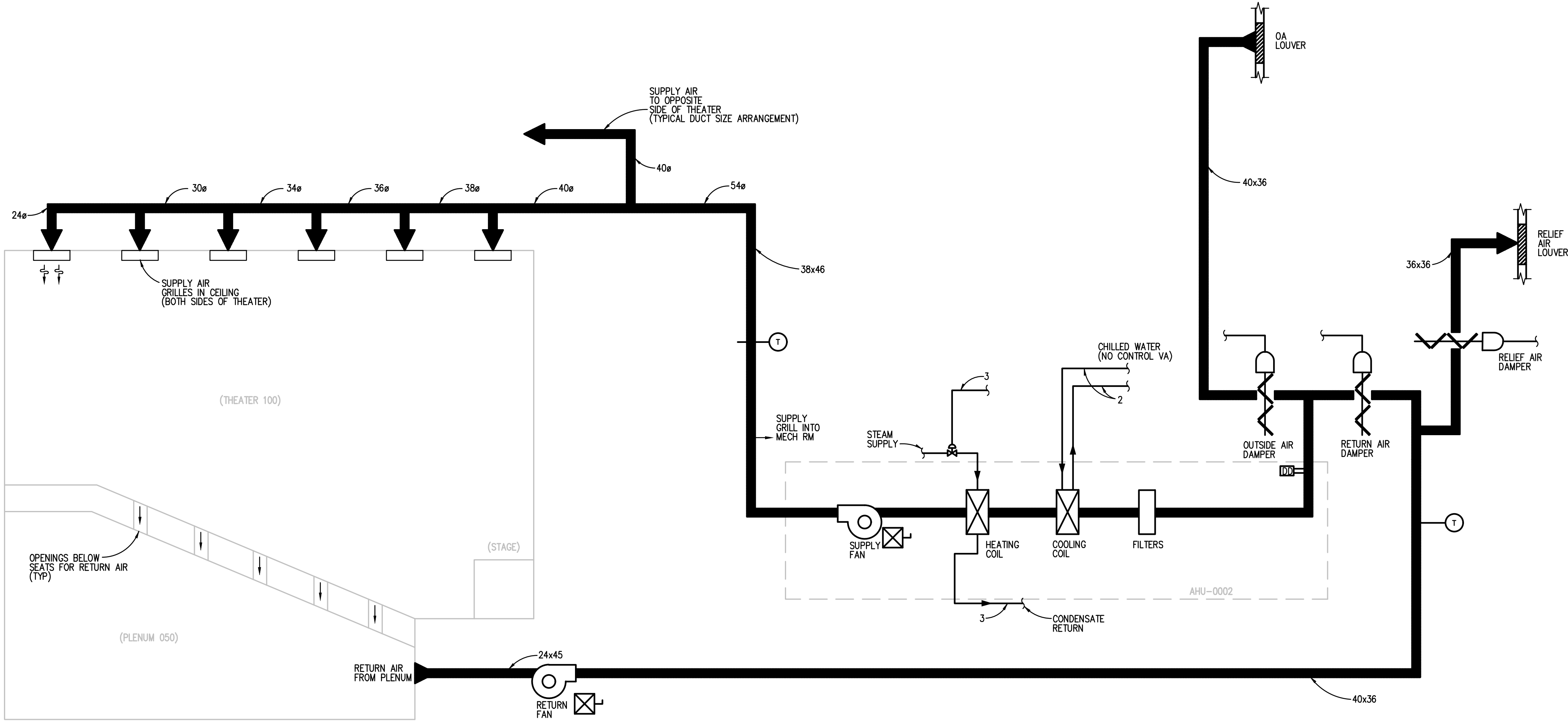
DATE  
05/20/19  
ISSUE  
FINAL REPORT

SHEET No.

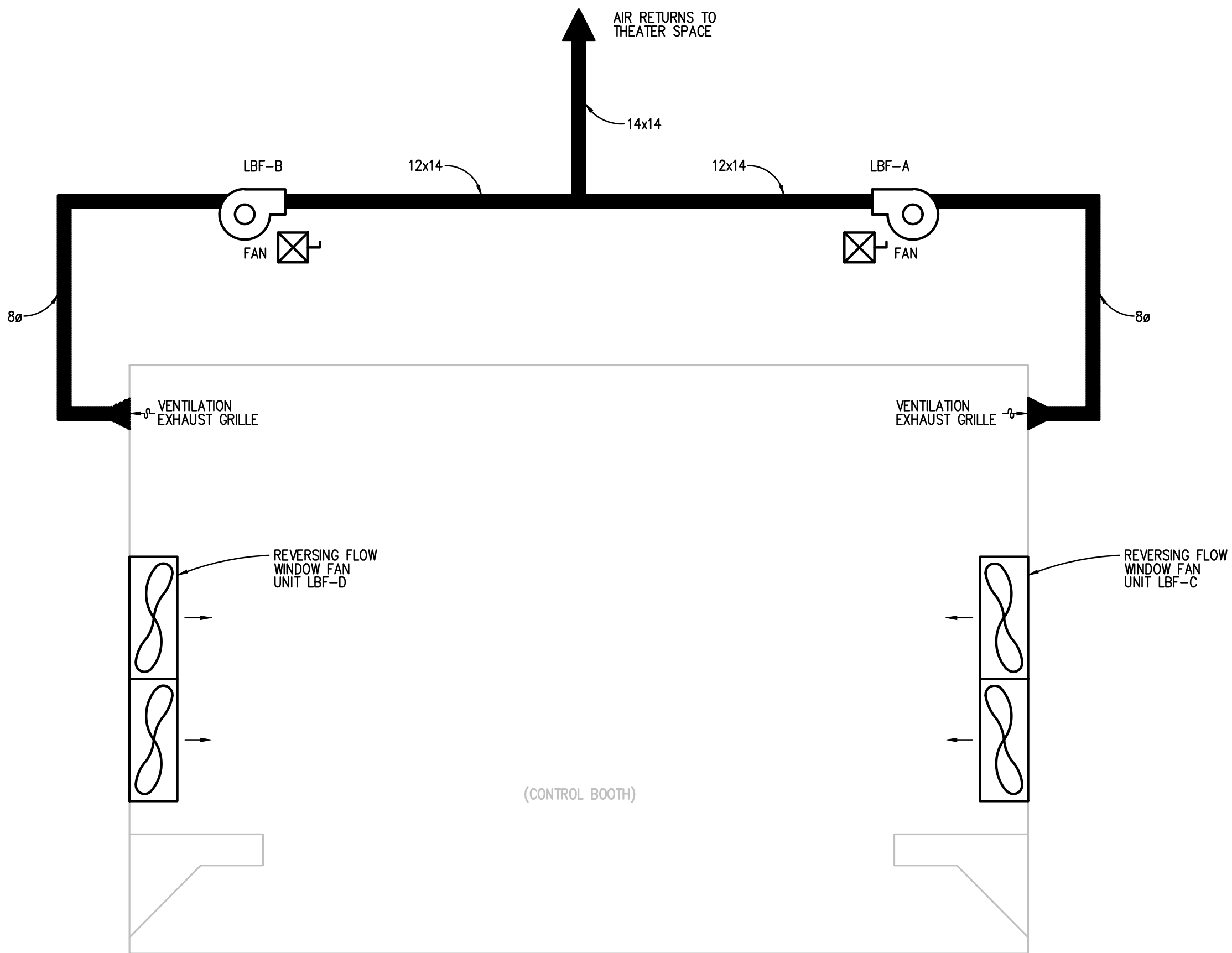
**M6.3**

Not For Construction

g:\2018\2018-0465-00\CAD\Phase 2\2018-0465-M6-M6-4, 5/20/2019 9:53:59 AM, Nadeen F. Hamid, Peter Basso Associates Inc.



EXISTING AIR HANDLING UNIT AHU-0002 CONTROL DIAGRAM  
NO SCALE



EXISTING THEATER CONTROL BOOTH VENTILATION FAN DIAGRAM  
NO SCALE

- AIR HANDLING UNIT - 189-AHU-0002 SEQUENCE OF OPERATION**
1. WITH AHU SUPPLY FAN, HAND/OFF/AUTO SWITCH IN AUTO POSITION, AHU SUPPLY FAN HAS START/STOP CAPABILITY FROM THE DDC SYSTEM. AHU SUPPLY FAN IS OPERATED BASED ON TIME SCHEDULED OCCUPIED MODE.
  2. AHU RETURN FAN IS NOT INTERLOCKED WITH AHU SUPPLY FAN AND OPERATES CONTINUOUSLY.
  3. FOR HEATING OCCUPIED MODE, AHU SUPPLY AND RETURN FANS OPERATE. OUTSIDE AIR ISOLATION DAMPER IS OPEN. MIXED AIR DAMPERS ARE AT 6% MINIMUM POSITION OR MODULATE TO MAINTAIN MIXED AIR TEMPERATURE CONTROL SET POINT. AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
  4. FOR HEATING UNOCCUPIED MODE, AHU SUPPLY FAN IS DE-ENERGIZED. AHU RETURN FAN CONTINUES TO OPERATE. OUTSIDE AIR ISOLATION, OUTSIDE AIR AND RELIEF AIR DAMPERS ARE CLOSED. RETURN AIR DAMPER IS OPEN. AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
  5. FOR COOLING OCCUPIED MODE WHEN CHILLED WATER IS AVAILABLE AS SENSED BY THE CHILLED WATER TEMPERATURE SENSOR, AHU SUPPLY AND RETURN FANS OPERATE. OUTSIDE AIR ISOLATION DAMPER IS OPEN. MIXED AIR DAMPERS ARE AT 6% MINIMUM POSITION. CHILLED WATER FLOWS THROUGH COOLING COIL (NO COOLING COIL CONTROL VALVE). AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
  6. FOR COOLING OCCUPIED MODE WHEN CHILLED WATER IS NOT AVAILABLE AS SENSED BY THE CHILLED WATER TEMPERATURE SENSOR, AHU SUPPLY AND RETURN FANS OPERATE. OUTSIDE AIR ISOLATION DAMPER IS OPEN. MIXED AIR DAMPERS ARE AT 6% MINIMUM POSITION OR MODULATE TO MAINTAIN MIXED AIR TEMPERATURE CONTROL SET POINT. AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
  7. FOR COOLING UNOCCUPIED MODE WHEN CHILLED WATER IS AVAILABLE AS SENSED BY THE CHILLED WATER TEMPERATURE SENSOR, AHU SUPPLY FAN IS DE-ENERGIZED. AHU RETURN FAN CONTINUES TO OPERATE. OUTSIDE AIR ISOLATION, OUTSIDE AIR AND RELIEF AIR DAMPERS ARE CLOSED. RETURN AIR DAMPER IS OPEN. CHILLED WATER FLOWS THROUGH COOLING COIL (NO COOLING COIL CONTROL VALVE). AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
  8. FOR COOLING UNOCCUPIED MODE WHEN CHILLED WATER IS NOT AVAILABLE AS SENSED BY THE CHILLED WATER TEMPERATURE SENSOR, AHU SUPPLY FAN IS DE-ENERGIZED. AHU RETURN FAN CONTINUES TO OPERATE. OUTSIDE AIR ISOLATION, OUTSIDE AIR AND RELIEF AIR DAMPERS ARE CLOSED. RETURN AIR DAMPER IS OPEN. AHU PNEUMATIC DISCHARGE AIR RECEIVER CONTROLLER MODULATES STEAM HEATING COIL CONTROL VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT, WHICH IS RESET TO MAINTAIN RETURN AIR TEMPERATURE CONTROL SET POINT.
  9. WHEN FREEZE/STAT SET POINT IS REACHED, ALARM IS INDICATED AT DDC. SUPPLY FAN DEACTIVATES, RETURN FAN CONTINUES TO OPERATE, DAMPERS GO TO THEIR NORMAL POSITIONS AND STEAM HEATING COIL CONTROL VALVE MODULATES TO MAINTAIN DISCHARGE AIR TEMPERATURE CONTROL SET POINT.
  10. WHEN RETURN DUCT HIGH TEMPERATURE SENSOR SET POINT IS REACHED, SUPPLY FAN DEACTIVATES, RETURN FAN CONTINUES TO OPERATE, DAMPERS GO TO THEIR NORMAL POSITIONS AND STEAM HEATING COIL CONTROL VALVE MODULATES TO MAINTAIN DISCHARGE AIR TEMPERATURE CONTROL SET POINT.
  11. WHEN AHU SUPPLY FAN IS DEACTIVATED, RETURN FAN CONTINUES TO OPERATE, DAMPERS GO TO THEIR NORMAL POSITIONS AND STEAM HEATING COIL CONTROL VALVE MODULATES TO MAINTAIN DISCHARGE AIR TEMPERATURE CONTROL SET POINT.



## **8.2- ELECTRICAL METERING REPORT**

The existing panelboards including main switchboard were metered for 30 consecutive days. The peak metered amperage did not exceed the panelboard amperage capacity. Most of the peak metered amperage was in the 40-50% of the panelboard amperage capacity.

Hilberry Theater (Wire labled studio fan) one line is question marked-Summary.txt  
Data Summary

Data File Name: Hilberry Theater (Wire labled studio fan) one line is question  
marked.elog

First Data Record End Time: 02/06/19 11:15:00

Last Data Record End Time: 03/08/19 09:30:00

Monitoring Period Duration: 29.94 days

Peak Demand

Window Size Min.: 15

Channel  
KVAR

KW

KVA

Power 5            2.079 12:52:37 02/19/2019  
3.264 12:48:37 02/19/2019

3.876 12:48:37 02/19/2019

Power 6            Off

Totalizers

Channel

KWH

-KWH

+KWH

KVAH

KVARH

-KVARH

+KVARH

Power 5

0.695

0.000

0.695

1.294

1.088

0.000

1.088

Channel

Average

Maximum (Date Time)

Minimum (Date

Hilberry Theater (Wire labled studio fan) one line is question marked-Summary.txt  
Time) Total

```

-----
-----
Power 1 Min. Volt      122.491  123.716  (02/09/19 00:30:00)  112.984
(02/26/19 16:15:00)

Power 1 Max. Volt      123.289  124.488  (02/09/19 01:00:00)  121.853
(02/16/19 18:45:00)

Power 1 Avg. Volt      122.955  124.077  (02/09/19 01:00:00)  121.577
(02/16/19 18:45:00)

Power 1 Amp Hours      0.001    2.143  (02/19/19 12:45:00)   0.000
(03/08/19 09:30:00)  3.578

Power 1 Min. Amp       0.000    0.000  (03/08/19 09:30:00)   0.000
(03/08/19 09:30:00)

Power 1 Max. Amp       0.031   77.465  (02/19/19 12:45:00)   0.000
(03/08/19 09:30:00)

Power 1 Avg. Amp       0.005    8.573  (02/19/19 12:45:00)   0.000
(03/08/19 09:30:00)

Power 1 KW Hours       0.000    0.147  (02/19/19 12:45:00)   0.000
(03/08/19 09:30:00)  0.246

Power 1 Avg. KW        0.000    0.587  (02/19/19 12:45:00)   0.000
(03/08/19 09:30:00)

Power 1 KVA Hours      0.000    0.262  (02/19/19 12:45:00)   0.000
(03/08/19 09:30:00)  0.437

Power 1 Min. KVA       0.000    0.000  (03/08/19 09:30:00)   0.000
(03/08/19 09:30:00)

Power 1 Max. KVA       0.004    9.409  (02/19/19 12:45:00)   0.000
(03/08/19 09:30:00)

Power 1 Avg. KVA       0.001    1.048  (02/19/19 12:45:00)   0.000
(03/08/19 09:30:00)

Power 1 Min. dPF       1.00     1.00   (03/08/19 09:30:00)   0.49
(02/19/19 12:45:00)

Power 1 Max. dPF       1.00     1.00   (03/08/19 09:30:00)   1.00

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Hilberry Theater (Wire labled studio fan) one line is question marked-Summary.txt  
(03/08/19 09:30:00)

Power 1 Avg. dPF (02/19/19 13:00:00)	1.00	1.00	(03/08/19 09:30:00)	0.56
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Power 1 THD = 147.316963

Power 2 Min. Volt (02/26/19 16:15:00)	122.344	123.588	(03/03/19 00:30:00)	112.662
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Power 2 Max. Volt (02/14/19 18:15:00)	123.179	124.295	(02/08/19 03:45:00)	121.917
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Power 2 Avg. Volt (02/15/19 19:00:00)	122.874	123.969	(02/08/19 03:45:00)	121.539
------------------------------------------	---------	---------	---------------------	---------

Power 2 Amp Hours (03/08/19 09:30:00)	0.001 3.419	2.041	(02/19/19 12:45:00)	0.000
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Power 2 Min. Amp (03/08/19 09:30:00)	0.000	0.000	(03/08/19 09:30:00)	0.000
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Power 2 Max. Amp (03/08/19 09:30:00)	0.030	74.057	(02/19/19 12:45:00)	0.000
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Power 2 Avg. Amp (03/08/19 09:30:00)	0.005	8.163	(02/19/19 12:45:00)	0.000
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Power 2 KW Hours (03/08/19 09:30:00)	0.000 0.195	0.116	(02/19/19 12:45:00)	0.000
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Power 2 Avg. KW (03/08/19 09:30:00)	0.000	0.466	(02/19/19 12:45:00)	0.000
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Power 2 KVA Hours (03/08/19 09:30:00)	0.000 0.417	0.249	(02/19/19 12:45:00)	0.000
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Power 2 Min. KVA (03/08/19 09:30:00)	0.000	0.000	(03/08/19 09:30:00)	0.000
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Power 2 Max. KVA (03/08/19 09:30:00)	0.004	8.991	(02/19/19 12:45:00)	0.000
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Power 2 Avg. KVA (03/08/19 09:30:00)	0.001	0.997	(02/19/19 12:45:00)	0.000
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Hilberry Theater (Wire labled studio fan) one line is question marked-Summary.txt  
 Power 2 Min. dPF 1.00 1.00 (03/08/19 09:30:00) 0.40  
 (02/19/19 12:45:00)

Power 2 Max. dPF 1.00 1.00 (03/08/19 09:30:00) 1.00  
 (03/08/19 09:30:00)

Power 2 Avg. dPF 1.00 1.00 (03/08/19 09:30:00) 0.47  
 (02/19/19 13:00:00)

Power 2 THD = 188.297018

Power 3 Min. Volt 121.963 123.331 (03/03/19 00:00:00) 112.855  
 (02/26/19 16:15:00)

Power 3 Max. Volt 122.851 124.102 (02/08/19 03:45:00) 121.467  
 (02/15/19 18:45:00)

Power 3 Avg. Volt 122.540 123.663 (03/03/19 00:00:00) 121.213  
 (02/15/19 19:00:00)

Power 3 Amp Hours 0.001 2.157 (02/19/19 12:45:00) 0.000  
 (03/08/19 09:30:00) 3.607

Power 3 Min. Amp 0.000 0.000 (03/08/19 09:30:00) 0.000  
 (03/08/19 09:30:00)

Power 3 Max. Amp 0.032 81.006 (02/19/19 12:45:00) 0.000  
 (03/08/19 09:30:00)

Power 3 Avg. Amp 0.005 8.630 (02/19/19 12:45:00) 0.000  
 (03/08/19 09:30:00)

Power 3 KW Hours 0.000 0.152 (02/19/19 12:45:00) 0.000  
 (03/08/19 09:30:00) 0.254

Power 3 Avg. KW 0.000 0.608 (02/19/19 12:45:00) 0.000  
 (03/08/19 09:30:00)

Power 3 KVA Hours 0.000 0.263 (02/19/19 12:45:00) 0.000  
 (03/08/19 09:30:00) 0.440

Power 3 Min. KVA 0.000 0.000 (03/08/19 09:30:00) 0.000  
 (03/08/19 09:30:00)

Power 3 Max. KVA 0.004 9.798 (02/19/19 12:45:00) 0.000  
 (03/08/19 09:30:00)

Hilberry Theater (Wire labled studio fan) one line is question marked-Summary.txt

Power 3 Avg. KVA (03/08/19 09:30:00)	0.001	1.050	(02/19/19 12:45:00)	0.000
Power 3 Min. dPF (02/19/19 13:00:00)	1.00	1.00	(03/08/19 09:30:00)	0.51
Power 3 Max. dPF (03/08/19 09:30:00)	1.00	1.00	(03/08/19 09:30:00)	1.00
Power 3 Avg. dPF (02/19/19 13:00:00)	1.00	1.00	(03/08/19 09:30:00)	0.58

Power 3 THD = 141.114171

Power 5 Min. Volt (02/26/19 16:15:00)	122.370	123.588	(03/03/19 00:30:00)	112.834
Power 5 Max. Volt (02/16/19 18:30:00)	123.027	124.209	(02/08/19 03:45:00)	121.746
Power 5 Avg. Volt (02/15/19 19:00:00)	122.790	123.829	(02/08/19 03:45:00)	121.500
Power 5 Amp Hours (03/08/19 09:30:00)	0.001 3.535	2.114	(02/19/19 12:45:00)	0.000
Power 5 Min. Amp (03/08/19 09:30:00)	0.000	0.000	(03/08/19 09:30:00)	0.000
Power 5 Max. Amp (03/08/19 09:30:00)	0.030	76.556	(02/19/19 12:45:00)	0.000
Power 5 Avg. Amp (03/08/19 09:30:00)	0.005	8.455	(02/19/19 12:45:00)	0.000
Power 5 KW Hours (03/08/19 09:30:00)	0.000 0.695	0.415	(02/19/19 12:45:00)	0.000
Power 5 Avg. KW (03/08/19 09:30:00)	0.001	1.662	(02/19/19 12:45:00)	0.000
Power 5 KVA Hours (03/08/19 09:30:00)	0.000 1.294	0.774	(02/19/19 12:45:00)	0.000
Power 5 Min. KVA	0.000	0.000	(03/08/19 09:30:00)	0.000

Hilberry Theater (Wire labled studio fan) one line is question marked-Summary.txt  
(03/08/19 09:30:00)

Power 5 Max. KVA (03/08/19 09:30:00)	0.011	27.857	(02/19/19 12:45:00)	0.000
Power 5 Avg. KVA (03/08/19 09:30:00)	0.002	3.095	(02/19/19 12:45:00)	0.000
Power 5 Min. dPF (02/19/19 12:45:00)	1.00	1.00	(03/08/19 09:30:00)	0.49
Power 5 Max. dPF (03/08/19 09:30:00)	1.00	1.00	(03/08/19 09:30:00)	1.00
Power 5 Avg. dPF (02/19/19 13:00:00)	1.00	1.00	(03/08/19 09:30:00)	0.54

PLEASE NOTE: Results suggest that some values may be distorted by THD.

#### Setup Summary

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Setup Table Description: HT ?? (STUDIO FAN)

Power 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil

Power 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil

Power 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil

Power 5 - Power Sum: 1,2,3

Memory Type: Ring

Line Frequency: 60 Hz

Integration Period: 15 Minutes

#### Logger Summary

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Logger Description Line: 8CDPHB

Logger Serial Number: XC1501039

Logger Type: ELITEpro XC

Hilberry Theater (Wire labled studio fan) one line is question marked-Summary.txt  
Firmware Version: ES400.257



# Hilberry Theatre Chiller-Summary.txt

## Data Summary

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Data File Name: Hilberry Theatre Chiller.ealog

First Data Record End Time: 02/06/19 10:45:00

Last Data Record End Time: 03/08/19 12:30:00

Monitoring Period Duration: 30.08 days

## Peak Demand

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Window Size Min.: 15

Channel KVAR	KW	KVA
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Power 5	0.000 10:42:04 02/06/2019	0.000 10:42:04 02/06/2019
	0.000 10:42:04 02/06/2019	
Power 6	Off	

## Totalizers

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Channel	KWH	-KWH	+KWH	KVAH	KVARH	-KVARH	+KVARH
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Power 5	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Channel Time)	Total	Average	Maximum (Date Time)	Minimum (Date
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# Hilberry Theatre Chiller-Summary.txt

Power 1 Min. Volt (02/26/19 16:30:00)	122.498	123.746	(02/09/19 01:00:00)	113.047
Power 1 Max. Volt (02/16/19 18:45:00)	123.304	124.520	(02/09/19 01:15:00)	121.877
Power 1 Avg. Volt (02/16/19 18:45:00)	122.961	124.114	(02/09/19 01:00:00)	121.612
Power 1 Amp Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 Min. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 Max. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 Avg. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 KW Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 Avg. KW (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 KVA Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 Min. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 Max. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 Avg. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 1 Min. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00
Power 1 Max. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00

Hilberry Theatre Chiller-Summary.txt

Power 1 Avg. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00
Power 2 Min. Volt (02/26/19 16:30:00)	122.388	123.617	(03/03/19 00:30:00)	112.725
Power 2 Max. Volt (02/15/19 18:45:00)	123.198	124.326	(02/08/19 04:00:00)	121.748
Power 2 Avg. Volt (02/15/19 18:45:00)	122.905	123.988	(02/08/19 03:15:00)	121.471
Power 2 Amp Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 Min. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 Max. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 Avg. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 KW Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 Avg. KW (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 KVA Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 Min. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 Max. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 Avg. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 2 Min. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00

Hilberry Theatre Chiller-Summary.txt

Power 2 Max. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00
Power 2 Avg. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00
Power 3 Min. Volt (02/26/19 16:30:00)	121.994	123.230	(03/03/19 00:30:00)	112.918
Power 3 Max. Volt (02/15/19 19:00:00)	122.915	124.133	(02/08/19 04:00:00)	121.555
Power 3 Avg. Volt (02/15/19 19:00:00)	122.599	123.738	(03/03/19 00:00:00)	121.274
Power 3 Amp Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 Min. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 Max. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 Avg. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 KW Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 Avg. KW (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 KVA Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 Min. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 Max. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 Avg. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 3 Min. dPF	1.00	1.00	(03/08/19 12:30:00)	1.00



Hilberry Theatre Chiller-Summary.txt

(03/08/19 12:30:00)

Power 3 Max. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00
Power 3 Avg. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00
Power 5 Min. Volt (02/26/19 16:30:00)	122.404	123.660	(02/08/19 03:30:00)	112.897
Power 5 Max. Volt (02/15/19 18:45:00)	123.054	124.219	(02/08/19 04:00:00)	121.705
Power 5 Avg. Volt (02/15/19 18:45:00)	122.822	123.864	(02/08/19 03:30:00)	121.509
Power 5 Amp Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 5 Min. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 5 Max. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 5 Avg. Amp (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 5 KW Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 5 Avg. KW (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 5 KVA Hours (03/08/19 12:30:00)	0.000 0.000	0.000	(03/08/19 12:30:00)	0.000
Power 5 Min. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 5 Max. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000
Power 5 Avg. KVA (03/08/19 12:30:00)	0.000	0.000	(03/08/19 12:30:00)	0.000

# Hilberry Theatre Chiller-Summary.txt

Power 5 Min. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00
Power 5 Max. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00
Power 5 Avg. dPF (03/08/19 12:30:00)	1.00	1.00	(03/08/19 12:30:00)	1.00

## Setup Summary

-----

Setup Table Description: HT CHILLER

Power 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil  
Power 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil  
Power 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil  
Power 5 - Power Sum: 1,2,3

Memory Type: Ring  
Line Frequency: 60 Hz  
Integration Period: 15 Minutes

## Logger Summary

-----

Logger Description Line: 8DPHB  
Logger Serial Number: XC1501021  
Logger Type: ELITEpro XC  
Firmware Version: ES400.257

# Hilberry Theatre LP-F-Summary.txt

## Data Summary

-----

Data File Name: Hilberry Theatre LP-F.ealog

First Data Record End Time: 02/06/19 12:45:00

Last Data Record End Time: 03/08/19 07:45:00

Monitoring Period Duration: 29.80 days

Peak Demand

-----

Window Size Min.: 15

Channel	KW	KVA
KVAR		
-----	-----	-----
Power 5	7.826 17:37:29 02/08/2019	8.412 17:34:29 02/21/2019
1.078 18:08:29 02/14/2019		
Power 6	Off	

## Totalizers

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Channel	KWH	-KWH	+KWH	KVAH	KVARH	-KVARH	+KVARH
-----	-----	-----	-----	-----	-----	-----	-----
Power 5	1042.618	0.000	1042.618	1099.465	100.232	-6.117	106.349

Channel Time)	Total	Average	Maximum (Date Time)	Minimum (Date
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Hilberry Theatre LP-F-Summary.txt

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-----
Power 1 Min. Volt      122.080  123.647  (02/09/19 00:30:00)  112.867
(02/26/19 16:15:00)

Power 1 Max. Volt      123.226  124.492  (02/09/19 01:00:00)  121.764
(02/15/19 18:30:00)

Power 1 Avg. Volt      122.736  123.976  (02/09/19 00:30:00)  121.299
(02/14/19 18:15:00)

Power 1 Amp Hours      0.640    6.998  (02/08/19 18:30:00)    0.000
(03/07/19 23:30:00)  1831.267

Power 1 Min. Amp       1.626   27.680  (02/08/19 18:30:00)    0.000
(03/08/19 01:30:00)

Power 1 Max. Amp       12.085   48.656  (02/09/19 12:45:00)    0.000
(03/07/19 23:30:00)

Power 1 Avg. Amp       2.560   27.991  (02/08/19 18:30:00)    0.000
(03/07/19 23:30:00)

Power 1 KW Hours       0.075    0.817  (02/08/19 18:30:00)    0.000
(03/08/19 01:15:00)  214.366

Power 1 Avg. KW        0.300    3.269  (02/08/19 18:30:00)    0.000
(03/08/19 01:15:00)

Power 1 KVA Hours      0.078    0.855  (02/12/19 15:15:00)    0.000
(03/08/19 01:15:00)  224.069

Power 1 Min. KVA       0.199    3.340  (02/08/19 18:30:00)    0.000
(03/08/19 01:30:00)

Power 1 Max. KVA       1.476    5.896  (02/09/19 12:45:00)    0.000
(03/07/19 23:30:00)

Power 1 Avg. KVA       0.314    3.421  (02/12/19 15:15:00)    0.000
(03/08/19 01:15:00)

Power 1 Min. dPF       0.73     1.00   (03/07/19 23:30:00)   -1.00
(03/06/19 07:15:00)

Power 1 Max. dPF       0.96     1.00   (03/08/19 07:45:00)   -1.00
(02/25/19 10:30:00)

```

Hilberry Theatre LP-F-Summary.txt

Power 1 Avg. dPF (03/05/19 06:45:00)	0.97	1.00	(03/08/19 07:30:00)	-0.99
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Power 1 THD = 15.366140

Power 2 Min. Volt (02/26/19 16:15:00)	121.919	123.193	(03/03/19 00:15:00)	112.218
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Power 2 Max. Volt (02/15/19 18:30:00)	122.780	123.972	(02/08/19 03:45:00)	120.790
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Power 2 Avg. Volt (02/15/19 18:30:00)	122.459	123.630	(02/08/19 03:30:00)	120.448
------------------------------------------	---------	---------	---------------------	---------

Power 2 Amp Hours (02/25/19 06:15:00)	1.303 3727.548	8.389	(02/21/19 17:30:00)	0.000
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Power 2 Min. Amp (03/07/19 16:00:00)	4.595	33.238	(02/21/19 16:30:00)	0.000
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Power 2 Max. Amp (02/25/19 06:15:00)	8.098	51.497	(02/21/19 16:15:00)	0.000
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Power 2 Avg. Amp (02/25/19 06:15:00)	5.211	33.554	(02/21/19 17:30:00)	0.000
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Power 2 KW Hours (02/25/19 06:15:00)	0.154 441.490	0.909	(02/21/19 17:30:00)	0.000
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Power 2 Avg. KW (02/25/19 06:15:00)	0.617	3.636	(02/21/19 17:30:00)	0.000
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Power 2 KVA Hours (02/25/19 06:15:00)	0.159 455.959	1.020	(02/21/19 16:30:00)	0.000
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Power 2 Min. KVA (03/07/19 16:00:00)	0.562	4.029	(02/21/19 16:30:00)	0.000
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Power 2 Max. KVA (02/25/19 06:15:00)	0.989	6.207	(02/21/19 16:15:00)	0.000
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Power 2 Avg. KVA (02/25/19 06:15:00)	0.637	4.082	(02/21/19 16:30:00)	0.000
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Power 2 Min. dPF	0.11	1.00	(03/02/19 13:15:00)	-1.00
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Hilberry Theatre LP-F-Summary.txt

(03/08/19 07:45:00)

Power 2 Max. dPF (03/07/19 23:45:00)	0.92	1.00	(03/08/19 07:45:00)	-1.00
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Power 2 Avg. dPF (03/07/19 16:00:00)	0.98	1.00	(03/08/19 07:45:00)	-0.99
-----------------------------------------	------	------	---------------------	-------

Power 2 THD = 18.062392

Power 3 Min. Volt (02/26/19 16:15:00)	121.300	123.063	(03/03/19 00:00:00)	112.672
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Power 3 Max. Volt (02/15/19 18:45:00)	122.567	123.712	(03/03/19 00:30:00)	120.660
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Power 3 Avg. Volt (02/15/19 18:45:00)	122.192	123.422	(03/02/19 23:45:00)	120.317
------------------------------------------	---------	---------	---------------------	---------

Power 3 Amp Hours (02/25/19 12:30:00)	1.199 3431.491	5.450	(02/08/19 19:00:00)	0.000
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Power 3 Min. Amp (02/27/19 12:30:00)	4.294	16.444	(02/24/19 11:30:00)	0.000
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Power 3 Max. Amp (02/25/19 12:30:00)	7.211	48.537	(02/09/19 19:30:00)	0.000
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Power 3 Avg. Amp (02/25/19 12:30:00)	4.798	21.798	(02/08/19 19:00:00)	0.000
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Power 3 KW Hours (02/25/19 12:30:00)	0.135 386.293	0.644	(02/08/19 19:00:00)	0.000
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Power 3 Avg. KW (02/25/19 12:30:00)	0.540	2.576	(02/08/19 19:00:00)	0.000
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Power 3 KVA Hours (02/25/19 12:30:00)	0.146 418.955	0.659	(02/08/19 19:00:00)	0.000
------------------------------------------	------------------	-------	---------------------	-------

Power 3 Min. KVA (02/27/19 12:30:00)	0.523	1.999	(02/24/19 11:30:00)	0.000
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Power 3 Max. KVA (02/25/19 12:30:00)	0.879	5.806	(02/09/19 19:30:00)	0.000
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Hilberry Theatre LP-F-Summary.txt

Power 3 Avg. KVA (02/25/19 12:30:00)	0.586	2.635	(02/08/19 19:00:00)	0.000
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Power 3 Min. dPF (02/19/19 18:00:00)	0.77	1.00	(02/25/19 12:30:00)	-1.00
-----------------------------------------	------	------	---------------------	-------

Power 3 Max. dPF (02/24/19 17:30:00)	0.97	1.00	(03/07/19 16:00:00)	-1.00
-----------------------------------------	------	------	---------------------	-------

Power 3 Avg. dPF (02/23/19 19:30:00)	0.97	1.00	(02/25/19 12:30:00)	-0.99
-----------------------------------------	------	------	---------------------	-------

Power 3 THD = 32.986980

Power 5 Min. Volt (02/26/19 16:15:00)	121.997	123.258	(02/08/19 03:15:00)	112.586
------------------------------------------	---------	---------	---------------------	---------

Power 5 Max. Volt (02/15/19 18:30:00)	122.711	123.972	(02/08/19 03:45:00)	121.006
------------------------------------------	---------	---------	---------------------	---------

Power 5 Avg. Volt (02/15/19 18:30:00)	122.462	123.548	(02/08/19 03:15:00)	120.771
------------------------------------------	---------	---------	---------------------	---------

Power 5 Amp Hours (02/25/19 06:00:00)	1.047 2996.720	5.737	(02/21/19 17:30:00)	0.000
------------------------------------------	-------------------	-------	---------------------	-------

Power 5 Min. Amp (02/25/19 06:30:00)	3.538	22.542	(02/21/19 17:30:00)	0.000
-----------------------------------------	-------	--------	---------------------	-------

Power 5 Max. Amp (02/25/19 02:15:00)	8.475	38.278	(02/08/19 18:45:00)	0.000
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Power 5 Avg. Amp (02/25/19 02:15:00)	4.190	22.949	(02/21/19 17:30:00)	0.000
-----------------------------------------	-------	--------	---------------------	-------

Power 5 KW Hours (02/25/19 06:15:00)	0.364 1042.315	1.943	(02/08/19 17:30:00)	0.000
-----------------------------------------	-------------------	-------	---------------------	-------

Power 5 Avg. KW (02/25/19 06:00:00)	1.457	7.774	(02/08/19 17:30:00)	0.000
----------------------------------------	-------	-------	---------------------	-------

Power 5 KVA Hours (02/25/19 06:15:00)	0.384 1099.156	2.099	(02/21/19 17:30:00)	0.000
------------------------------------------	-------------------	-------	---------------------	-------

Power 5 Min. KVA (02/25/19 06:30:00)	1.297	8.215	(02/21/19 17:30:00)	0.000
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# Hilberry Theatre LP-F-Summary.txt

Power 5 Max. KVA (02/25/19 02:15:00)	3.105	13.868	(02/08/19 18:45:00)	0.000
Power 5 Avg. KVA (02/25/19 06:00:00)	1.537	8.398	(02/21/19 17:30:00)	0.000
Power 5 Min. dPF (02/25/19 08:30:00)	0.92	1.00	(03/04/19 07:15:00)	-0.99
Power 5 Max. dPF (02/16/19 18:30:00)	1.00	1.00	(03/08/19 07:45:00)	0.96
Power 5 Avg. dPF (02/15/19 00:00:00)	0.99	1.00	(03/07/19 15:45:00)	0.79

PLEASE NOTE: Results suggest that some values may be distorted by THD.

## Setup Summary

-----

Setup Table Description: HT LP-F

Power 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 5 - Power Sum: 1,2,3

Memory Type: Ring  
 Line Frequency: 60 Hz  
 Integration Period: 15 Minutes

## Logger Summary

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Logger Description Line: GME-8B  
 Logger Serial Number: XC1408051  
 Logger Type: ELITEpro XC  
 Firmware Version: ES400.257

# Hilberry Theatre LP-G-Summary.txt

## Data Summary

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Data File Name: Hilberry Theatre LP-G.ealog

First Data Record End Time: 02/06/19 10:15:00

Last Data Record End Time: 03/08/19 11:15:00

Monitoring Period Duration: 30.05 days

Peak Demand

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Window Size Min.: 15

Channel	KW	KVA
KVAR		
-----	-----	-----
-----	-----	-----
Power 5	9.049 17:09:44 02/24/2019	9.102 17:09:44 02/24/2019
0.584 10:55:44 03/07/2019		
Power 6	Off	

## Totalizers

-----

Channel	KWH	-KWH	+KWH	KVAH	KVARH	-KVARH	+KVARH
-----	-----	-----	-----	-----	-----	-----	-----
Power 5	1721.331	0.000	1721.331	1787.122	144.206	-1.977	146.182

Channel Time)	Total	Average	Maximum (Date Time)	Minimum (Date
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Hilberry Theatre LP-G-Summary.txt

Power 1 Min. Volt (02/22/19 13:00:00)	122.403	123.820	(02/09/19 00:45:00)	0.000
Power 1 Max. Volt (02/16/19 18:30:00)	123.244	124.400	(02/09/19 00:45:00)	121.755
Power 1 Avg. Volt (02/16/19 18:30:00)	122.913	124.129	(02/09/19 00:45:00)	121.516
Power 1 Amp Hours (03/08/19 09:00:00)	2.215 6389.320	9.366	(02/08/19 20:30:00)	0.000
Power 1 Min. Amp (03/08/19 11:15:00)	7.347	36.275	(02/08/19 20:30:00)	0.000
Power 1 Max. Amp (03/08/19 09:00:00)	17.563	55.330	(02/08/19 23:00:00)	0.000
Power 1 Avg. Amp (03/08/19 09:00:00)	8.859	37.463	(02/08/19 20:30:00)	0.000
Power 1 KW Hours (03/08/19 09:00:00)	0.270 780.293	1.150	(02/08/19 20:30:00)	0.000
Power 1 Avg. KW (03/08/19 09:00:00)	1.082	4.599	(02/08/19 20:30:00)	0.000
Power 1 KVA Hours (03/08/19 09:00:00)	0.272 784.742	1.151	(02/08/19 20:30:00)	0.000
Power 1 Min. KVA (03/08/19 11:15:00)	0.902	4.449	(02/08/19 20:30:00)	0.000
Power 1 Max. KVA (03/08/19 09:00:00)	2.156	6.826	(02/08/19 23:00:00)	0.000
Power 1 Avg. KVA (03/08/19 09:00:00)	1.088	4.604	(02/08/19 20:30:00)	0.000
Power 1 Min. dPF (03/07/19 11:45:00)	0.75	1.00	(03/08/19 09:00:00)	-1.00
Power 1 Max. dPF (03/01/19 08:15:00)	0.99	1.00	(03/08/19 11:15:00)	-1.00



Hilberry Theatre LP-G-Summary.txt

Power 1 Avg. dPF (02/22/19 05:45:00)	1.00	1.00	(03/08/19 11:15:00)	-0.99
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Power 1 THD = 4.560918

Power 2 Min. Volt (02/26/19 16:00:00)	122.334	123.561	(03/03/19 00:15:00)	112.915
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Power 2 Max. Volt (02/15/19 18:30:00)	123.172	124.271	(02/08/19 03:45:00)	121.819
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Power 2 Avg. Volt (02/15/19 18:30:00)	122.870	123.967	(02/08/19 03:00:00)	121.501
------------------------------------------	---------	---------	---------------------	---------

Power 2 Amp Hours (03/08/19 11:15:00)	0.627 1808.485	5.252	(02/14/19 18:30:00)	0.000
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Power 2 Min. Amp (03/08/19 11:15:00)	2.241	20.601	(02/14/19 18:30:00)	0.000
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Power 2 Max. Amp (03/08/19 11:15:00)	2.868	37.106	(02/14/19 17:45:00)	0.000
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Power 2 Avg. Amp (03/08/19 11:15:00)	2.507	21.007	(02/14/19 18:30:00)	0.000
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Power 2 KW Hours (03/08/19 11:15:00)	0.076 218.481	0.637	(02/14/19 18:30:00)	0.000
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Power 2 Avg. KW (03/08/19 11:15:00)	0.303	2.549	(02/14/19 18:30:00)	0.000
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Power 2 KVA Hours (03/08/19 11:15:00)	0.077 222.020	0.639	(02/14/19 18:30:00)	0.000
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Power 2 Min. KVA (03/08/19 11:15:00)	0.275	2.500	(02/14/19 18:30:00)	0.000
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Power 2 Max. KVA (03/08/19 11:15:00)	0.352	4.532	(02/14/19 17:45:00)	0.000
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Power 2 Avg. KVA (03/08/19 11:15:00)	0.308	2.557	(02/14/19 18:30:00)	0.000
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Power 2 Min. dPF	0.79	1.00	(03/08/19 11:15:00)	-1.00
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Hilberry Theatre LP-G-Summary.txt

(03/06/19 14:30:00)

Power 2 Max. dPF (03/08/19 11:15:00)	1.00	1.00	(03/08/19 11:15:00)	1.00
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Power 2 Avg. dPF (02/20/19 22:30:00)	1.00	1.00	(03/08/19 11:15:00)	-0.99
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Power 2 THD = 17.885144

Power 3 Min. Volt (02/26/19 16:00:00)	122.109	123.368	(03/02/19 23:45:00)	113.109
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Power 3 Max. Volt (02/15/19 18:30:00)	123.001	124.207	(02/08/19 03:45:00)	121.626
------------------------------------------	---------	---------	---------------------	---------

Power 3 Avg. Volt (02/15/19 18:30:00)	122.686	123.824	(03/02/19 23:45:00)	121.362
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Power 3 Amp Hours (03/03/19 16:15:00)	2.205 6362.688	7.237	(02/08/19 18:00:00)	0.000
------------------------------------------	-------------------	-------	---------------------	-------

Power 3 Min. Amp (03/08/19 11:15:00)	4.446	23.584	(02/22/19 18:15:00)	0.000
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Power 3 Max. Amp (03/03/19 12:00:00)	14.783	46.821	(02/09/19 14:45:00)	0.000
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Power 3 Avg. Amp (03/03/19 12:00:00)	8.822	28.947	(02/08/19 18:00:00)	0.000
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Power 3 KW Hours (03/03/19 16:15:00)	0.250 722.290	0.877	(02/08/19 18:00:00)	0.000
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Power 3 Avg. KW (03/03/19 16:15:00)	1.001	3.509	(02/08/19 18:00:00)	0.000
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Power 3 KVA Hours (03/03/19 16:15:00)	0.270 780.081	0.882	(02/08/19 18:00:00)	0.000
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Power 3 Min. KVA (03/08/19 11:15:00)	0.545	2.873	(02/22/19 18:15:00)	0.000
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Power 3 Max. KVA (03/03/19 12:00:00)	1.813	5.749	(02/09/19 14:45:00)	0.000
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Hilberry Theatre LP-G-Summary.txt

Power 3 Avg. KVA (03/03/19 16:15:00)	1.082	3.526	(02/08/19 18:00:00)	0.000
Power 3 Min. dPF (03/08/19 09:45:00)	0.74	1.00	(03/08/19 09:15:00)	-1.00
Power 3 Max. dPF (03/06/19 14:00:00)	0.97	1.00	(03/08/19 11:15:00)	-1.00
Power 3 Avg. dPF (02/25/19 06:00:00)	0.96	1.00	(03/08/19 11:15:00)	0.70
Power 3 THD = 28.736292				
Power 5 Min. Volt (02/22/19 13:00:00)	122.388	123.647	(02/08/19 03:00:00)	81.815
Power 5 Max. Volt (02/15/19 18:30:00)	123.058	124.207	(02/08/19 03:45:00)	121.712
Power 5 Avg. Volt (02/15/19 18:30:00)	122.823	123.877	(02/09/19 00:45:00)	121.524
Power 5 Amp Hours (03/03/19 15:15:00)	1.682 4853.548	6.152	(02/24/19 17:15:00)	0.000
Power 5 Min. Amp (03/08/19 11:15:00)	4.712	24.222	(02/24/19 17:15:00)	0.000
Power 5 Max. Amp (02/25/19 06:15:00)	10.887	32.314	(02/08/19 23:00:00)	0.000
Power 5 Avg. Amp (03/03/19 13:30:00)	6.729	24.607	(02/24/19 17:15:00)	0.000
Power 5 KW Hours (03/03/19 16:15:00)	0.597 1721.146	2.255	(02/24/19 17:15:00)	0.000
Power 5 Avg. KW (03/03/19 15:00:00)	2.386	9.021	(02/24/19 17:15:00)	0.000
Power 5 KVA Hours (03/03/19 16:15:00)	0.619 1786.915	2.269	(02/24/19 17:15:00)	0.000
Power 5 Min. KVA (03/08/19 11:15:00)	1.734	8.917	(02/24/19 17:15:00)	0.000

# Hilberry Theatre LP-G-Summary.txt

Power 5 Max. KVA (02/25/19 06:15:00)	4.008	11.941	(02/08/19 23:00:00)	0.000
Power 5 Avg. KVA (03/03/19 15:00:00)	2.478	9.074	(02/24/19 17:15:00)	0.000
Power 5 Min. dPF (03/07/19 19:45:00)	0.83	1.00	(03/08/19 07:00:00)	-0.99
Power 5 Max. dPF (02/25/19 03:15:00)	1.00	1.00	(03/08/19 11:15:00)	0.79
Power 5 Avg. dPF (02/25/19 06:00:00)	0.98	1.00	(03/08/19 11:15:00)	0.70

PLEASE NOTE: Results suggest that some values may be distorted by THD.

## Setup Summary

-----

Setup Table Description: HT LP-G

Power 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 5 - Power Sum: 1,2,3

Memory Type: Ring  
 Line Frequency: 60 Hz  
 Integration Period: 15 Minutes

## Logger Summary

-----

Logger Description Line: DENT ELITEpro XC  
 Logger Serial Number: XC1501032  
 Logger Type: ELITEpro XC  
 Firmware Version: ES400.257

# Hilberry Theatre LP-H-Summary.txt

## Data Summary

-----

Data File Name: Hilberry Theatre LP-H.ealog

First Data Record End Time: 02/06/19 10:15:00

Last Data Record End Time: 03/08/19 10:00:00

Monitoring Period Duration: 30.00 days

## Peak Demand

-----

Window Size Min.: 15

Channel	KW	KVA
KVAR		
-----	-----	-----
-----	-----	-----
Power 5	2.185 00:36:35 02/25/2019	2.247 00:36:35 02/25/2019
-0.206 15:54:35 02/22/2019		
Power 6	Off	

## Totalizers

-----

Channel	KWH	-KWH	+KWH	KVAH	KVARH	-KVARH	+KVARH
-----	-----	-----	-----	-----	-----	-----	-----
Power 5	914.994	-0.000	914.994	948.583	-4.285	-34.509	30.224

Channel	Average	Maximum	(Date Time)	Minimum	(Date
Time)	Total				



Hilberry Theatre LP-H-Summary.txt

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-----
-----
Power 1 Min. Volt      122.459  123.698  (02/09/19 01:00:00)  113.009
(02/26/19 16:30:00)

Power 1 Max. Volt      123.256  124.470  (02/09/19 01:00:00)  121.766
(02/16/19 19:00:00)

Power 1 Avg. Volt      122.929  124.075  (02/09/19 01:00:00)  121.523
(02/16/19 18:45:00)

Power 1 Amp Hours      1.321    2.118  (02/23/19 23:15:00)   0.000
(03/08/19 10:00:00)  3803.749

Power 1 Min. Amp        4.983    8.103  (03/03/19 02:00:00)   0.000
(03/08/19 10:00:00)

Power 1 Max. Amp        5.625   26.363  (02/06/19 15:45:00)   0.000
(03/08/19 10:00:00)

Power 1 Avg. Amp        5.283    8.471  (02/23/19 23:15:00)   0.000
(03/08/19 10:00:00)

Power 1 KW Hours        0.158    0.253  (02/23/19 23:15:00)   0.000
(03/08/19 10:00:00)  454.556

Power 1 Avg. KW         0.631    1.011  (02/23/19 23:15:00)   0.000
(03/08/19 10:00:00)

Power 1 KVA Hours       0.162    0.259  (02/23/19 23:15:00)   0.000
(03/08/19 10:00:00)  467.534

Power 1 Min. KVA        0.612    0.999  (02/14/19 01:30:00)   0.000
(03/08/19 10:00:00)

Power 1 Max. KVA        0.691    3.244  (02/06/19 15:45:00)   0.000
(03/08/19 10:00:00)

Power 1 Avg. KVA        0.649    1.038  (02/23/19 23:15:00)   0.000
(03/08/19 10:00:00)

Power 1 Min. dPF        -0.29    1.00   (03/08/19 10:00:00)  -1.00
(03/02/19 07:30:00)

Power 1 Max. dPF        0.33     1.00   (03/08/19 10:00:00)  -1.00
(03/07/19 19:00:00)

```

# Hilberry Theatre LP-H-Summary.txt

Power 1 Avg. dPF (03/07/19 17:45:00)	1.00	1.00	(03/08/19 10:00:00)	-0.99
-----------------------------------------	------	------	---------------------	-------

Power 1 THD = 23.710116

Power 2 Min. Volt (02/26/19 16:30:00)	122.359	123.633	(03/03/19 00:30:00)	112.751
------------------------------------------	---------	---------	---------------------	---------

Power 2 Max. Volt (02/15/19 18:45:00)	123.199	124.277	(02/08/19 04:00:00)	121.702
------------------------------------------	---------	---------	---------------------	---------

Power 2 Avg. Volt (02/15/19 18:45:00)	122.899	123.976	(02/08/19 03:15:00)	121.462
------------------------------------------	---------	---------	---------------------	---------

Power 2 Amp Hours (03/08/19 10:00:00)	1.358 3912.356	2.475	(02/19/19 06:00:00)	0.000
------------------------------------------	-------------------	-------	---------------------	-------

Power 2 Min. Amp (03/08/19 10:00:00)	4.475	9.633	(02/19/19 06:15:00)	0.000
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Power 2 Max. Amp (03/08/19 10:00:00)	7.802	40.684	(02/13/19 15:45:00)	0.000
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Power 2 Avg. Amp (03/08/19 10:00:00)	5.434	9.901	(02/19/19 06:00:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 2 KW Hours (03/08/19 10:00:00)	0.160 460.434	0.295	(02/25/19 03:00:00)	0.000
-----------------------------------------	------------------	-------	---------------------	-------

Power 2 Avg. KW (03/08/19 10:00:00)	0.639	1.182	(02/24/19 23:30:00)	0.000
----------------------------------------	-------	-------	---------------------	-------

Power 2 KVA Hours (03/08/19 10:00:00)	0.167 481.040	0.304	(02/25/19 00:30:00)	0.000
------------------------------------------	------------------	-------	---------------------	-------

Power 2 Min. KVA (03/08/19 10:00:00)	0.550	1.180	(02/24/19 23:30:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 2 Max. KVA (03/08/19 10:00:00)	0.959	5.006	(02/13/19 15:45:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 2 Avg. KVA (03/08/19 10:00:00)	0.668	1.215	(02/24/19 23:30:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 2 Min. dPF	0.20	1.00	(03/08/19 10:00:00)	-1.00
------------------	------	------	---------------------	-------

Hilberry Theatre LP-H-Summary.txt

(02/25/19 06:30:00)

Power 2 Max. dPF (03/07/19 06:00:00)	0.90	1.00	(03/08/19 10:00:00)	-1.00
-----------------------------------------	------	------	---------------------	-------

Power 2 Avg. dPF (02/24/19 15:45:00)	1.00	1.00	(03/08/19 10:00:00)	-0.99
-----------------------------------------	------	------	---------------------	-------

Power 2 THD = 29.075922

Power 3 Min. Volt (02/26/19 16:30:00)	122.006	123.247	(03/03/19 00:00:00)	113.009
------------------------------------------	---------	---------	---------------------	---------

Power 3 Max. Volt (02/16/19 18:30:00)	122.894	124.084	(02/08/19 04:00:00)	121.573
------------------------------------------	---------	---------	---------------------	---------

Power 3 Avg. Volt (02/15/19 19:00:00)	122.582	123.703	(03/03/19 00:00:00)	121.259
------------------------------------------	---------	---------	---------------------	---------

Power 3 Amp Hours (03/08/19 10:00:00)	0.000 0.000	0.000	(03/08/19 10:00:00)	0.000
------------------------------------------	----------------	-------	---------------------	-------

Power 3 Min. Amp (03/08/19 10:00:00)	0.000	0.000	(03/08/19 10:00:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 3 Max. Amp (03/08/19 10:00:00)	0.000	0.000	(03/08/19 10:00:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 3 Avg. Amp (03/08/19 10:00:00)	0.000	0.000	(03/08/19 10:00:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 3 KW Hours (03/08/19 10:00:00)	0.000 0.000	0.000	(03/08/19 10:00:00)	0.000
-----------------------------------------	----------------	-------	---------------------	-------

Power 3 Avg. KW (03/08/19 10:00:00)	0.000	0.000	(03/08/19 10:00:00)	0.000
----------------------------------------	-------	-------	---------------------	-------

Power 3 KVA Hours (03/08/19 10:00:00)	0.000 0.000	0.000	(03/08/19 10:00:00)	0.000
------------------------------------------	----------------	-------	---------------------	-------

Power 3 Min. KVA (03/08/19 10:00:00)	0.000	0.000	(03/08/19 10:00:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 3 Max. KVA (03/08/19 10:00:00)	0.000	0.000	(03/08/19 10:00:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Hilberry Theatre LP-H-Summary.txt

Power 3 Avg. KVA (03/08/19 10:00:00)	0.000	0.000	(03/08/19 10:00:00)	0.000
Power 3 Min. dPF (03/08/19 10:00:00)	1.00	1.00	(03/08/19 10:00:00)	1.00
Power 3 Max. dPF (03/08/19 10:00:00)	1.00	1.00	(03/08/19 10:00:00)	1.00
Power 3 Avg. dPF (03/08/19 10:00:00)	1.00	1.00	(03/08/19 10:00:00)	1.00
Power 5 Min. Volt (02/26/19 16:30:00)	122.380	123.590	(03/03/19 00:00:00)	112.923
Power 5 Max. Volt (02/15/19 18:45:00)	123.036	124.191	(02/08/19 04:00:00)	121.680
Power 5 Avg. Volt (02/15/19 18:45:00)	122.803	123.817	(02/09/19 01:00:00)	121.474
Power 5 Amp Hours (03/08/19 10:00:00)	0.893 2572.035	1.517	(02/19/19 06:00:00)	0.000
Power 5 Min. Amp (03/08/19 10:00:00)	3.201	5.905	(02/19/19 06:15:00)	0.000
Power 5 Max. Amp (03/08/19 10:00:00)	4.404	13.561	(02/13/19 15:45:00)	0.000
Power 5 Avg. Amp (03/08/19 10:00:00)	3.572	6.067	(02/19/19 06:00:00)	0.000
Power 5 KW Hours (03/08/19 10:00:00)	0.318 914.991	0.546	(02/25/19 02:30:00)	0.000
Power 5 Avg. KW (03/08/19 10:00:00)	1.271	2.182	(02/25/19 02:30:00)	0.000
Power 5 KVA Hours (03/08/19 10:00:00)	0.329 948.585	0.561	(02/25/19 02:30:00)	0.000
Power 5 Min. KVA (03/08/19 10:00:00)	1.180	2.177	(02/24/19 23:30:00)	0.000
Power 5 Max. KVA	1.624	5.006	(02/13/19 15:45:00)	0.000

# Hilberry Theatre LP-H-Summary.txt

(03/08/19 10:00:00)

Power 5 Avg. KVA (03/08/19 10:00:00)	1.317	2.245	(02/25/19 02:30:00)	0.000
Power 5 Min. dPF (03/08/19 06:15:00)	-0.05	1.00	(03/08/19 10:00:00)	-0.99
Power 5 Max. dPF (03/08/19 10:00:00)	1.00	1.00	(03/08/19 10:00:00)	1.00
Power 5 Avg. dPF (02/24/19 16:30:00)	1.00	1.00	(03/08/19 10:00:00)	-0.99

## Setup Summary

-----

Setup Table Description: HT LP-H

Power 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 5 - Power Sum: 1,2,3

Memory Type: Ring  
 Line Frequency: 60 Hz  
 Integration Period: 15 Minutes

## Logger Summary

-----

Logger Description Line: DENT ELITEpro XC  
 Logger Serial Number: XC1501036  
 Logger Type: ELITEpro XC  
 Firmware Version: ES400.257



# Hilberry Theatre LP-J-Summary.txt

## Data Summary

-----

Data File Name: Hilberry Theatre LP-J.ealog

First Data Record End Time: 02/06/19 10:00:00

Last Data Record End Time: 03/08/19 10:15:00

Monitoring Period Duration: 30.02 days

Peak Demand

-----

Window Size Min.: 15

Channel	KW	KVA
KVAR		
-----	-----	-----
-----	-----	-----
Power 5	12.839 14:37:51 02/06/2019	12.932 14:37:51 02/06/2019
1.070 14:35:51 02/08/2019		
Power 6	Off	

## Totalizers

-----

Channel	KWH	-KWH	+KWH	KVAH	KVARH	-KVARH	+KVARH
-----	-----	-----	-----	-----	-----	-----	-----
Power 5	1217.825	0.000	1217.825	1275.606	52.166	-17.561	69.726

Channel Time)	Total	Average	Maximum (Date Time)	Minimum (Date
------------------	-------	---------	---------------------	---------------

# Hilberry Theatre LP-J-Summary.txt

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-----
-----
Power 1 Min. Volt      122.472  123.795  (02/09/19 00:45:00)  113.052
(02/26/19 16:30:00)

Power 1 Max. Volt      123.276  124.442  (02/09/19 01:15:00)  121.789
(02/16/19 19:00:00)

Power 1 Avg. Volt      122.941  124.059  (02/09/19 00:45:00)  121.483
(02/16/19 19:00:00)

Power 1 Amp Hours      1.997    11.302  (02/16/19 13:15:00)   0.000
(02/24/19 20:30:00)  5756.648

Power 1 Min. Amp        6.781    41.073  (02/22/19 19:15:00)   0.000
(02/24/19 20:45:00)

Power 1 Max. Amp        13.966    95.584  (02/23/19 19:00:00)   0.000
(02/24/19 20:30:00)

Power 1 Avg. Amp        7.990    45.209  (02/16/19 13:15:00)   0.000
(02/24/19 20:30:00)

Power 1 KW Hours        0.231    1.367  (02/16/19 13:15:00)   0.000
(02/24/19 20:30:00)  665.409

Power 1 Avg. KW         0.924    5.468  (02/16/19 13:15:00)   0.000
(02/24/19 20:30:00)

Power 1 KVA Hours       0.245    1.378  (02/16/19 13:15:00)   0.000
(02/24/19 20:30:00)  707.219

Power 1 Min. KVA        0.833    5.005  (02/22/19 19:15:00)   0.000
(02/24/19 20:45:00)

Power 1 Max. KVA        1.715    11.635  (02/23/19 19:00:00)   0.000
(02/24/19 20:30:00)

Power 1 Avg. KVA        0.982    5.512  (02/16/19 13:15:00)   0.000
(02/24/19 20:30:00)

Power 1 Min. dPF        0.87     1.00   (03/08/19 10:15:00)  -1.00
(02/28/19 18:15:00)

Power 1 Max. dPF        0.98     1.00   (03/08/19 10:15:00)  -1.00
(02/28/19 18:15:00)

```

Hilberry Theatre LP-J-Summary.txt

Power 1 Avg. dPF (02/14/19 15:45:00)	0.98	1.00	(03/08/19 10:15:00)	0.78
-----------------------------------------	------	------	---------------------	------

Power 1 THD = 28.547218

Power 2 Min. Volt (02/26/19 16:30:00)	122.303	123.536	(03/03/19 00:30:00)	112.664
------------------------------------------	---------	---------	---------------------	---------

Power 2 Max. Volt (02/15/19 18:45:00)	123.144	124.248	(02/08/19 04:00:00)	121.724
------------------------------------------	---------	---------	---------------------	---------

Power 2 Avg. Volt (02/15/19 18:45:00)	122.837	123.936	(02/08/19 03:15:00)	121.448
------------------------------------------	---------	---------	---------------------	---------

Power 2 Amp Hours (03/07/19 08:45:00)	0.817 2354.097	9.762	(02/24/19 14:00:00)	0.000
------------------------------------------	-------------------	-------	---------------------	-------

Power 2 Min. Amp (03/07/19 09:00:00)	2.795	32.901	(02/24/19 14:00:00)	0.000
-----------------------------------------	-------	--------	---------------------	-------

Power 2 Max. Amp (03/07/19 08:45:00)	4.138	50.633	(02/16/19 13:15:00)	0.000
-----------------------------------------	-------	--------	---------------------	-------

Power 2 Avg. Amp (03/07/19 08:45:00)	3.267	39.048	(02/24/19 14:00:00)	0.000
-----------------------------------------	-------	--------	---------------------	-------

Power 2 KW Hours (03/07/19 08:45:00)	0.098 281.299	1.193	(02/24/19 14:00:00)	0.000
-----------------------------------------	------------------	-------	---------------------	-------

Power 2 Avg. KW (03/07/19 08:45:00)	0.390	4.774	(02/24/19 14:00:00)	0.000
----------------------------------------	-------	-------	---------------------	-------

Power 2 KVA Hours (03/07/19 08:45:00)	0.100 288.995	1.203	(02/24/19 14:00:00)	0.000
------------------------------------------	------------------	-------	---------------------	-------

Power 2 Min. KVA (03/07/19 09:00:00)	0.343	4.054	(02/24/19 14:00:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 2 Max. KVA (03/07/19 08:45:00)	0.508	6.160	(02/16/19 13:15:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 2 Avg. KVA (03/07/19 08:45:00)	0.401	4.812	(02/24/19 14:00:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 2 Min. dPF	0.49	1.00	(03/07/19 08:45:00)	-1.00
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# Hilberry Theatre LP-J-Summary.txt

(03/04/19 13:00:00)

Power 2 Max. dPF	0.56	1.00	(03/07/19 09:00:00)	-1.00
(03/07/19 10:30:00)				

Power 2 Avg. dPF	1.00	1.00	(03/07/19 08:45:00)	-0.99
(02/24/19 18:15:00)				

Power 2 THD = 21.264492

Power 3 Min. Volt	122.012	123.212	(03/03/19 00:30:00)	112.858
(02/26/19 16:30:00)				

Power 3 Max. Volt	122.906	124.118	(02/08/19 04:00:00)	121.530
(02/16/19 18:45:00)				

Power 3 Avg. Volt	122.589	123.695	(03/03/19 00:15:00)	121.274
(02/15/19 19:15:00)				

Power 3 Amp Hours	0.791	9.057	(02/07/19 18:00:00)	0.000
(03/08/19 10:15:00)	2279.413			

Power 3 Min. Amp	2.651	32.896	(02/06/19 15:15:00)	0.000
(03/08/19 10:15:00)				

Power 3 Max. Amp	4.782	69.402	(02/06/19 13:15:00)	0.000
(03/08/19 10:15:00)				

Power 3 Avg. Amp	3.164	36.228	(02/07/19 18:00:00)	0.000
(03/08/19 10:15:00)				

Power 3 KW Hours	0.094	1.103	(02/06/19 14:45:00)	0.000
(03/08/19 10:15:00)	270.813			

Power 3 Avg. KW	0.376	4.414	(02/06/19 14:45:00)	0.000
(03/08/19 10:15:00)				

Power 3 KVA Hours	0.097	1.107	(02/06/19 14:45:00)	0.000
(03/08/19 10:15:00)	279.106			

Power 3 Min. KVA	0.324	4.022	(02/06/19 15:00:00)	0.000
(03/08/19 10:15:00)				

Power 3 Max. KVA	0.585	8.488	(02/06/19 13:15:00)	0.000
(03/08/19 10:15:00)				

Hilberry Theatre LP-J-Summary.txt

Power 3 Avg. KVA (03/08/19 10:15:00)	0.387	4.428	(02/06/19 14:45:00)	0.000
-----------------------------------------	-------	-------	---------------------	-------

Power 3 Min. dPF (02/27/19 16:30:00)	0.95	1.00	(03/08/19 10:15:00)	-1.00
-----------------------------------------	------	------	---------------------	-------

Power 3 Max. dPF (02/16/19 13:45:00)	0.99	1.00	(03/08/19 10:15:00)	-1.00
-----------------------------------------	------	------	---------------------	-------

Power 3 Avg. dPF (02/15/19 19:00:00)	0.99	1.00	(03/08/19 10:15:00)	0.60
-----------------------------------------	------	------	---------------------	------

Power 3 THD = 18.606068

Power 5 Min. Volt (02/26/19 16:30:00)	122.368	123.557	(02/08/19 03:30:00)	112.858
------------------------------------------	---------	---------	---------------------	---------

Power 5 Max. Volt (02/16/19 18:45:00)	123.029	124.183	(02/08/19 04:00:00)	121.724
------------------------------------------	---------	---------	---------------------	---------

Power 5 Avg. Volt (02/15/19 18:45:00)	122.789	123.839	(02/08/19 04:00:00)	121.469
------------------------------------------	---------	---------	---------------------	---------

Power 5 Amp Hours (02/24/19 20:30:00)	1.202 3463.404	8.627	(02/06/19 14:45:00)	0.000
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Power 5 Min. Amp (02/24/19 20:45:00)	4.130	33.526	(02/06/19 15:00:00)	0.000
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Power 5 Max. Amp (02/24/19 20:30:00)	7.274	51.254	(02/16/19 13:00:00)	0.000
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Power 5 Avg. Amp (02/24/19 20:30:00)	4.807	34.509	(02/06/19 14:45:00)	0.000
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Power 5 KW Hours (02/24/19 20:30:00)	0.422 1217.511	3.147	(02/06/19 14:45:00)	0.000
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Power 5 Avg. KW (02/24/19 20:30:00)	1.690	12.589	(02/06/19 14:45:00)	0.000
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Power 5 KVA Hours (02/24/19 20:30:00)	0.443 1275.314	3.172	(02/06/19 14:45:00)	0.000
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Power 5 Min. KVA (02/24/19 20:45:00)	1.520	12.323	(02/06/19 15:00:00)	0.000
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# Hilberry Theatre LP-J-Summary.txt

Power 5 Max. KVA (02/24/19 20:30:00)	2.677	18.571	(02/16/19 13:00:00)	0.000
Power 5 Avg. KVA (02/24/19 20:30:00)	1.770	12.687	(02/06/19 14:45:00)	0.000
Power 5 Min. dPF (03/07/19 09:00:00)	0.90	1.00	(03/08/19 10:15:00)	-0.99
Power 5 Max. dPF (02/14/19 14:30:00)	0.99	1.00	(03/08/19 10:15:00)	0.80
Power 5 Avg. dPF (02/28/19 14:00:00)	0.98	1.00	(03/08/19 10:15:00)	-0.99

PLEASE NOTE: Results suggest that some values may be distorted by THD.

## Setup Summary

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Setup Table Description: HT LP-J

Power 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil  
Power 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil  
Power 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil  
Power 5 - Power Sum: 1,2,3

Memory Type: Ring  
Line Frequency: 60 Hz  
Integration Period: 15 Minutes

## Logger Summary

-----

Logger Description Line: pmcdr-618  
Logger Serial Number: XC1403120  
Logger Type: ELITEpro XC  
Firmware Version: ES400.257

# Hilberry Theatre LP-K-Summary.txt

## Data Summary

-----

Data File Name: Hilberry Theatre LP-K.ealog

First Data Record End Time: 02/06/19 11:00:00

Last Data Record End Time: 03/08/19 12:00:00

Monitoring Period Duration: 30.05 days

## Peak Demand

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Window Size Min.: 15

Channel KVAR	KW	KVA
-----	-----	-----
Power 5	4.290 08:51:44 02/18/2019	4.385 08:51:44 02/18/2019
	0.707 08:24:44 02/25/2019	
Power 6	Off	

## Totalizers

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Channel	KWH	-KWH	+KWH	KVAH	KVARH	-KVARH	+KVARH
-----	-----	-----	-----	-----	-----	-----	-----
Power 5	1339.800	0.000	1339.800	1379.388	50.059	-40.411	90.470

Channel Time)	Total	Average	Maximum (Date Time)	Minimum (Date
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Hilberry Theatre LP-K-Summary.txt

Power 1 Min. Volt (02/26/19 16:15:00)	122.432	123.623	(02/11/19 03:45:00)	113.104
Power 1 Max. Volt (02/16/19 18:45:00)	123.229	124.402	(02/09/19 01:00:00)	121.740
Power 1 Avg. Volt (02/16/19 18:45:00)	122.899	123.986	(02/09/19 00:30:00)	121.481
Power 1 Amp Hours (03/08/19 12:00:00)	0.981 2830.481	2.540	(02/18/19 08:30:00)	0.000
Power 1 Min. Amp (03/08/19 12:00:00)	3.594	9.955	(02/18/19 08:30:00)	0.000
Power 1 Max. Amp (03/08/19 12:00:00)	4.334	14.945	(02/23/19 18:30:00)	0.000
Power 1 Avg. Amp (03/08/19 12:00:00)	3.924	10.162	(02/18/19 08:30:00)	0.000
Power 1 KW Hours (03/08/19 12:00:00)	0.118 339.868	0.303	(02/18/19 08:30:00)	0.000
Power 1 Avg. KW (03/08/19 12:00:00)	0.471	1.210	(02/18/19 08:30:00)	0.000
Power 1 KVA Hours (03/08/19 12:00:00)	0.120 347.598	0.312	(02/18/19 08:30:00)	0.000
Power 1 Min. KVA (03/08/19 12:00:00)	0.441	1.220	(02/18/19 08:30:00)	0.000
Power 1 Max. KVA (03/08/19 12:00:00)	0.532	1.830	(02/23/19 18:30:00)	0.000
Power 1 Avg. KVA (03/08/19 12:00:00)	0.482	1.246	(02/18/19 08:30:00)	0.000
Power 1 Min. dPF (02/07/19 23:45:00)	-0.04	1.00	(03/08/19 12:00:00)	-1.00
Power 1 Max. dPF (03/01/19 17:00:00)	0.14	1.00	(03/08/19 12:00:00)	-1.00

Hilberry Theatre LP-K-Summary.txt

Power 1 Avg. dPF (03/07/19 21:45:00)	0.99	1.00	(03/08/19 12:00:00)	-0.99
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Power 1 THD = 15.558944

Power 2 Min. Volt (02/24/19 15:00:00)	122.279	123.558	(02/08/19 03:00:00)	116.091
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Power 2 Max. Volt (02/14/19 18:15:00)	123.113	124.207	(02/08/19 03:45:00)	121.805
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Power 2 Avg. Volt (02/15/19 19:00:00)	122.808	123.903	(02/08/19 03:00:00)	121.461
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Power 2 Amp Hours (02/21/19 22:00:00)	2.912 8402.106	6.693	(02/20/19 09:30:00)	0.000
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Power 2 Min. Amp (03/04/19 18:30:00)	10.548	25.567	(03/08/19 08:15:00)	0.000
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Power 2 Max. Amp (02/21/19 22:00:00)	14.166	52.057	(03/05/19 14:30:00)	0.000
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Power 2 Avg. Amp (02/21/19 22:00:00)	11.649	26.771	(02/20/19 09:30:00)	0.000
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Power 2 KW Hours (02/21/19 22:00:00)	0.346 999.203	0.807	(02/20/19 09:30:00)	0.000
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Power 2 Avg. KW (02/21/19 22:00:00)	1.385	3.226	(02/20/19 09:30:00)	0.000
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Power 2 KVA Hours (02/21/19 22:00:00)	0.357 1030.992	0.820	(02/20/19 09:30:00)	0.000
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Power 2 Min. KVA (03/04/19 18:30:00)	1.293	3.130	(03/08/19 07:15:00)	0.000
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Power 2 Max. KVA (02/21/19 22:00:00)	1.739	6.371	(03/05/19 14:30:00)	0.000
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Power 2 Avg. KVA (02/21/19 22:00:00)	1.429	3.280	(02/20/19 09:30:00)	0.000
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Power 2 Min. dPF	0.21	1.00	(03/08/19 02:45:00)	-1.00
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Hilberry Theatre LP-K-Summary.txt

(03/08/19 06:30:00)

Power 2 Max. dPF (02/25/19 05:45:00)	0.99	1.00	(03/08/19 12:00:00)	-1.00
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Power 2 Avg. dPF (02/26/19 06:30:00)	0.99	1.00	(03/08/19 12:00:00)	0.92
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Power 2 THD = 19.724114

Power 3 Min. Volt (02/26/19 16:15:00)	121.965	123.168	(03/03/19 00:15:00)	113.234
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Power 3 Max. Volt (02/16/19 18:30:00)	122.854	124.077	(02/08/19 03:45:00)	121.480
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Power 3 Avg. Volt (02/15/19 19:00:00)	122.539	123.641	(03/03/19 00:00:00)	121.236
------------------------------------------	---------	---------	---------------------	---------

Power 3 Amp Hours (03/08/19 12:00:00)	0.002 5.638	0.463	(02/26/19 14:45:00)	0.000
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Power 3 Min. Amp (03/08/19 12:00:00)	0.000	0.000	(03/08/19 12:00:00)	0.000
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Power 3 Max. Amp (03/08/19 12:00:00)	0.202	10.900	(03/04/19 06:30:00)	0.000
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Power 3 Avg. Amp (03/08/19 12:00:00)	0.008	1.852	(02/26/19 14:45:00)	0.000
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Power 3 KW Hours (03/08/19 12:00:00)	0.000 0.677	0.056	(02/26/19 15:00:00)	0.000
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Power 3 Avg. KW (03/08/19 12:00:00)	0.001	0.222	(02/26/19 15:00:00)	0.000
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Power 3 KVA Hours (03/08/19 12:00:00)	0.000 0.688	0.057	(02/26/19 15:00:00)	0.000
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Power 3 Min. KVA (03/08/19 12:00:00)	0.000	0.000	(03/08/19 12:00:00)	0.000
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Power 3 Max. KVA (03/08/19 12:00:00)	0.025	1.330	(03/04/19 06:30:00)	0.000
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Hilberry Theatre LP-K-Summary.txt

Power 3 Avg. KVA (03/08/19 12:00:00)	0.001	0.227	(02/26/19 15:00:00)	0.000
Power 3 Min. dPF (02/15/19 08:45:00)	1.00	1.00	(03/08/19 12:00:00)	-1.00
Power 3 Max. dPF (03/08/19 12:00:00)	1.00	1.00	(03/08/19 12:00:00)	1.00
Power 3 Avg. dPF (03/05/19 06:45:00)	1.00	1.00	(03/08/19 12:00:00)	0.42

Power 3 THD = 19.270616

Power 5 Min. Volt (02/26/19 16:15:00)	122.328	123.493	(02/08/19 03:15:00)	117.065
Power 5 Max. Volt (02/15/19 19:00:00)	122.985	124.164	(02/08/19 03:45:00)	121.675
Power 5 Avg. Volt (02/15/19 19:00:00)	122.748	123.798	(02/08/19 03:45:00)	121.447
Power 5 Amp Hours (02/21/19 17:15:00)	1.298 3746.068	2.951	(02/18/19 09:00:00)	0.000
Power 5 Min. Amp (03/04/19 18:30:00)	4.730	11.410	(02/18/19 08:30:00)	0.000
Power 5 Max. Amp (02/21/19 17:15:00)	6.167	19.607	(02/11/19 08:45:00)	0.000
Power 5 Avg. Amp (02/21/19 17:15:00)	5.194	11.802	(02/18/19 09:00:00)	0.000
Power 5 KW Hours (02/21/19 17:15:00)	0.464 1339.700	1.060	(02/18/19 09:00:00)	0.000
Power 5 Avg. KW (02/21/19 17:15:00)	1.858	4.239	(02/18/19 09:00:00)	0.000
Power 5 KVA Hours (02/21/19 17:15:00)	0.478 1379.296	1.084	(02/18/19 09:00:00)	0.000
Power 5 Min. KVA (03/04/19 18:30:00)	1.740	4.184	(02/18/19 08:30:00)	0.000

# Hilberry Theatre LP-K-Summary.txt

Power 5 Max. KVA (02/21/19 17:15:00)	2.271	7.208	(02/11/19 08:45:00)	0.000
Power 5 Avg. KVA (02/21/19 17:15:00)	1.912	4.335	(02/18/19 09:00:00)	0.000
Power 5 Min. dPF (03/07/19 20:15:00)	0.45	1.00	(03/08/19 06:30:00)	-0.99
Power 5 Max. dPF (02/21/19 22:00:00)	0.93	1.00	(03/08/19 12:00:00)	-0.99
Power 5 Avg. dPF (02/24/19 16:15:00)	0.99	1.00	(03/08/19 12:00:00)	-0.99

PLEASE NOTE: Results suggest that some values may be distorted by THD.

## Setup Summary

-----

Setup Table Description: HT LP-K

Power 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil  
Power 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil  
Power 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
CT Type = RoCoil  
Power 5 - Power Sum: 1,2,3

Memory Type: Ring  
Line Frequency: 60 Hz  
Integration Period: 15 Minutes

## Logger Summary

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Logger Description Line: pmcdr-627  
Logger Serial Number: XC1408039  
Logger Type: ELITEpro XC  
Firmware Version: ES400.257

# Hilberry Theatre PP-1-Summary.txt

## Data Summary

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Data File Name: Hilberry Theatre PP-1.ealog

First Data Record End Time: 02/06/19 10:15:00

Last Data Record End Time: 03/08/19 12:15:00

Monitoring Period Duration: 30.09 days

Peak Demand

-----

Window Size Min.: 15

Channel	KW	KVA
KVAR		
-----	-----	-----
-----	-----	-----
Power 5	10.090 17:44:45 02/23/2019	28.667 17:58:45 02/08/2019
5.296 19:00:45 02/08/2019		
Power 6	Off	

## Totalizers

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Channel	KWH	-KWH	+KWH	KVAH	KVARH	-KVARH	+KVARH
-----	-----	-----	-----	-----	-----	-----	-----
Power 5	2794.442	-3.489	2797.930	12425.199	1616.462	-7.182	1623.644

Channel Time)	Total	Average	Maximum (Date Time)	Minimum (Date
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# Hilberry Theatre PP-1-Summary.txt

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-----
Power 1 Min. Volt      122.495  123.742  (02/09/19 00:30:00)  112.942
(02/26/19 16:15:00)

Power 1 Max. Volt      123.303  124.449  (02/09/19 01:00:00)  121.877
(02/16/19 18:45:00)

Power 1 Avg. Volt      122.955  124.030  (02/09/19 00:30:00)  121.598
(02/16/19 18:45:00)

Power 1 Amp Hours      10.556   17.923  (02/08/19 19:00:00)   3.349
(03/07/19 11:30:00)  30497.518

Power 1 Min. Amp       36.994   60.103  (02/08/19 17:45:00)  11.930
(03/07/19 09:00:00)

Power 1 Max. Amp       56.238  205.296  (02/15/19 07:00:00)  15.385
(03/07/19 09:15:00)

Power 1 Avg. Amp       42.226   71.692  (02/08/19 19:00:00)  13.394
(03/07/19 11:30:00)

Power 1 KW Hours       1.076   2.071  (02/08/19 18:30:00)   0.409
(03/07/19 11:30:00)  3109.063

Power 1 Avg. KW        4.305   8.283  (02/08/19 18:30:00)   1.635
(03/07/19 11:30:00)

Power 1 KVA Hours      1.298   2.193  (02/08/19 19:00:00)   0.412
(03/07/19 11:30:00)  3748.795

Power 1 Min. KVA       4.548   7.369  (02/08/19 17:45:00)   1.470
(03/07/19 09:00:00)

Power 1 Max. KVA       6.905  25.008  (02/15/19 07:00:00)   1.898
(03/07/19 09:15:00)

Power 1 Avg. KVA       5.190   8.770  (02/08/19 19:00:00)   1.647
(03/07/19 11:30:00)

Power 1 Min. dPF       0.78    0.99   (02/06/19 12:15:00)   0.23
(02/23/19 07:00:00)

Power 1 Max. dPF       0.89    1.00   (03/07/19 11:45:00)   0.78
(03/07/19 16:30:00)

```

Hilberry Theatre PP-1-Summary.txt

Power 1 Avg. dPF (03/07/19 16:45:00)	0.83	1.00	(03/07/19 11:30:00)	0.74
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Power 1 THD = 11.632433

Power 2 Min. Volt (02/26/19 16:15:00)	122.467	123.677	(03/03/19 00:30:00)	112.814
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Power 2 Max. Volt (02/14/19 18:15:00)	123.277	124.384	(02/08/19 03:45:00)	122.006
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Power 2 Avg. Volt (02/15/19 19:00:00)	122.983	124.066	(03/03/19 00:30:00)	121.635
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Power 2 Amp Hours (03/07/19 09:15:00)	11.476 33155.236	20.662	(02/08/19 18:00:00)	1.620
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Power 2 Min. Amp (03/07/19 09:00:00)	41.879	74.561	(02/08/19 17:45:00)	0.000
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Power 2 Max. Amp (03/07/19 10:15:00)	52.583	194.094	(02/08/19 07:00:00)	7.409
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Power 2 Avg. Amp (03/07/19 09:15:00)	45.905	82.646	(02/08/19 18:00:00)	6.479
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Power 2 KW Hours (03/07/19 09:15:00)	1.220 3524.639	2.172	(02/08/19 18:00:00)	0.196
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Power 2 Avg. KW (03/07/19 09:15:00)	4.880	8.686	(02/08/19 18:00:00)	0.786
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Power 2 KVA Hours (03/07/19 09:15:00)	1.411 4076.530	2.533	(02/08/19 18:00:00)	0.199
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Power 2 Min. KVA (03/07/19 09:00:00)	5.148	9.145	(02/08/19 17:45:00)	0.000
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Power 2 Max. KVA (03/07/19 10:15:00)	6.461	23.596	(03/01/19 07:00:00)	0.911
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Power 2 Avg. KVA (03/07/19 09:15:00)	5.644	10.133	(02/08/19 18:00:00)	0.797
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Power 2 Min. dPF	0.83	0.97	(03/07/19 11:15:00)	0.15
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Hilberry Theatre PP-1-Summary.txt

(03/02/19 13:45:00)

Power 2 Max. dPF (03/07/19 15:00:00)	0.90	1.00	(03/07/19 11:45:00)	0.79
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Power 2 Avg. dPF (03/08/19 12:15:00)	0.87	1.00	(03/07/19 09:15:00)	0.75
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Power 2 THD = 9.161950

Power 3 Min. Volt (02/26/19 16:15:00)	122.007	123.227	(03/03/19 00:00:00)	113.007
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Power 3 Max. Volt (02/15/19 18:45:00)	122.946	124.256	(02/08/19 03:45:00)	121.556
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Power 3 Avg. Volt (02/15/19 19:00:00)	122.626	123.768	(03/03/19 00:00:00)	121.304
------------------------------------------	---------	---------	---------------------	---------

Power 3 Amp Hours (02/06/19 11:00:00)	12.984 37511.334	21.890	(02/08/19 19:00:00)	4.559
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Power 3 Min. Amp (02/06/19 10:15:00)	41.886	72.677	(02/15/19 18:45:00)	11.614
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Power 3 Max. Amp (02/25/19 05:15:00)	107.042	223.594	(02/11/19 07:00:00)	58.438
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Power 3 Avg. Amp (02/06/19 11:00:00)	51.937	87.561	(02/08/19 19:00:00)	18.237
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Power 3 KW Hours (02/08/19 19:00:00)	-1.329 -3839.575	-0.476	(02/06/19 11:00:00)	-2.527
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Power 3 Avg. KW (02/08/19 19:00:00)	-5.316	-1.905	(02/06/19 11:00:00)	-10.107
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Power 3 KVA Hours (02/06/19 12:45:00)	1.592 4597.890	2.668	(02/08/19 19:00:00)	0.559
------------------------------------------	-------------------	-------	---------------------	-------

Power 3 Min. KVA (02/06/19 10:15:00)	5.137	8.820	(02/15/19 18:45:00)	1.426
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Power 3 Max. KVA (02/25/19 05:15:00)	13.072	27.165	(02/11/19 07:00:00)	7.137
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Hilberry Theatre PP-1-Summary.txt

Power 3 Avg. KVA (02/06/19 11:00:00)	6.366	10.671	(02/08/19 19:00:00)	2.234
Power 3 Min. dPF (02/19/19 07:00:00)	0.72	0.88	(02/15/19 19:00:00)	0.05
Power 3 Max. dPF (03/07/19 16:15:00)	0.93	1.00	(02/10/19 23:45:00)	0.85
Power 3 Avg. dPF (03/08/19 04:45:00)	0.83	0.95	(02/08/19 19:00:00)	0.73
Power 3 THD = 0.000000				
Power 5 Min. Volt (02/26/19 16:15:00)	122.435	123.656	(03/03/19 00:00:00)	112.921
Power 5 Max. Volt (02/16/19 18:30:00)	123.090	124.320	(02/08/19 03:45:00)	121.813
Power 5 Avg. Volt (02/15/19 19:00:00)	122.855	123.911	(02/08/19 03:45:00)	121.567
Power 5 Amp Hours (03/07/19 09:15:00)	11.672 33721.360	19.420	(02/08/19 18:00:00)	3.362
Power 5 Min. Amp (03/07/19 09:00:00)	41.940	68.341	(02/08/19 17:45:00)	10.816
Power 5 Max. Amp (03/07/19 10:45:00)	67.147	204.614	(02/11/19 07:00:00)	31.179
Power 5 Avg. Amp (03/07/19 09:15:00)	46.689	77.682	(02/08/19 18:00:00)	13.448
Power 5 KW Hours (03/07/19 09:15:00)	0.967 2794.073	2.511	(02/23/19 17:45:00)	0.098
Power 5 Avg. KW (03/07/19 09:15:00)	3.869	10.046	(02/23/19 17:45:00)	0.390
Power 5 KVA Hours (03/07/19 09:15:00)	4.300 12423.189	7.130	(02/08/19 18:00:00)	1.239
Power 5 Min. KVA (03/07/19 09:00:00)	15.455	25.119	(02/08/19 17:45:00)	3.991

# Hilberry Theatre PP-1-Summary.txt

Power 5 Max. KVA (03/07/19 10:45:00)	24.678	74.748	(02/10/19 07:00:00)	11.440
Power 5 Avg. KVA (03/07/19 09:15:00)	17.201	28.519	(02/08/19 18:00:00)	4.957
Power 5 Min. dPF (03/01/19 02:00:00)	0.09	0.93	(03/03/19 04:30:00)	-0.91
Power 5 Max. dPF (03/07/19 22:45:00)	0.69	1.00	(03/08/19 12:15:00)	-0.99
Power 5 Avg. dPF (02/06/19 12:45:00)	0.84	1.00	(02/20/19 13:00:00)	-0.99

## Setup Summary

-----

Setup Table Description: HT PP-1

Power 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 5 - Power Sum: 1,2,3

Memory Type: Ring

Line Frequency: 60 Hz

Integration Period: 15 Minutes

## Logger Summary

-----

Logger Description Line: ATS EQA PEQDPHA

Logger Serial Number: XC1501041

Logger Type: ELITEpro XC

Firmware Version: ES400.257

# Hilberry Theatre SWBD #1-Summary.txt

## Data Summary

-----

Data File Name: Hilberry Theatre SWBD #1.ealog

First Data Record End Time: 02/06/19 09:30:00

Last Data Record End Time: 03/08/19 09:30:00

Monitoring Period Duration: 30.01 days

Peak Demand

-----

Window Size Min.: 15

Channel	KW	KVA
KVAR		
-----	-----	-----
-----	-----	-----
Power 5	36.727 18:43:21 02/08/2019	37.229 18:43:21 02/08/2019
7.587 12:41:21 02/19/2019		
Power 6	Off	

## Totalizers

-----

Channel	KWH	-KWH	+KWH	KVAH	KVARH	-KVARH	+KVARH
-----	-----	-----	-----	-----	-----	-----	-----
Power 5	10891.593	0.000	10891.593	11500.594	2472.840	-0.050	2472.890

Channel Time)	Total	Average	Maximum (Date Time)	Minimum (Date
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Hilberry Theatre SWBD #1-Summary.txt

Power 1 Min. Volt (02/26/19 16:15:00)	122.420	123.778	(02/09/19 00:45:00)	112.931
Power 1 Max. Volt (02/16/19 18:30:00)	123.218	124.424	(02/09/19 00:45:00)	121.776
Power 1 Avg. Volt (02/16/19 18:30:00)	122.887	124.106	(02/09/19 00:45:00)	121.495
Power 1 Amp Hours (02/09/19 11:30:00)	12.684 36543.365	32.026	(02/08/19 18:45:00)	2.839
Power 1 Min. Amp (02/09/19 10:15:00)	38.858	112.530	(02/08/19 18:45:00)	5.275
Power 1 Max. Amp (02/15/19 08:30:00)	79.037	175.384	(02/08/19 19:15:00)	31.034
Power 1 Avg. Amp (02/09/19 11:30:00)	50.737	128.106	(02/08/19 18:45:00)	11.354
Power 1 KW Hours (02/09/19 11:30:00)	1.507 4340.515	3.886	(02/08/19 18:45:00)	0.312
Power 1 Avg. KW (02/09/19 11:30:00)	6.026	15.544	(02/08/19 18:45:00)	1.249
Power 1 KVA Hours (02/09/19 11:30:00)	1.558 4488.934	3.914	(02/08/19 18:45:00)	0.351
Power 1 Min. KVA (02/09/19 10:15:00)	4.773	13.769	(02/08/19 18:45:00)	0.652
Power 1 Max. KVA (02/15/19 08:30:00)	9.693	21.380	(02/08/19 19:15:00)	3.803
Power 1 Avg. KVA (02/09/19 11:30:00)	6.232	15.656	(02/08/19 18:45:00)	1.405
Power 1 Min. dPF (03/07/19 11:30:00)	0.82	0.99	(03/07/19 11:15:00)	-0.99
Power 1 Max. dPF (03/08/19 09:30:00)	0.98	1.00	(03/08/19 09:15:00)	-1.00

Hilberry Theatre SWBD #1-Summary.txt

Power 1 Avg. dPF (03/08/19 08:30:00)	0.98	1.00	(03/08/19 09:30:00)	-0.99
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Power 1 THD = 14.400232

Power 2 Min. Volt (02/26/19 16:15:00)	122.227	123.455	(02/08/19 03:30:00)	112.543
------------------------------------------	---------	---------	---------------------	---------

Power 2 Max. Volt (02/15/19 18:30:00)	123.070	124.165	(02/08/19 03:45:00)	121.712
------------------------------------------	---------	---------	---------------------	---------

Power 2 Avg. Volt (02/15/19 18:30:00)	122.768	123.868	(02/08/19 03:00:00)	121.384
------------------------------------------	---------	---------	---------------------	---------

Power 2 Amp Hours (02/24/19 08:15:00)	11.201 32268.785	25.123	(02/08/19 18:45:00)	3.123
------------------------------------------	---------------------	--------	---------------------	-------

Power 2 Min. Amp (02/23/19 12:30:00)	33.869	91.559	(02/16/19 22:30:00)	8.315
-----------------------------------------	--------	--------	---------------------	-------

Power 2 Max. Amp (02/21/19 07:45:00)	79.923	138.816	(02/08/19 18:45:00)	39.550
-----------------------------------------	--------	---------	---------------------	--------

Power 2 Avg. Amp (02/24/19 08:15:00)	44.802	100.493	(02/08/19 18:45:00)	12.491
-----------------------------------------	--------	---------	---------------------	--------

Power 2 KW Hours (02/24/19 08:15:00)	1.337 3853.119	3.011	(02/08/19 18:45:00)	0.360
-----------------------------------------	-------------------	-------	---------------------	-------

Power 2 Avg. KW (02/24/19 08:15:00)	5.350	12.045	(02/08/19 18:45:00)	1.438
----------------------------------------	-------	--------	---------------------	-------

Power 2 KVA Hours (02/24/19 08:15:00)	1.374 3959.619	3.068	(02/16/19 22:30:00)	0.386
------------------------------------------	-------------------	-------	---------------------	-------

Power 2 Min. KVA (02/23/19 10:00:00)	4.158	11.190	(02/16/19 22:45:00)	1.026
-----------------------------------------	-------	--------	---------------------	-------

Power 2 Max. KVA (02/21/19 07:45:00)	9.779	16.878	(02/08/19 18:45:00)	4.861
-----------------------------------------	-------	--------	---------------------	-------

Power 2 Avg. KVA (02/24/19 08:15:00)	5.498	12.273	(02/16/19 22:30:00)	1.543
-----------------------------------------	-------	--------	---------------------	-------

Power 2 Min. dPF	0.91	1.00	(02/06/19 11:00:00)	0.67
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Hilberry Theatre SWBD #1-Summary.txt

(02/10/19 12:15:00)

Power 2 Max. dPF (03/07/19 06:30:00)	0.99	1.00	(03/08/19 09:30:00)	-1.00
-----------------------------------------	------	------	---------------------	-------

Power 2 Avg. dPF (02/24/19 09:15:00)	0.98	1.00	(03/08/19 07:45:00)	0.91
-----------------------------------------	------	------	---------------------	------

Power 2 THD = 13.023964

Power 3 Min. Volt (03/08/19 09:15:00)	121.907	123.197	(03/03/19 00:00:00)	39.710
------------------------------------------	---------	---------	---------------------	--------

Power 3 Max. Volt (03/08/19 09:30:00)	122.839	124.036	(02/08/19 03:45:00)	41.776
------------------------------------------	---------	---------	---------------------	--------

Power 3 Avg. Volt (03/08/19 09:30:00)	122.498	123.669	(03/02/19 23:45:00)	41.444
------------------------------------------	---------	---------	---------------------	--------

Power 3 Amp Hours (02/13/19 00:00:00)	8.644 24902.075	19.834	(02/08/19 20:30:00)	4.822
------------------------------------------	--------------------	--------	---------------------	-------

Power 3 Min. Amp (02/06/19 10:30:00)	26.775	66.251	(02/22/19 14:15:00)	13.487
-----------------------------------------	--------	--------	---------------------	--------

Power 3 Max. Amp (03/07/19 08:45:00)	62.402	145.031	(02/19/19 12:30:00)	30.143
-----------------------------------------	--------	---------	---------------------	--------

Power 3 Avg. Amp (02/13/19 00:00:00)	34.574	79.335	(02/08/19 20:30:00)	19.287
-----------------------------------------	--------	--------	---------------------	--------

Power 3 KW Hours (03/08/19 09:30:00)	0.936 2695.945	2.385	(02/08/19 21:00:00)	-0.208
-----------------------------------------	-------------------	-------	---------------------	--------

Power 3 Avg. KW (03/08/19 09:30:00)	3.743	9.542	(02/08/19 21:00:00)	-0.830
----------------------------------------	-------	-------	---------------------	--------

Power 3 KVA Hours (03/08/19 09:30:00)	1.059 3049.689	2.423	(02/08/19 20:30:00)	0.254
------------------------------------------	-------------------	-------	---------------------	-------

Power 3 Min. KVA (03/08/19 09:15:00)	3.276	8.102	(02/22/19 14:15:00)	0.791
-----------------------------------------	-------	-------	---------------------	-------

Power 3 Max. KVA (03/08/19 09:30:00)	7.634	17.577	(02/19/19 12:30:00)	1.910
-----------------------------------------	-------	--------	---------------------	-------

Hilberry Theatre SWBD #1-Summary.txt

Power 3 Avg. KVA (03/08/19 09:30:00)	4.234	9.693	(02/08/19 20:30:00)	1.016
Power 3 Min. dPF (02/06/19 12:45:00)	0.74	0.98	(02/06/19 11:00:00)	-0.98
Power 3 Max. dPF (02/21/19 07:45:00)	0.94	1.00	(03/07/19 10:15:00)	-1.00
Power 3 Avg. dPF (03/07/19 06:00:00)	0.88	1.00	(03/04/19 09:15:00)	0.65
Power 3 THD = 0.000000				
Power 5 Min. Volt (03/08/19 09:15:00)	122.292	123.520	(02/09/19 00:45:00)	94.894
Power 5 Max. Volt (03/08/19 09:30:00)	122.958	124.122	(02/08/19 03:45:00)	95.712
Power 5 Avg. Volt (03/08/19 09:30:00)	122.718	123.788	(02/09/19 00:45:00)	95.453
Power 5 Amp Hours (02/24/19 09:30:00)	10.843 31238.060	25.098	(02/08/19 18:45:00)	4.123
Power 5 Min. Amp (02/24/19 10:00:00)	33.810	87.209	(02/08/19 18:45:00)	11.384
Power 5 Max. Amp (02/24/19 10:00:00)	68.461	134.471	(02/19/19 12:30:00)	36.776
Power 5 Avg. Amp (02/24/19 09:30:00)	43.371	100.393	(02/08/19 18:45:00)	16.494
Power 5 KW Hours (02/24/19 10:30:00)	3.780 10889.597	9.061	(02/08/19 18:45:00)	1.258
Power 5 Avg. KW (02/24/19 10:30:00)	15.119	36.245	(02/08/19 18:45:00)	5.033
Power 5 KVA Hours (02/24/19 09:30:00)	3.991 11498.211	9.191	(02/08/19 18:45:00)	1.522
Power 5 Min. KVA (02/24/19 10:00:00)	12.446	31.968	(02/08/19 18:45:00)	4.188

# Hilberry Theatre SWBD #1-Summary.txt

Power 5 Max. KVA (02/24/19 10:00:00)	25.160	48.985	(02/19/19 12:30:00)	13.528
Power 5 Avg. KVA (02/24/19 09:30:00)	15.964	36.765	(02/08/19 18:45:00)	6.086
Power 5 Min. dPF (02/24/19 07:45:00)	0.90	1.00	(02/06/19 12:30:00)	0.67
Power 5 Max. dPF (03/07/19 03:45:00)	0.99	1.00	(03/08/19 09:30:00)	0.95
Power 5 Avg. dPF (02/23/19 08:00:00)	0.97	1.00	(03/08/19 09:30:00)	0.88

## Setup Summary

-----

Setup Table Description: HT SWBD #1

Power 1 - Power: VHi: L1, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 2 - Power: VHi: L2, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 3 - Power: VHi: L3, VLo: N; PT = 1.000; CT = 5000.000; Phase Shift = 0.000;  
 CT Type = RoCoil  
 Power 5 - Power Sum: 1,2,3

Memory Type: Ring  
 Line Frequency: 60 Hz  
 Integration Period: 15 Minutes

## Logger Summary

-----

Logger Description Line: PMCDR-606  
 Logger Serial Number: XC1311219  
 Logger Type: ELITEpro XC  
 Firmware Version: ES400.257

### **8.3 -Functional Test Fire Alarm Report**

The existing fire alarm system was functionally tested. There were no issues with the fire alarm devices. There was an issue with notification devices and the system had to be reset. Testing was resumed after reset.

## INSPECTION AND TESTING FORM

DATE: 5/6 - 5/7

TIME: 7:00 am - 3:00 pm

### SERVICE ORGANIZATION

Name: Edgewood Electric, LLC

Address: 3633 Michigan Ave. Ste 100 Detroit MI

Representative: Kevin Spoutz  
5202120

License No.: \_\_\_\_\_

Telephone: 313-263-0440

### MONITORING ENTITY

Contact: WSU Public Safety

Telephone: 313-577-2222

Monitoring Account Ref. No.: \_\_\_\_\_

### TYPE TRANSMISSION

- ☐ McCulloh  
☐ Multiplex  
☐ Digital  
☐ Reverse Priority  
☐ RF  
☒ Other (Specify) Security System

Control Unit Manufacturer: Notifier

Circuit Styles: Class B

Number of Circuits: 1

Software Rev.: \_\_\_\_\_

Last Date System Had Any Service Performed: \_\_\_\_\_

Last Date that Any Software or Configuration Was Revised: \_\_\_\_\_

### PROPERTY NAME (USER)

Name: WSU Hillberry Theater

Address: 4743 Cass Detroit MI

Owner Contact: Ryan Miller

Telephone: \_\_\_\_\_

### APPROVING AGENCY

Contact: \_\_\_\_\_

Telephone: \_\_\_\_\_

### SERVICE

- ☐ Weekly  
☐ Monthly  
☐ Quarterly  
☐ Semiannually  
☐ Annually  
☐ Other (Specify) \_\_\_\_\_

Model No.: \_\_\_\_\_

### ALARM-INITIATING DEVICES AND CIRCUIT INFORMATION

Quantity	Circuit Style
<u>20</u>	<u>B</u>
<u>NA</u>	<u>B</u>
<u>52</u>	<u>B</u>
<u>8</u>	<u>B</u>
<u>NA</u>	<u>B</u>
<u>1</u>	<u>B</u>
<u>1</u>	<u>B</u>
<u>14</u>	<u>B</u>

Manual Fire Alarm Boxes

Ion Detectors

Photo Detectors

Duct Detectors

Heat Detectors

Waterflow Switches

Supervisory Switches

Other (Specify): \_\_\_\_\_

**ALARM NOTIFICATION APPLIANCES AND CIRCUIT INFORMATION**

Quantity	Circuit Style	
NA	NA	Bells
1	B	Horns
NA	NA	Chimes
69	B	Strobes
42	B	Speakers
		Other (Specify): _____

No. of alarm notification appliance circuits: 8

Are circuits monitored for integrity? ☒ Yes ☐ No

**SUPERVISORY SIGNAL-INITIATING DEVICES AND CIRCUIT INFORMATION**

Quantity	Circuit Style	
NA		Building Temp.
NA		Site Water Temp.
NA		Site Water Level
1	B	Fire Pump Power
1	B	Fire Pump Running
1	B - Not connected	Fire Pump Auto-Position- Phase Reversal
NA		Fire Pump or Pump Controller Trouble
1	B	Fire Pump Running
NA		Generator In Auto Position
NA		Generator or Controller Trouble
NA		Switch Transfer
NA		Generator Engine Running
		Other: _____

**SIGNALING LINE CIRCUITS**

Quantity and style (See NFPA 72, Table 3-6) of signaling line circuits connected to system:

Quantity 1 Style(s) B

**SYSTEM POWER SUPPLIES**

- a. Primary (Main): Nominal Voltage 120V, Amps \_\_\_\_\_  
Overcurrent Protection: Type breaker, Amps 20  
Location (of Primary Supply Panelboard): \_\_\_\_\_  
Disconnecting Means Location: Basement
- b. Secondary (Standby):  
Storage Battery: Amp-Hr. Rating \_\_\_\_\_  
Calculated capacity to operate system, in hours: \_\_\_\_\_ 24 \_\_\_\_\_ 60 \_\_\_\_\_  
Engine-driven generator dedicated to fire alarm system: \_\_\_\_\_  
Location of fuel storage: \_\_\_\_\_

**TYPE BATTERY**

- ☐ Dry Cell  
☐ Nickel-Cadmium  
☐ Sealed Lead-Acid  
☐ Lead-Acid  
☐ Other (Specify): \_\_\_\_\_
- c. Emergency or standby system used as a backup to primary power supply, instead of using a secondary power supply:
- \_\_\_\_\_ Emergency system described in NFPA 70, Article 700  
\_\_\_\_\_ Legally required standby described in NFPA 70, Article 701  
\_\_\_\_\_ Optional standby system described in NFPA 70, Article 702, which also meets the performance requirements of Article 700 or 701.



### PRIOR TO ANY TESTING

#### NOTIFICATIONS ARE MADE

	Yes	No	Who	Time
Monitoring Entity	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____	_____
Building Occupants	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____	_____
Building Management	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____	_____
Other (Specify)	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____
AHJ (Notified) of Any Impairments	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____

### SYSTEM TESTS AND INSPECTIONS

TYPE	Visible	Functional	Comments
Control Unit	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
Interface Eq.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Lamps/LEDS	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
Fuses	<input checked="" type="checkbox"/>	<input type="checkbox"/>	_____
Primary Power Supply	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
Trouble Signals	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
Disconnect Switches	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
Ground-Fault Monitoring	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____

#### SECONDARY POWER

TYPE	Visible	Functional	Comments
Battery Condition	<input checked="" type="checkbox"/>		_____
Load Voltage		<input type="checkbox"/>	_____
Discharge Test		<input type="checkbox"/>	_____
Charger Test		<input type="checkbox"/>	_____
Specific Gravity		<input type="checkbox"/>	_____

#### TRANSIENT SUPPRESSORS

☐

#### REMOTE ANNUNCIATORS

☐
☒

#### NOTIFICATION APPLIANCES

Audible	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
Visual	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
Speakers	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____
Voice Clarity		<input checked="" type="checkbox"/>	_____

### INITIATING AND SUPERVISORY DEVICE TESTS AND INSPECTIONS

Loc. & S/N	Device Type	Visual Check	Functional Test	Factory Setting	Meas. Setting	Pass	Fail
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	<input type="checkbox"/>	<input type="checkbox"/>

Comments: Fire Alarm panel after about 10 minutes of alarm with notification signals active started to malfunction. System would not silence, reset, or report additional alarm signals. Power had to be disconnected for system to be reset. Testing was resumed with resetting soon after alarm was reportable.

(NFPA Inspection and Testing 3 of 4)

The inspection was started and completed with 1 trouble on the FACP smoke detector 124 is not responding  
 All speaker strobes were tested and working  
 Panel LPE breaker #29 in bsmt (for FACP) did not have a breaker lock  
 Outside horn strobe above fire department connection was not working  
 Water flow 121 could not be opened. Tested contacts only  
 Tamper 122 was faulty (leaking water) tested contact only  
 Phase reversal 124 was not hooked up  
 Smoke detector description for 48 and 58 should be switched  
 All panels were tested for troubles  
 Signals to monitoring were verified with building engineer

**EMERGENCY COMMUNICATIONS EQUIPMENT**

	Visual	Functional	Comments
Phone Set	<input type="checkbox"/>	<input type="checkbox"/>	<u>N/A</u>
Phone Jacks	<input type="checkbox"/>	<input type="checkbox"/>	
Off-Hook Indicator	<input type="checkbox"/>	<input type="checkbox"/>	
Amplifier(s)	<input type="checkbox"/>	<input type="checkbox"/>	
Tone Generator(s)	<input type="checkbox"/>	<input type="checkbox"/>	
Call-in Signal	<input type="checkbox"/>	<input type="checkbox"/>	
System Performance	<input type="checkbox"/>	<input type="checkbox"/>	

**INTERFACE EQUIPMENT**

(Specify) \_\_\_\_\_  
(Specify) N/A \_\_\_\_\_  
(Specify) \_\_\_\_\_

Visual

Device  
OperationSimulated  
Operation☐☐☐☐☐☐☐☐☐**SPECIAL HAZARD SYSTEMS**

(Specify) \_\_\_\_\_  
(Specify) N/A \_\_\_\_\_  
(Specify) \_\_\_\_\_

☐☐☐☐☐☐☐☐☐Special Procedures: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_**SUPERVISING STATION MONITORING**

Yes

No

Time

Comments

Alarm Signal

☒☐

Alarm Restoration

☐☐

Trouble Signal

☒☐

Supervisory Signal

☐☐

Supervisory Restoration

☐☐**NOTIFICATIONS THAT TESTING IS COMPLETE**

Yes

No

Who

Time

Building Management

☒☐

Engineer

3:00

Monitoring Agency

☐☐

Building Occupants

☐☐

Other (Specify)

☐☐The following did not operate correctly: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_System restored to normal operation: Date: 5/7/19 Time: 2:30**THIS TESTING WAS PERFORMED IN ACCORDANCE WITH APPLICABLE NFPA STANDARDS.**Name of Inspector: James Tourville Date: 5/7/19 Time: 3:00 pmSignature: [Signature]

Name of Owner or Representative: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Signature: \_\_\_\_\_

**NOTIFICATION APPLIANCE  
SUPPLEMENTARY RECORD OF INSPECTION AND TESTING**

*This form is a supplement of the System Record of Inspection and Testing.*

*It includes a notification appliance test record.*

*This form is to be completed by the system inspection and testing contractor at the time of the inspection and/ or test.*

*It shall be permitted to modify this form as needed to provide a more complete and/or clear record.*

*Insert N/A in all unused lines.*

Inspection/Test Start Date/Time: 5/6 – 5/7 Inspection/Test Completion Date/Time: 7:00 AM – 3:00 PM

Number of Supplemental Pages Attached: 3

**1. Property Information**

Name of property: Hillberry

Address: 4743 Cass Detroit MI

**2. NOTIFICATION APPLIANCE TEST RESULTS**

Appliance Type	Location/Identifier	Test Results
Smoke Detector	Above FACP main lobby	Pass
Smoke Detector	Main office/tickets main lobby	Pass
Smoke Detector	Janitor closet main lobby	Pass
Smoke Detector	Stairs by office main lobby	Pass
Smoke Detector	South stairs main lobby	Pass
Smoke Detector	Candy room inside coat room	Pass
Duck Detector	Mech rm inside coat rm	Pass
Duck Detector	Mech rm inside coat rm	Pass
Smoke Detector	Coat room	Pass
Duck Detector	Coat room	Pass
Duck Detector	Coat room	Pass
Smoke Detector	Mech room inside main office	Pass
Duck Detector	Mech room inside main office	Pass
Duck Detector	Mech room inside main office	Pass
Smoke Detector	Green rm backstage NE	Pass
Smoke Detector	Storage 103 backstage	Pass
Smoke Detector	Janitors closet 111 backstage	Pass
Smoke Detector	Wardrobe 113 backstage	Pass
Smoke Detector	Storage 117 backstage	Pass
Smoke Detector	Tools rm 119 backstage	Pass
Tele/comm	rm 121 backstage	Pass
Smoke Detector	By women's lounge 210 2nd fl N	Pass
Smoke Detector	Hall at storage 206 2nd fl N	Pass
Smoke Detector	Hall at storage 206 2nd fl CTR	Pass
Smoke Detector	Hall at storage 206 2nd fl S	Pass
Smoke Detector	By men's lounge 208 2nd fl SW	Pass
Smoke Detector	Storage rm 206 2nd fl W	Pass
Smoke Detector	Storage rm 206 2nd fl W	Pass
Smoke Detector	Lighting 206.2 2nd fl N	Pass
Smoke Detector	Lighting 206.2 2nd fl N	Pass

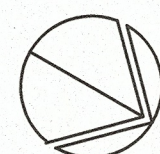
Smoke Detector	Lighting 206.2 2nd fl N	Pass
Smoke Detector	Stage manager booth 2nd fl CTR	Pass
Smoke Detector	Lighting 206.3 2nd fl S	Pass
Smoke Detector	Lighting 206.3 2nd fl S	Pass
Smoke Detector	Lighting 206.3 2nd fl S	Pass
Smoke Detector	Above seats south seating area	Pass
Smoke Detector	Above seats south seating area	Pass
Smoke Detector	Above seats center seating area	Pass
Smoke Detector	Above seats north seating area	Pass
Smoke Detector	Above seats north seating area	Pass
Smoke Detector	Above seats north seating area	Pass
Smoke Detector	Above seats center seating area	Pass
Smoke Detector	Above seats south seating area	Pass
Smoke Detector	Above seats south seating area	Pass
Smoke Detector	Above seats south seating area	Pass
Smoke Detector	Above seats south seating area	Pass
Smoke Detector	Above seats center seating area	Pass
Smoke Detector	Above seats north seating area	Pass
Smoke Detector	Above seats north seating area	Pass
Smoke Detector	Above seats north seating area	Pass
Smoke Detector	Stair @ wardrobe 201 upper stage	Pass
Smoke Detector	Above curtain left upper stage	Pass
Smoke Detector	Above curtain right upper stage	Pass
Smoke Detector	Organ loft 3rd fl NW	Pass
Smoke Detector	Fan rm 301 3rd fl SE	Pass
Smoke Detector	Storage at vestibule BSMT NW	Pass
Smoke Detector	Janitor closet 006 BSMT NW	Pass
Smoke Detector	Common area BSMT NW	Pass
Smoke Detector	Storage 015 BSMT SW	Pass
Smoke Detector	Storage 017 BSMT SW	Pass
Smoke Detector	BSMT theater BSMT SW	Pass
Smoke Detector	BSMT theater BSMT SW	Pass
Smoke Detector	Storage 021 BSMT SW	Pass
Smoke Detector	Storage 021 BSMT SW	Pass
Smoke Detector	Elec. Rm. BSMT SOUTH	Pass
Smoke Detector	Mech rm 047 BSMT east	Pass
Smoke Detector	Mech rm 047 BSMT east	Pass
Duck Detector	Mech rm 047 supply BSMT east	Pass
Smoke Detector	Mech rm 045 BSMT SE	Pass
Smoke Detector	Mech rm 045 BSMT SE	Pass
Smoke Detector	Boiler rm 043 BSMT SE	Pass
Smoke Detector	Engineers rm 041 BSMT SE	Pass
Smoke Detector	Engineers rm 041 BSMT SE	Pass
Duct Detector	Mech rm 047 return BSMT east	Pass
Pull	Cass exit main lobby	Pass

Pull	West exit main lobby	Pass
Pull	West exit main lobby	Pass
Relay	For DD 7&8 coat rm	Pass
Relay	For DD 14&15 main office	Pass
Waterflow strobe		Pass
Pull	Green rm backstage NE	Pass
Pull	NE by storage 103 backstage NE	Pass
Pull	SE stairs E doors backstage SE	Pass
Pull	Hall at SE stairs backstage SE	Pass
Pull	SE stairs S doors backstage SE	Pass
Pull	By women's lounge 210 2nd fl NW	Pass
Pull	By mens lounge 208 2nd fl SW	Pass
Pull	Lighting 206.2 2nd fl NE	Pass
Pull	Lightning 206.3 2nd fl NW	Pass
Pull	Wardrobe 201 upper stage	Pass
Pull	Stairs at makeup 205 upper stage	Pass
Pull	Makeup 205 upper stage	Pass
Relay	For DD 11&12 coat rm	Pass
Trouble to security	Basement	Pass
Alarm to security	Basement	Pass
Pull	Stairs at Fan Room 301 3rd fl SE	Pass
Pull	BSMT vestibule bsmt theater	Pass
Pull	Common area stairs bsmt NW	Pass
Pull	Common area stairs bsmt SW	Pass
Pull	Electrical rm stairs bsmt south	Pass
Monitor	Waterflow bsmt fire pump 051	Pass
Monitor	Tamper bsmt fire pump 051	Pass
Monitor	Fire pump AC loss fire pump 051	Pass
Monitor	Fire pump phase rev fire pump 051	Pass
Monitor	Fire pump running fire pump 051	Pass
Monitor	Spare XP10 fire pump 051	Pass
Monitor	Spare XP10 fire pump 051	Pass
Monitor	Spare XP10 fire pump 051	Pass
Monitor	Spare XP10 fire pump 051	Pass
Monitor	Spare XP10 fire pump 051	Pass
Relay	For DD 123 bsmt mech rm	Pass
Pull	Stairs at mech rm 045 bsmt SE	Pass

## **8.4 - Functional Test Emergency Lighting Report**

The existing emergency lighting fixtures consist of emergency battery units except for the vestibule area. The vestibule area emergency lighting consists of a control lighting inverter that provided emergency power to the ceiling mounted chandeliers. Most of the emergency battery units were non-functional. Recommend maintenance or replacement of emergency battery units. Recommend re-test of emergency lighting be performed once emergency lighting units are operational to an accurate measurement of light levels. Areas where emergency lighting was operational, the emergency light levels were within code required minimums.





SCALE: 1/8" = 1' - 0"

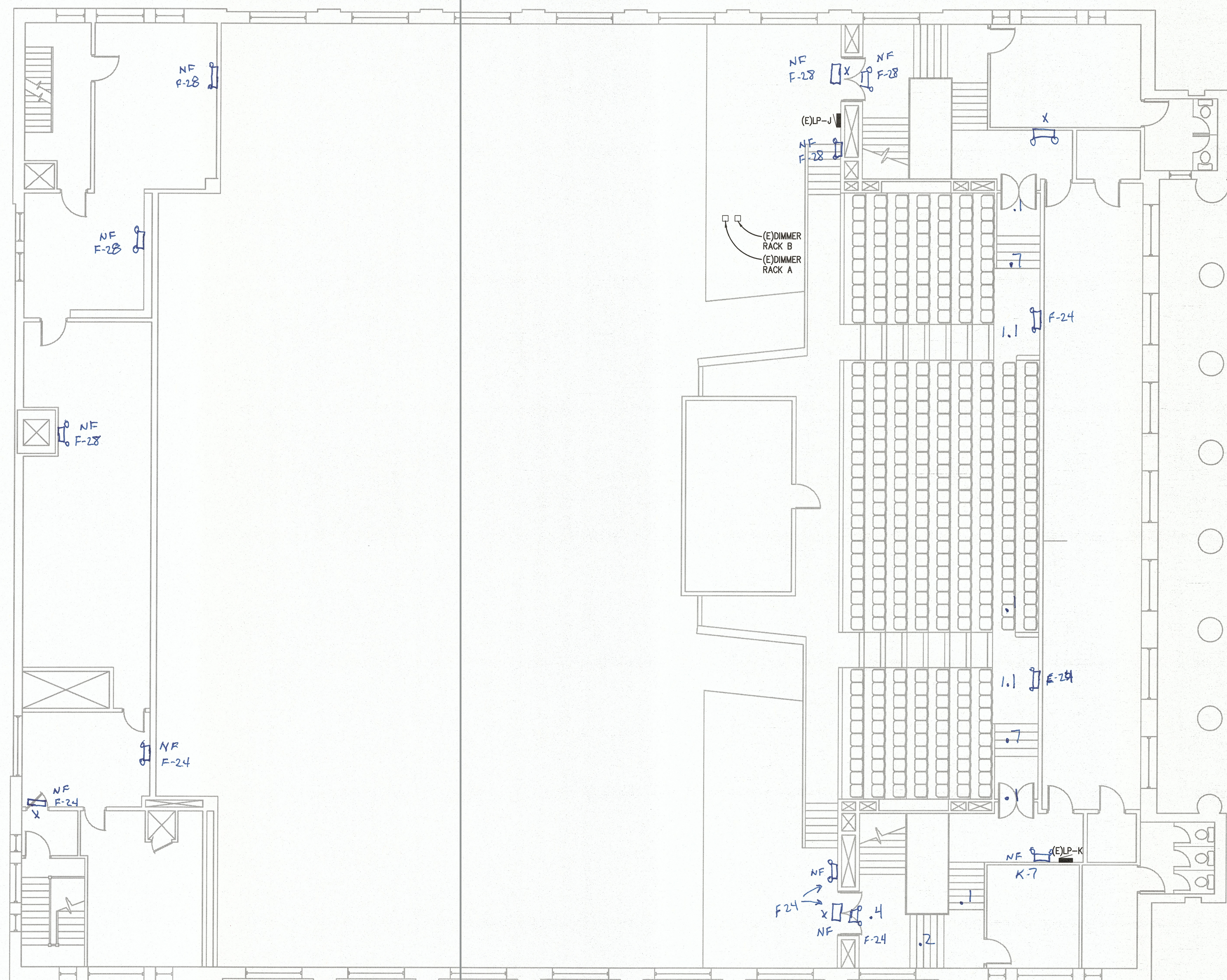
### E3.1

PROJECT TITLE

**Peter Basso Associates Inc**  
CONSULTING ENGINEERS

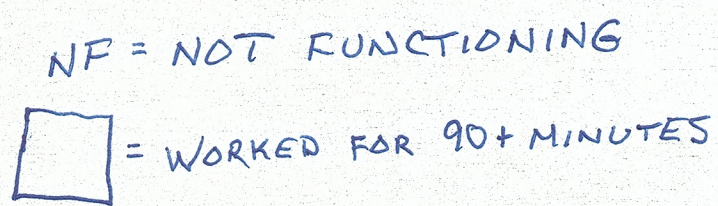
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PBA Project No. 2018.0465 PH1





## SECOND FLOOR POWER PLAN





## BASEMENT POWER PLAN

SCALE: 1/8" = 1' - 0"