Domestic Water and Ventilation Analysis Report

For

METRO, PORTLAND'5 CENTER FOR THE ARTS

ARLENE SCHNITZER CONCERT HALL

ANTOINETTE HATFIELD HALL

AND

KELLER AUDITORIUM

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To: Portland'5 Centers for the Arts
Nancy Strening
Ed Williams

Subject: Domestic Water and Ventilation analysis Report for Arlene Schnitzer Concert Hall, Antoinette Hatfield Hall and Keller Auditorium

This report covers the domestic water and mechanical systems analysis for Arlene Schnitzer Concert Hall, Antoinette Hatfield Hall and Keller Auditorium. The potable water supply analysis included sampling and testing for Escherichia coli (E. coli) and Legionella bacteria in each building. The mechanical systems were tested to determine performance of the existing air-handling units. These systems were also analyzed to determine code compliance with the *2019 Oregon Mechanical Specialty Code* and *ASHRAE 62.1-2016 Ventilation for Acceptable Indoor Air Quality.*

Plumbing Domestic Water System

The domestic water supply sampling and testing was performed by Watercare Industrial Services, Inc. and Columbia Laboratories. On May 26, 2021 we witnessed water samples being taken from multiple remotely located plumbing fixtures in each building. A set of these samples were sent to Environmental Safety Technologies, Inc. to be tested for Legionella. The microbiological analysis showed no bacteria detection in any of the samples. This lab analysis is included in *Appendix 5a - Portland 5 Water Legionella Report*. The Escherichia coli testing, was done by Columbia Laboratory from another set of the samples taken. No E. coli was found in any of the samples. The lab analysis for E. coli is included in *Appendix 5b - Portland 5 Water Escherichia Coli Report*.

Mechanical Ventilation and Exhaust System

The mechanical study was based on the as-built documents and the airflow measurement and testing performed in the field between the dates of 05/24/2021 and 08/03/2021. The HVAC as-built documents are included in *Appendixes 7a, 7b, and 7c*. Our comments and suggestions in this document are based on the provided record drawings and documents. If the installation is completed differently than detailed or changes where not captured in the record drawings then these observations would potentially be incorrect.

The outside airflow ventilation calculations for code compliance include the space supply airflow rates. This is done to account for the system's outdoor airflow's mixing and distribution effectiveness in reaching the occupied level. The space supply airflow rates included in the calculations have been taken from the HVAC as-built floor plans. In order to meet the newer code's ventilation airflow requirements, control adjustments will need to be made and most of the existing air-handlers' fans will be required to operate at full airflow rate when the building is fully occupied. The calculated occupancy rate has also been adjusted to code minimum in certain spaces. Verification of the possible number of people in the building is required prior to accepting the calculated ventilation airflow rates for these systems. Also some of the rooms' supply airflow rates have been adjusted in the calculation and this will require field rebalancing to ensure the listed supply airflow is provided in the space. These adjusted airflow rates have been specifically noted in the calculation tables shown in the appendixes at the end of this document.

In addition, calculations were also performed to determine current performance of the room air change rates for the supply, exhaust and ventilation airflow rates; these values were based on the air balancing data reported and the as-built documents. The air change rate calculations tables for each building are provided as separate files for individual distribution. For Arlene Schnitzer Concert Hall see Appendix 8a; for Antoinette Hatfield Hall see Appendix 8b and for Keller Auditorium see Appendix 8c.

The energy code has been requiring demand control ventilation or CO2 control to reduce outside airflow when there is no demand. For the time being, this code section has been recently superseded by the CDC to reduce risk exposure to the SARS-CoV-2 viral particles and to reduce the spread of the disease. The minimum CO2 ventilation rate calculated and noted below shows the minimum ventilation airflow rate allowed in compliance with the previous requirements. If the systems have demand-controlled ventilation (DCV) that reduce air supply based on occupancy or temperature during occupied hours, this strategy must be disabled until further guidance and recommendations are put in place.

Airflow measurement and testing was done at each air-handling unit at the system level; this field work was conducted by Air Balancing Specialty, Inc. The air balancing report data is included in *Appendix 4 – Portland 5 Air Balancing Report* following the ventilation calculation appendixes. Some of the air-handling systems did not have testing capability. As a result reliable test information is not available.

General Balancing Report Review Comments

In our review of the balancing report we noticed ventilation airflow being supplied to the space during the warm-up operation or 0% outdoor airflow test. Most of the air-handlers have a minimum and a maximum outside air damper. The 0% ventilation testing should measure close to 0 CFM of outdoor airflow. The balancing data measured various airflow rates at this test; verify operation of the minimum and maximum outdoor air dampers (where two dampers are installed). Per the original design the minimum outside air dampers shall open for minimum ventilation operation. For maximum outside airflow ventilation or economizer function, in addition to the minimum damper, the maximum outside air damper shall open as well. The maximum ventilation airflow for economizer function does not match the fan total at the 100% outdoor air test for most of the air-handlers. Verify return air damper is closed and outside air damper is open to prevent recirculating air for economizer function.

The balancing report shows a number of the system's exhaust/relief fans not operating within their design airflow range; these are noted below. Code requires adequate relief airflow for space pressure control.

The information below is arranged to addresses each building in a separate section. The building's HVAC systems installation and operation and common aspects are described at the beginning of the building section. Then, in consecutive order, each air-handler system is addressed in detail. A summary of the air-handling units' original design airflow rates is included at the bottom of the building section, under the System Design Parameter Table. The section is also followed by the Air Balancing Summary Table which summarizes the final test data for each air-handler unit.

Arlene Schnitzer Concert Hall

System Descriptions

Arlene Schnitzer Concert Hall is heated, ventilated and air-conditioned by six indoor air-handling units originally installed in 1983. A roof-top unit was added later to condition the projection spaces. The air-handlers are located in mechanical rooms on various building levels. Ventilation outdoor airflow is ducted to the air-handling units from wall louvers or roof hoods. Relief air is ducted from the air-handling units to wall louvers or roof hoods. The ventilation calculation analysis table for this building is included under *Appendix 1 - Outside Ventilation Airflow Code Analysis Calculation Table – Arlene Schnitzer*.

The air-handling units have a minimum and a maximum outside air damper. The field balancing data shows outdoor ventilation airflow rates inconsistent with the design conditions. Both outside air dampers shall be closed at the 0% ventilation testing. Unless noted differently below, only the minimum outside air dampers shall be opened for the minimum ventilation operation. During maximum outside airflow ventilation, in addition to the minimum damper, the maximum outside air damper shall also be opened.

ASU-1 and ASU-2 Systems

Unit ASU-1 and ASU-2 are designed for two speed operation. Each air-handler is comprised of a supply fan, return air damper, minimum outside air damper, and maximum outside air damper. The system provides minimum ventilation outside airflow through the minimum outside air damper. Economizer outside airflow is provided by opening both the minimum and maximum outdoor air dampers; the total outdoor airflow is limited by the duct and louver size and cannot be increased beyond what is shown in the calculations table. The associated exhaust fan (EF-5 with ASU-1; EF-4 with ASU-2) must operate to provide space exhaust when the maximum outside air damper is open for economizer function. During the warm-up mode, the associated exhaust fan shall be off and both outside air dampers shall be closed.

ASU-1: Auditorium System

This system is designed to supply 41,000 CFM and 28,700 CFM during normal occupied and unoccupied operation modes respectively. The minimum outdoor ventilation airflow is designed to provide 6,950 CFM and 13,750 CFM during unoccupied and occupied operation modes respectively.

The code's ventilation calculations for normal occupancy require 13,750 CFM outdoor airflow with the supply fan providing full airflow to each space. For this air-handler both minimum and maximum dampers need to be open to meet this ventilation rate of 13,750 CFM. The heating and cooling coils are sized to handle the design maximum outdoor airflow rate. The code space area outdoor ventilation rate for minimum CO2 control equates to 1,450 CFM. The original design's lower ventilation rate is above this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 38,453 CFM and 41,170 CFM depending on dampers position and operation mode. The outside airflow measured between 350 CFM and 10,370 CFM. The measured supply airflow falls within design parameters. The measured outside airflow minimum and maximum ventilation is not per design. The air-handler outside airflow must be rebalanced to meet its design condition and the code ventilation rates noted above. Additional controls and equipment verification must be performed for optimum performance during warm-up and normal occupancy operation modes.

The balancing report shows the auditorium exhaust/relief fan, EF-5 below its design range. This unit was designed for 6,800 CFM and the balancing data measured 397 CFM. The discharge air

damper is noted not to function properly. The pertaining dampers and control functions must be fixed and corrected and the system must be rebalanced.

ASU-2: Lobbies System

This system is designed to supply 23,500 CFM and 16,500 CFM during normal occupied and unoccupied operation modes respectively. The minimum outdoor ventilation airflow is designed to provide 1,400 CFM and 8,400 CFM during unoccupied and occupied operation modes respectively.

The code's ventilation calculations for normal occupancy require 8,400 CFM outdoor airflow with the supply fan providing full airflow to the space. For this air-handler, both minimum and maximum dampers need to be open to meet this ventilation rate of 8,400 CFM. The cooling coil is sized to handle the maximum outdoor airflow load. The heating coil is closely sized and most likely able to handle this load. In some spaces, the supply airflow must be rebalanced to meet the ventilation code. The code space area outdoor ventilation rate for minimum CO2 control equates to approximately 2,300 CFM. The original design lower ventilation rate did not meet this minimum outdoor airflow and will need to be increased. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 26,387 CFM and 30,043 CFM depending on dampers position and operation mode. The outside airflow measured between 126 CFM and 7,614 CFM. The supply airflow's higher rate is above design and should be rebalanced. The outside airflow lower ventilation rate is not per design and the maximum ventilation airflow is slightly below design. The outside airflow rate must be rebalanced to meet design and the code ventilation rates noted above. Additional controls and equipment verification must be performed for optimum performance during warm-up and normal occupancy operation modes.

The balancing report shows the lobby exhaust/relief fan EF-4, below its design range. This unit was designed for 7,000 CFM and the balancing data measured 3,744 CFM. The pertaining dampers and control functions must be fixed and corrected and the system must be rebalanced.

ASU-3 System: Studio Rooms

Unit ASU-3 is designed for single speed operation. This air-handler is comprised of a supply fan, return fan, return air damper, minimum outside air damper, maximum outside air damper and exhaust air damper. The system provides minimum ventilation outside airflow through the minimum outside air dampers. Economizer cooling outside airflow is provided by opening both the minimum and the maximum outdoor air dampers. The associated space exhaust fan EF-6, must operate to provide general exhaust airflow during the building's occupied schedule. During warm-up mode the associated exhaust fan is off and both outside air dampers are closed.

This system is designed to supply 4,400 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 400 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 1,190 CFM outdoor airflow with the supply fan providing full airflow to the space. The existing ventilation airflow of 400 CFM does not meet current code. The maximum outdoor air damper actuator needs to be a modulating damper to increase the ventilation airflow per code; new control damper actuators may be required if modulation is not possible. The cooling coil has capacity to handle the added ventilation load. The heating coil is tightly sized to handle this load. The code space area outdoor ventilation rate for minimum CO2 control equates to 575 CFM. The original design lower

ventilation rate did not meet this minimum outdoor airflow and will need to be increased. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 4,722 CFM and 5,779 CFM depending on dampers position and operation mode. The outside airflow measured between 357 CFM and 4,323 CFM. The supply airflow during normal and warm up operation is above design range and should be rebalanced. Intake air louvers and screens must be cleaned, and the outside airflow must be rebalanced to meet the minimum code ventilation rate noted above.

The exhaust fan EF-6, serving the studio toilets, was not included in the balancing report. The exhaust fan must operate during building occupancy per design and ventilation calculations.

ASU-4 System: Dressing Rooms

Unit ASU-4 is designed for single speed operation. The air-handler is comprised of a supply fan, return fan, return and exhaust air damper, minimum outside air damper, and maximum outside air damper. The system provides minimum ventilation outside airflow through the minimum outside air damper. Economizer cooling outside airflow is provided by opening both the minimum and the maximum outdoor air dampers. The associated exhaust fan EF-1, must operate to provide general space exhaust airflow during the building's occupied schedule. During warm-up mode the associated exhaust fan is off and the outside dampers are closed.

This system is designed to supply 5,450 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 1,900 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 1,900 CFM outdoor airflow with the supply fan providing full airflow to the space. The supply airflow rates must be rebalanced in some spaces to meet the ventilation code. The cooling coil is sized to handle this maximum outdoor airflow load. The heating coil is tightly sized to handle the load. The code space area outdoor ventilation rate for minimum CO2 control equates to 975 CFM. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 3,705 CFM and 7,053 CFM depending on the dampers position and operation mode. The outside airflow measured between 42 CFM and 6,486 CFM. The supply airflow is above the design range during normal occupied mode operation and below design range during warm-up mode. The outside airflow minimum ventilation operation is outside its design range as well. The outside and supply airflow must be rebalanced to meet design and the code ventilation rates noted above. Additional controls and equipment verification must be performed for optimum performance during warm-up and normal occupancy operation modes.

The balancing report show the exhaust fan EF-1, operating below its design range. The pertaining dampers and control functions must be fixed and corrected and the system must be rebalanced.

ASU-5 System: Projection

Unit ASU-5 is designed for single speed operation. The air-handler is comprised of a supply fan, return and exhaust air damper, minimum outside air damper, and maximum outside air damper. The system provides minimum ventilation outside airflow through the minimum outside air damper. Economizer cooling outside airflow is provided by opening both the minimum and the maximum outdoor air dampers. The associated space exhaust fan EF-3, must operate to provide general exhaust airflow during the building's occupied schedule.

This system is designed to supply 2700 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 1100 CFM during the building's occupied schedule.

The minimum ventilation airflow of 1100 CFM is above code requirements (320 CFM per code). The cooling coil is sized to handle the design minimum outdoor airflow load. The heating coil is only sized for about half of the design airflow. The code space area outdoor ventilation rate for minimum CO2 control equates to 100 CFM. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data showed the supply fan providing 2,272 CFM and 2,642 CFM depending on dampers position and operation mode. The outside airflow measured between 64 CFM and 2425 CFM. 1,187 CFM was measured at the minimum ventilation testing. The minimum ventilation measurement was within design parameters. The outside and supply airflow must be rebalanced to meet heating coil design conditions and the code ventilation rates noted above. Additional controls and equipment verification must be performed for optimum performance during warm-up, heating and economizer cooling operation modes.

The balancing data for system exhaust fan EF-3, shows operation within its design range. This unit was designed for 2,265 CFM and the balancing data measured 1,230 CFM. A number of dressing rooms do not have direct room exhaust airflow. There rooms are adjacent to toilet rooms with higher exhaust airflow than required by code and a retrofit is possible. The dressing rooms must be provided with exhaust airflow as noted in the calculations table. The fan system must be verified and spaces rebalanced after the retrofit.

ASU-6 System: Stage

Unit ASU-6 is designed for two speed operation. The air-handler is comprised of a supply fan, return fan, return air damper, minimum outside air damper, and maximum outside air damper and minimum exhaust air damper and maximum exhaust air damper. The system provides minimum ventilation outside airflow through the minimum outside air damper. Economizer cooling outside airflow is provided by opening both the minimum and the maximum outdoor air dampers.

This system is designed to supply 8,000 CFM 5,000 CFM during normally occupied and unoccupied operation modes respectively. The minimum outdoor ventilation airflow is designed to provide 600 CFM during the building's occupied schedule.

Balancing data showed the supply fan providing between 7,347 CFM and 10,122 CFM depending on dampers position and operation mode. The outside airflow measured between 547 CFM and 7,349 CFM. The supply airflow and outside airflow readings at 100% outdoor air testing do not match. The outdoor airflow at minimum ventilation operation meets the code requirements noted above. Additional controls and equipment verification must be performed for optimum performance during warm-up, and economizer cooling operation modes.

The code's ventilation calculations for normal occupancy require 1,850 CFM outdoor airflow with the supply fan providing full airflow to each space. The cooling and heating coils have enough capacity to handle the new ventilation outdoor airflow load. The code space area outdoor ventilation rate for minimum CO2 control equates to 150 CFM. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

System Design Parameters Table - Schnitzer

UNIT	SERVES	Design MIN OA	Design MAX OA	Design SA CFM normal flow / low flow	Normal ventilation exhaust fan	Max outdoor air relief fan	**Minimum Code Req'd Ventilation Airflow CFM**
ASU-1	AUDITORIUM	6950	13750	41000/28700	EF-2	EF-5	13750
ASU-2	LOBBIES	1400	8400	23500/16500	EF-2	EF-4	8400
ASU-3	STUDIO	400	4400	4400	EF-6	ASU-Return fan	1190
ASU-4	DRESSING	1900	5400	5450	EF-1	ASU-Return fan	1900
ASU-5	PROJECT	1100	2700	2700	EF-3	-	575
ASU-6	STAGE	600	8000	8000/5000	-	ASU-Return fan	1850
RTU-1 [1]	PROJECTION						

1. No as-built documents provided.

Field Test Data

For Air Balancing Specialty's completed air balancing data see *Appendix 1b - 10218 Portland 5 Schnitzer-Pretest Air Balancing Report*.

The table below is the air balancing summary from the air balancing report.

Air balancing Summary Table

UNIT	Tested Unit SA at Ventilation OA Ratio of: 0% | min | 100% CFM	Tested Unit OA at Ventilation OA Ratio of: 0% | min | max CFM
ASU-1	41,170 | 38,453 | 38,617	342 | 9,630 | 10,368
ASU-2	30043 | 27118 | 26387	126 | 3708 | 7614
ASU-3	5052 | 5779 | 4722	375 | 431 | 4323
ASU-4	3705 | 6603 | 7053	42 | 3636 | 6486
ASU-5	2272 | 2642 | 2491	64 | 1187 | 2425
ASU-6	7347 | 8200 | 10122	547 | 1812 | 7349
RTU-1	[TAB not provided]	185 | 346 | 1764

Antoinette Hatfield Hall

System Descriptions

Antoinette Hatfield Hall is heated, ventilated and air-conditioned by seven indoor air-handling units originally installed in 1984. An additional air-handler, ASU-8 was installed in 1999 for the remodeled 4th floor rehearsal space. The air-handlers are located in mechanical rooms on the various building levels. Ventilation outdoor airflow is ducted to the air-handling units from wall or penthouse louvers. Relief air is ducted from the air-handling units to wall or penthouse louvers. Return air from each space is ducted back to the air-handling units. The ventilation calculation analysis table for this building is included in *Appendix 2 - Outside Ventilation Airflow Code Analysis Calculation Table – Antoinette Hatfield*.

The air-handling units are designed to provide minimum ventilation outdoor airflow for the building's normal occupied schedule and 100% outside airflow for economizer cooling function. Each system (except ASU-9) is comprised of a supply fan, return/relief air fan, a minimum and a maximum outside air damper, return air damper, and relief air damper. Unit ASU-9 is a multi-zone unit comprised of a supply fan, hot and cold deck and zone mixing. All the air-handlers have a filter, and cooling coil. Heating coils inside the air-handlers are provided in all units except for ASU-1. Variable air volume terminal units with re-heat coils provide the heating required at the spaces served by ASU-1.

At the air-handling units with return fans, the associated return fan must be interlocked to operate when the supply fan operates to provide return air and space relief. The associated exhaust fans must also operate to provide general exhaust airflow during the building's occupied schedule. Unit ASU-1 does not have adequate outdoor airflow during normal occupancy operation to replenish the air exhausted by all the exhaust fans installed within this system. Air transfer from ASU-2, ASU-3, and ASU-5 will need to provide the additional make-up airflow.

ASU-1: Back of House System

Unit ASU-1 is designed to supply 26,000 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide up to 2,600 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 5,580 CFM outdoor airflow. A number of the VAV boxes will be limited on reducing airflow; these will need to operate at a higher rate than 50% (see ventilation table for minimum airflow rate allowed per space). The cooling coil is short of the added capacity however the new load will most likely be handled by increasing the coil fluid flow. An additional heating coil may be required in the air-handling unit to account for the higher ventilation rate. The code space area outdoor ventilation rate for minimum CO2 control equates to 3,605 CFM of outdoor airflow. The original design lower ventilation rate did not meet this minimum outdoor airflow and will need to be increased. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 26,492 CFM and 27,416 CFM depending on damper positions and operation mode. The outside airflow measured between 528 and 22,131 CFM. The supply airflow and outside airflow readings at 100% outdoor air testing do not match. The measured minimum ventilation outside airflow of 1,281 does not meet code as noted above. Additional controls and equipment verification must be performed for optimum performance during warm-up, normal ventilation and economizer cooling operation modes.

The balancing data for exhaust fans EF-1, and -3 shows current operation slightly below their acceptable design range. This may be resolved by simple rebalancing methods. The exhaust fans EF-2 and -4 are operating below acceptable range and will require additional fan motor and duct connection verifications. A number of rooms do not have direct room exhaust airflow. The

calculations table for this building notes the rooms that require exhaust airflow rates adjustments to meet code. The fan system must be verified and spaces rebalanced after the retrofit.

ASU-2: Interior Theater System

Unit ASU-2 is designed to supply 21,600 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 4,750 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 7,550 CFM outdoor airflow with the supply fan providing full airflow to the space. The cooling coil is short of the added capacity however the new load most likely will be handled by increasing the coil fluid flow. The heating coil seems not to have the capacity required for the new ventilation load. The code space area outdoor ventilation rate for minimum CO2 control equates to 1,180 CFM. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 16,280 CFM and 19,844 CFM depending on dampers position and operation mode. The outside airflow measured between 3,293 and 17,665 CFM. The outside airflow measured at the 0% outside air test is very high; this should be close to 0 CFM. The minimum ventilation airflow of 6,926 CFM is above design however does not meet the code ventilation shown above. The maximum ventilation airflow for economizer function does not match the fan total at the 100% outdoor air test. Additional controls and equipment verification must be performed for optimum performance during warm-up, normal ventilation and economizer cooling operation modes.

ASU-3: Lower Lobby System

Unit ASU-3 is designed to supply 30,120 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 2,900 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 8,200 CFM outdoor airflow with the supply fan providing full airflow to the space. The cooling coil is short of the added capacity however the new load most likely will be handled by increasing the coil fluid flow. The heating coil seems not to have the capacity for the new ventilation load. The code space area outdoor ventilation rate for minimum CO2 control equates to 1,970 CFM. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan's ability to provide between 26,000 CFM and 32,600 CFM depending on dampers position and operation mode. The outside airflow measured between 1,100 CFM and 29,000 CFM. The supply airflow during normal operation is within the design range. The outside airflow measured at the 0% outside air test is very high; this should be close to 0 CFM. The measured minimum ventilation outside airflow of 7,960 CFM is above design however slightly below the calculated value noted above. The maximum ventilation airflow measured for economizer function does not match the total supply fan airflow at the 100% outdoor air test. Additional controls and equipment verification must be performed for optimum performance during warm-up, normal ventilation and economizer cooling operation modes.

ASU-4: Showcase Theater System

Unit ASU-4 is designed to supply 14,200 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 2,270 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 3,750 CFM outdoor airflow with the supply fan providing full airflow to the space. The cooling coil has adequate capacity to handle the total coil load. The heating coil seems not to have the capacity for the new ventilation load. The code space area outdoor ventilation rate for minimum CO2 control equates to 665 CFM of outdoor airflow. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 15,800 CFM and 16,900 CFM depending on dampers position and operation mode. The outside airflow measured between 1,380 and 15,800 CFM. The 16,900 CFM supply airflow at normal operation is slightly above design. Verify the cooling coil velocity; this must be below 500 FPM to prevent condensate carryover. The 5,100 CFM outside airflow at minimum ventilation is above the original design and also the calculated ventilation airflow noted above. The outside airflow measured at the 0% outside air test is very high; this should be close to 0 CFM. Additional controls and equipment verification must be performed for optimum performance during warm-up, normal ventilation and economizer cooling operation modes.

ASU-5: Upper Lobby System

Unit ASU-5 is designed to supply 16,800 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 1,680 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 7,750 CFM outdoor airflow with the supply fan providing full airflow to the space. The cooling coil is short of the added capacity however the new load most likely will be handled by increasing the coil fluid flow. The heating coil does not have enough capacity to meet the new ventilation load. The code space area outdoor ventilation rate for minimum CO2 control equates to 1,400 CFM of outdoor airflow. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 10,350 CFM and 12,000 CFM depending on dampers position and operation mode. The outside airflow measured between 2,080 CFM and 11,030 CFM. The 12,170 CFM supply airflow at normal operation is below design. The 2,350 CFM outside airflow at minimum ventilation is above the original design however it does not meet the calculated ventilation airflow noted above. The outside airflow measured at the 0% outside air test is very high; this should be close to 0 CFM. Additional controls and equipment verification must be performed for optimum performance during warm-up, normal ventilation and economizer cooling operation modes.

ASU-7: Projection Space System

Unit ASU-7 is designed to supply 3,200 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 300 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 1,310 CFM outdoor airflow with the supply fan providing full airflow to the space. The cooling coil does not seem to have enough capacity for the new ventilation load. The heating coil is also short of the capacity required by the new ventilation load. The code space area outdoor ventilation rate for minimum CO2 control equates to 560 CFM of outdoor airflow. The original design lower ventilation rate did not meet this minimum outdoor airflow and will need to be increased. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 2,560 CFM and 5,700 CFM depending on dampers position and operation mode. The outside airflow measured between 60 CFM and 1,800 CFM. The 5,740 CFM supply airflow measured at the minimum ventilation test is above design; verify cooling coil velocity is below 500 FPM to prevent condensate carryover into the air stream. The 510 CFM outside airflow measured at the minimum ventilation test is above original design however, it does not meet the calculated ventilation airflow noted above. The maximum ventilation airflow measured for economizer function does not match the total supply fan airflow at the 100% outdoor air test. Additional controls and equipment verification must be performed for optimum performance during warm-up, normal ventilation and economizer cooling operation modes.

ASU-8: Rehearsal System

Unit ASU-8 is designed to supply 7,950 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 3,720 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 3,720 CFM outdoor airflow with the supply fan providing full airflow to the space. The cooling and heating coils have adequate capacity for the ventilation load. The code space area outdoor ventilation rate for minimum CO2 control equates to 300 CFM of outdoor airflow. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing considerably different airflow measurements between the first test and the second test. In the first test, the supply airflow measured between 6,300 CFM and 6,400 CFM depending on dampers position and operation mode. In the second test, the supply airflow measured between 1,800 CFM and 2,200 CFM. In the first test, the outside airflow measured between 0 CFM and 8800 CFM. In the second test, the outside airflow measured between 1,400 CFM and 7,300 CFM. The supply airflow measured in both tests is below design. The maximum ventilation airflow measured for economizer function does not match the total supply fan airflow at the 100% outdoor air test. Additional controls and equipment verification must be performed for optimum performance during warm-up, normal ventilation and economizer cooling operation modes.

A number of rooms do not have direct room exhaust airflow. The building calculations table notes the rooms that require added exhaust and exhaust airflow rates adjustments to meet code.

ASU-9: Gallery System

Unit ASU-9 is designed to supply 2,800 CFM for the heating and cooling operation modes. The system's minimum outdoor ventilation airflow is designed to provide 280 CFM during the building's occupied schedule.

The code's ventilation calculations for normal occupancy require 340 CFM outdoor airflow with the supply fan providing full airflow to the space. The cooling coil has adequate capacity to provide for the additional ventilation airflow. The heating coil is short of the added capacity however the new load most likely will be handled by increasing the coil fluid flow. The code space area outdoor ventilation rate for minimum CO2 control equates to 100 CFM of outdoor airflow. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 2,900 CFM and 3,200 CFM depending on dampers position and operation mode. The outside airflow measured between 420CFM and 2,800 CFM. These measurements came from the pre-test data prior to new filters being installed. The new filters have not been completely installed and the final test has not been completed.

Currently the measured supply airflow exceeds the design range and the measured outside minimum ventilation airflow is above the design range. The outside airflow measured at the 0% outside air test is very high; this should be close to 0 CFM. Filter installation must be completed prior to the system must be tested again. Additional controls and equipment verification must be performed for optimum performance during warm-up, normal ventilation and economizer cooling operation modes.

Summary - Hatfield

With the exception of ASU-8, the existing air-handlers have not been designed to handle the new ventilation airflow loads. For this building and depending on spaces served, the code requires between 30 to 45% outdoor airflow for normal occupancy. The existing air-handling units were designed with very low outside airflow (9%-20% outside air). In the original design, the heating coils were tightly sized and some coils seem to be short of their required heating capacity. For most of the air-handlers, heating coil replacement will be needed in order to increase ventilation airflow rates. The cooling coils have some ability for additional ventilation load but most of them cannot handle the new ventilation load without changing fluid flowrates and possibly control valves.

The air balancing test report indicates a few of the air-handlers cannot attain the supply airflow rates listed on the floor plans. The outdoor air system is designed to provide full economizer cooling function on all units. The outside air, exhaust air and return air (mixing) damper positions and the exhaust fans operation must verified for proper control.

System Design Parameters Table - Hatfield

UNIT	SERVES	Design MIN OA	Design MAX OA	Design SA CFM	Normal ventilation exhaust fan	Min. Code Ventilation Req'd OA rate CFM
ASU-1	BACK OF HOUSE	2600	26000	26000	EF-1,EF-3, EF-4, EF-2	5580
ASU-2	INT THEATER	4750	21600	21600		7550
ASU-3	LOWER LOBBY	2900	29000	32500		8200
ASU-4	SHOWCASE THEATER	2270	14200	14200		3750
ASU-5	UPPER LOBBY	1680	16800	16800		7750
ASU-6	FUTURE FOUNDERS RM	0	0	0		
ASU-7	PROJECTION	300	3200	3200	EF-5	1310
ASU-8	REHEARSAL	3750	7950	*7950*		3720/2355
ASU-9	GALLERY	280	2800	2800		340

Field Test Data

For Air Balancing Specialty's completed air balancing data see *Appendix 2b - 10218 Portland 5 Antoinette Hatfield Air Balancing Report.*

The table below is the air balancing summary from the air balancing report.

Air balancing Summary Table

UNIT	Tested Unit SA at Ventilation OA Ratio of: 0% | min | 100% CFM	Tested Unit OA at Ventilation OA Ratio of: 0% | min | max CFM
ASU-1	27416 | 28534 | 26492	528 | 1281 | 22131
ASU-2	16280 | 18744 | 19844	3293 | 6926 | 17665
ASU-3	26028 | 30618 | 32616	1123 | 7958 | 28975
ASU-4	15764 | 16912 | 16800	1380 | 5097 | 15822
ASU-5	10,346 | 12,170 | 11,201	2,080 | 2,353 | 11,024
ASU-6	0	0
ASU-7	RA-5416 | 5738 | 2558	56 | 514 | 1792
ASU-8*	6297-1833 | 6287-2156 | 6454-1985	0-1378 | 4847-1558 | 8782-7301
ASU-9**	RA-3141 | 3233 | 2899	417 | 1334 | 2824

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- * data shows pre-test and post-test data. The post-test data is outside design range
- ** system was not provided with a post-test after the filter installation and supply air test.

Keller Auditorium

System Descriptions

Keller Auditorium is heated, ventilated and air-conditioned by ten indoor air-handling units originally installed in 1966. The air-handlers are located in mechanical rooms on various building levels. Ventilation outdoor airflow is ducted to the air-handling units from intake well/pit louvers. Relief air is ducted from the air-handling units to exhaust well/pit louvers. The ventilation calculation analysis table for this building is included in *Appendix 3 - Outside Ventilation Airflow Code Analysis Calculation Table - Keller Auditorium*.

The balancing data did not include measurements of the outside airflow for a good number of units. On some of the units, the data shows ventilation airflow being supplied to the spaces during warm-up operation or the 0% outdoor airflow test. The air-handlers' outside air dampers must be closed at the 0% OA test. On other units the minimum ventilation airflow test measured higher than designed ventilation rates. The as-built plans and documents are not clear whether the air-handlers have a minimum outside air damper or not and a maximum outside air damper. If there are minimum outdoor air dampers, only the minimum outside air dampers shall be opened for minimum ventilation operation. For maximum outside airflow ventilation in addition to the minimum damper the maximum outside air damper shall also open.

The balancing report noted higher velocities than allowed for cooling coils on a number of units. The test location for the noted airflow velocities must be verified. The coil velocity must be below the allowable cooling coil velocity to prevent condensate carry over during the cooling operation.

SU-1 System: Stage and Rehearsal 238

Unit SU-1 is designed to provide minimum ventilation for normal occupancy at 50% of supply airflow. The air-handling system is comprised of a supply fan, filter, heating coil (this coil also has a chilled water piping connection to provide limited cooling), and the outside air damper. The system also includes an exhaust fan with a control damper. The associated exhaust fan must operate to provide general exhaust airflow during the building's occupied schedule. 100% outdoor airflow cooling economizer operation is not available. During the warm-up mode the associated exhaust fan is off and outside damper is closed.

> Unit SU-1 is designed to supply 3,500 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide 1,750 CFM during the building's occupied schedule.
>
> The ventilation calculations require a higher outdoor airflow rate. The system's 1,750 CFM outdoor airflow is not adequate to meet the new ventilation code. At the current supply airflow rate, the code's space area outdoor ventilation rate for minimum CO2 control equates to 1,900 CFM. The original room design supply airflow is about 0.50 CFM/sq. ft. Because of the very low room supply airflow the new calculated outdoor airflow rate is extremely high. First the space supply airflow must be increased to about 1 CFM /sq. ft. or 8,800 CFM. At this supply airflow rate the system level required ventilation airflow rate is 2,850 CFM for normal occupancy ventilation and 900 CFM minimum when CO2 control code is back in effect. The original design's lower ventilation rate met this low ventilation code requirement. For the time being, the low ventilation operation is annulled by CDC.
>
> Balancing data shows the supply fan providing between 3,100 CFM and 3,890 CFM depending on dampers position and operation mode. The balancing data did not provide a measurement of the actual outside airflow rate. The supply airflow at normal operation is within the original design range which is below the recommended space airflow. To determine code compliance, the actual outdoor ventilation airflow measurement is still required for this unit. Additional control and equipment verification of outside air and exhaust air damper positions and exhaust fan operation must be confirmed for proper operation as well.

The balancing report shows higher than allowed velocity for cooling coils; the testing location must be verified.

The balancing data for exhaust fan EF-1, shows operation below its original design range. This unit was designed for 1,750 CFM and the balancing data measured 1,280 CFM. This exhaust fan will not be able to perform at the higher ventilation rate noted above.

For ventilation code compliance, the supply airflow rates in some of the spaces must be adjusted and rebalanced as noted in the ventilation calculation tables.

SU-2, -4, -5, & -6 Systems

The air-handling units SU-2, SU-4, SU-5, & SU-6 are designed to provide minimum ventilation for normal occupancy and 100% outside airflow for economizer cooling. Each system is comprised of a supply fan, filter, heating coil, cooling coil, exhaust/return fan, outside air damper, return air damper, and exhaust air damper. The units also have a two stage cooling coil and a single stage heating coil. The exhaust fans function as relief air fans during full outdoor air economizer cooling operation. The exhaust air and return air dampers must be controlled properly for each of these applications. The associated exhaust fan must be interlocked with the supply fan to provide space relief airflow. For unit SU-2 the associated exhaust fan also functions as a return air fan during warm-up or normal occupied operation modes. During warm-up mode at units SU-4, -5, & -6 the associated exhaust fan is off and the outside damper is closed.

The scheduled cooling coils capacities for these units are sized for the full outdoor ventilation airflow rates indicated below. The scheduled heating coils capacities are sized for about half of cooling outdoor ventilation airflow rates. If the winter design space heating load cannot be maintained at the required ventilation airflow rate, the coils and control valves will need to be replaced.

With the exception of unit SU-6, the balancing data did not provide a measurement of the actual system outside airflow. To determine code compliance, the actual outdoor ventilation airflow measurement is still required for these units. Also all the units except for SU-6, had higher noted velocities than allowed for cooling coils. The test location for the listed airflow velocities must be verified. The coil velocity must be within design limits to prevent condensate carry over during cooling operations.

SU-2: Rehearsal

Unit SU-2 is designed to supply 3,300 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide up to 660 CFM. The cooling coil is sized for this ventilation load but not the heating coil. The available heating coil capacity is for about 330 CFM of outdoor airflow load.

The code's ventilation calculations for normal occupancy require 570 CFM outdoor airflow with the supply fan providing full airflow to the space; the lower ventilation rate allowed by the heating coil design data does not meet code. This coil may need to be replaced. The code's space area outdoor ventilation rate for minimum CO2 control equates to 120 CFM of outdoor airflow. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 3,480 CFM and 3,900 CFM depending on dampers position and operation mode. The supply airflow of 3,880 CFM at normal ventilation operation is within the original design range of the floor plans airflow rates. Outside airflow measurement is still required. Additional control and equipment verification of outside air and exhaust air damper positions and exhaust fan operation must be confirmed for proper operation.

The balancing data for exhaust fan EF-2, shows operation below its original design range. This unit was designed for 3,300 CFM and the balancing data measured 2,490 CFM.

SU-4: Orchestra level Foyer and Lobby

Unit SU-4 is designed to supply 8,200 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide up to 1,640 CFM. The cooling coil is sized for this ventilation load but not the heating coil. The available heating coil capacity provides for about half of this outdoor ventilation airflow load.

The code's ventilation calculations for normal occupancy require 2,040 CFM outdoor airflow with the supply fan providing full airflow to the space. The code's space area outdoor ventilation rate for minimum CO2 control equates to 690 CFM. The cooling coil is tightly sized but will most likely handle the capacity of the additional ventilation load. The heating coil and control valve may need to be replaced. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

The balancer observed plugged coils and the supply suction and discharge pressure measured was too high. The balancing report only provided the supply fan airflow at 5,580 CFM. This was measured at the minimum outdoor ventilation test. This supply airflow is not within the original design range. Outside airflow measurement was not provided and must be verified. Additional control and equipment verification of outside airflow rate, exhaust air damper positions and exhaust fan operation must be confirmed for proper operation.

The balancing data for exhaust fan, EF-4 shows the high fan speed operation within its original higher design range. This unit was designed for 14,400 CFM at high speed. The balancing data measured 13,160 CFM. The low speed operation was designed for 9,600 CFM which is more in-line with the supply fan operation for this system. Further analysis is needed to determine when the fan needs to run at the higher speed. Detailed balancing measurements are required for economizer and normal ventilation operating modes to determine the correct speed for this fan to provide space relief. Running the fan at the higher speed will cause a negative pressure and higher air leakage in the building.

SU-5: 1st Balcony Foyer and Lobby

Unit SU-5 is designed to supply 11,000 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide up to 2,750 CFM during cooling but not for heating. The heating coil was sized for less outdoor ventilation airflow load.

The code's ventilation calculations for normal occupancy require 2,750 CFM outdoor airflow with the supply fan providing full airflow to the space; a lower ventilation rate does not meet code. The cooling coil appears to have enough capacity to provide for this code ventilation load. The heating coil and control valve may need to be replaced. The code's space area outdoor ventilation rate for minimum CO2 control equates to 670 CFM. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 11,520 CFM and 8,780 CFM depending on dampers position and operation mode. The minimum outdoor airflow test measured the supply fan operating within its design range. The supply airflow measured at 100% OA is below the design range. The outside airflow test was not performed. Control damper position and exhaust fan operation must be verified.

The balancing data for exhaust fan EF-5 shows the fan's high speed operation above its original design range. This unit is designed for 15,300 CFM at high speed. This unit's balancing data

measured 17,350 CFM. The fan's low speed operation of 10,200 CFM is more in-line with the supply fan operation. Further analysis is needed to determine when the fan needs to run at the higher speed. Detailed balancing measurements are required for economizer and normal ventilation operating modes to determine the correct speed for this exhaust fan.

SU-6 System: 2nd Balcony Foyer and Lobby

Unit SU-6 is designed to supply 7,800 CFM for the heating and cooling operation modes. The minimum outdoor ventilation airflow is designed to provide up to 1,950 CFM during cooling but not for heating. The heating coil is sized for less outdoor ventilation airflow load.

The code's ventilation calculations for normal occupancy require 2,200 CFM outdoor airflow with the supply fan providing full airflow to the space. The cooling coil appears to have enough capacity to provide for the code ventilation load. The heating coil and control valve may need to be replaced. The code's space area outdoor ventilation rate for minimum CO2 control equates to 390 CFM of outdoor airflow. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 7,000 CFM and 8,500 CFM depending on dampers position and operation mode. The outside airflow measured between 36 and 10,330 CFM. The supply airflow at normal operation is within the original design range. The measured 640 CFM outside airflow at the minimum ventilation test is below the original design and does not meet the calculated ventilation airflow noted above. The maximum ventilation airflow measured for economizer function does not match the total supply fan airflow measure at the 100% outdoor air test. Additional controls and equipment verification must be performed for optimum performance during warm-up, normal ventilation and economizer cooling operation modes.

The balancing data for exhaust fan EF-6 shows the fan operation below its original design range. This unit's balancing data measured 7,210 CFM and 6,510 CFM.

SU-3 System: West Vestibule

Unit SU-3 is designed to supply 5,400 CFM for the heating and cooling operation modes. The unit is not provided with outside airflow. The system is a three zone, multi-zone unit comprised of a supply fan, hot and cold deck and mixing dampers. Return air is ducted back to the unit.

The balancing data shows the system ability to provide 7,605 CFM at the normal operation mode. The test measured the unit's return airflow. The return airflow measure is above design range. The cooling coil velocity must be verified.

The current code requires outdoor ventilation airflow be provided to the spaces served by this system. Using the original design supply airflow rate, the calculations equate to 150 CFM of outdoor air to meet the code required ventilation airflow.

The airflow rate for exhaust fan, EF-3 was not measured and no balancing data was provided. This unit is designed to exhaust 1,000 CFM.

SU-7, -8, & -10 Systems

Units SU-7, SU-8 & SU-10 do not have capability for economizer cooling function at 100% outside airflow. On these systems the outside air ducts and intake air louver is limited in size. Each system is a multi-zone unit comprised of a supply fan, filter, hot and cold deck with heating and cooling coils in parallel and zone mixing dampers to supply mixed air to their zones. Static pressure dampers are located upstream of the coils. For units SU-8 and SU-10, the cooling coil is also designed to provide a second stage of

heating. Return air is ducted back to the units. Additional exhaust fans provide building exhaust and space relief airflow. The units include outside air, and exhaust air dampers.

The associated exhaust fans must operate to provide general exhaust airflow during the building's occupied schedule. During warm-up mode the associated exhaust fans are off and outside dampers are closed.

The supply fans have been sized to provide a higher airflow than the cooling and the heating coils selections indicate. It is unclear if the units have coil bypasses and what the space airflow is during the cooling and heating modes. Balancing data should be provided for both of these operations. The ventilation analysis was done under the assumption the indicated fan airflow can reach the spaces. For reduced supply airflow rates the ventilation assessments below do not apply.

SU-7: North Rooms

The supply fan is sized to provide 7,000 CFM supply airflow. The cooling coil is sized for 5,000 CFM and the heating coil is only sized for 3,500 CFM. Flapper type dampers are installed for the zone mixing dampers. The minimum outdoor ventilation airflow is designed to supply up to 1,500 CFM during cooling but not for heating. The heating coil and control valve size available capacity is for about half of this airflow.

The code's ventilation calculations for normal occupancy require 1,750 CFM outdoor airflow with the supply fan providing full airflow to the space; the lower ventilation rate during heating does not meet code. The cooling coil has enough capacity to provide for the additional ventilation load. The heating coil and control valve will need to be replaced. The code's space area outdoor ventilation rate for minimum CO2 control equates to 830 CFM. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

Balancing data shows the supply fan providing between 6,170 CFM and 6,390 CFM depending on dampers position and operation mode. The outside airflow measured between 1,180 and 1,290 CFM. The supply airflow of 6170 CFM measured at the minimum ventilation test is below the original design range. The 1,190 CFM outside airflow measured at the minimum ventilation is below the original cooling design and does not meet the calculated ventilation airflow noted above. Additional controls and equipment verification must be performed for optimum performance during warm-up and normal ventilation operation modes.

The balancing data for exhaust fan EF-7, shows operation below its original design range. This fan was designed for 1,750 CFM and the balancing data measured between 180 CFM and 1,500 CFM.

The supply airflow rates in some of the spaces must be rebalanced as noted in the ventilation calculation table. The exhaust airflow rates in some spaces are not adequate or missing and must be adjusted. The calculations table for this building notes the rooms that require exhaust airflow rates adjustments to meet code.

SU-8: South Rooms

The supply fan is sized to provide 4,800 CFM supply airflow. The cooling and heating coils are sized for 3,600 CFM total supply airflow. Flapper type dampers are installed for the zone mixing dampers. The minimum outdoor ventilation airflow is designed to provide up to 1,980 CFM during the building's occupied schedule.

The ventilation calculations meet code at 2,560 CFM outdoor airflow with the supply fan providing full airflow to the space; the lower ventilation rate does not meet code. Using the fan airflow, the

cooling coil seems to have enough capacity to provide the additional ventilation load. The heating coil is tightly sizes but seems to have adequate capacity for the additional ventilation airflow load (using the fan airflow). The code's space area outdoor ventilation rate for minimum CO2 control equates to 1,320 CFM. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

The balancing data indicates supply airflow between 6,000 and 7,260 CFM. Outside air measurement test was not performed. The measured supply airflow exceeds the fan design range. Verification of the cooling coil airflow is required to determine acceptable coil velocity. Actual outdoor airflow must be measured to determine availability for code compliance.

The balancing data for exhaust fan EF-8, shows operation below its original design range. This unit was designed for 2,700 CFM and the balancing data measured 1,820 CFM.

The supply airflow rates in some of the spaces must be rebalanced as noted in the ventilation calculation table. The exhaust airflow rates in some spaces are not adequate or missing and must adjusted. The calculations table for this building notes the rooms that require exhaust airflow rates adjustments to meet code.

SU-10: Dressing

The supply fan is sized to provide 8,000 CFM of supply airflow. This adds up to the sum of the supply airflow rates noted on plans. From the IOM data the cooling coil is sized for 6,800 CFM. The minimum outdoor ventilation airflow is designed to provide 6,250 CFM during the building's occupied schedule. IOM data is not available for the heating coil. This coil is smaller than the cooling coil however it seems to be sized to meet the capacity for 6,800 CFM and this ventilation rate. Opposed blade type dampers are installed for the zone mixing dampers. This system is set up to provide 92% outside airflow constantly. The exhaust fan shall operate when the supply fan is on to provide space relief and exhaust. This system has limited recirculating capabilities; only a few rooms have return air ducted back to the air-handler. The building will be over-pressurized when the exhaust fan is not operating.

The balancing data measured supply airflow between 3,090 CFM and 5,800 CFM. The measured supply airflow rate is less than the design supply fan airflow. The measured outside airflow is between 1,100 CFM to 6,170 CFM. Outside airflow is designed to be constantly supplied at 6,250 CFM. Reducing outdoor airflow is not possible because the system does not have adequately sized return ductwork routed back to the air-handler. The supply fan, exhaust fan and dampers must be verified for proper operation.

The ventilation airflow is high due the original design space exhaust airflow and surpasses the code requirements of 3,880 CFM.

The balancing data for exhaust fan EF-10, shows operation below its original design range. This unit was designed for 7,100 CFM and the balancing data measured 4,630 CFM. The exhaust airflow is not adequate or is missing in some of the rooms. Exhaust airflow must be added or adjusted in these rooms. The calculations table for this building notes the rooms that require exhaust airflow rates adjustments to meet code.

The balancing data for exhaust fan EF-11, shows operation below its original design range. This unit was designed for 3,000 CFM and the balancing data measured 1,870 CFM. Exhaust fan, EF-11 operates based on temperature control to exhaust the Board Patch room. Transfer air is ducted back to the mechanical room for make-up air.

SU-9 System: Auditorium & Orchestra

This system is a multi-zone unit comprised of a supply fan, filters, a hot and a cold deck with two heating and one cooling coil in parallel and zone mixing dampers to supply mixed air to each zone. Static pressure dampers are located upstream of the coils. The supply fan is sized to provide 45,000 CFM, which closely adds up to meet the space supply airflow rates. From the IOM data the cooling coil is sized for 45,000 CFM supply airflow. There are two heating coils each sized for 25,000 CFM. The unit design provides for a minimum ventilation of 15,750 CFM during cooling and 14,400 CFM during heating. 100% outside airflow full economizer cooling function is provided. Return air is ducted to both the main exhaust fan and to a discharge opening in the mechanical room. The main exhaust fan is used for space exhaust and relief. The exhaust fan shall operate to provide general exhaust airflow during the building's occupied schedule and for economizer cooling space relief. During warm-up mode the associated exhaust fan is off and outside damper is closed.

The code's ventilation calculations for normal occupancy require 19,350 CFM outdoor airflow; the existing lower ventilation rate of 15,750 CFM does not meet code for normal occupancy operation. The cooling coil and heating coil seems to have enough capacity to provide for the additional ventilation load. The heating coil's control valve may need to be replaced. The code's space area outdoor ventilation rate for minimum CO2 control equates to 2,530. The original design's lower ventilation rate met this code requirement. For the time being, the low ventilation operation is annulled by CDC.

The balancing data indicates supply airflow between 35,170 CFM and 44,760 CFM. The outside airflow test measured between 20,040 CFM and 42,550 CFM. The supply airflow measured at normal operation is slightly less than the design supply fan airflow. The 24,560 CFM outside airflow at minimum ventilation is above the original design and above the calculated ventilation airflow noted above. Outdoor airflow at the 0% outside air test must be 0 CFM; damper and exhaust fan operation must be verified. The supply airflow varies significantly between the various tests performed; the supply fan speed, exhaust fan and dampers positions must be verified for proper operation.

The balancing data for exhaust fan EF-9, shows operation below its original design range. This unit was designed for 45,000 CFM and the balancing data measured 26,650 CFM.

The supply airflow rates in some of the spaces must be rebalanced as noted in the ventilation calculation table. The exhaust airflow rate in some spaces is not adequate or missing and must be adjusted. The calculations table for this building notes the rooms that require exhaust airflow rates adjustments to meet code.

System Design Parameters Table - Keller

UNIT	SERVES	Design MIN OA	Design MAX OA	Design SA CFM	Normal ventilation exhaust fan	Max outdoor air relief fan	Minimum Code Ventilation Airflow CFM
SU-1	STAGE	1,750	1,750	3,500	EF-1		5310 (2850 at 8810 CFM SA)
SU-2	REHEARSAL	660	3,300	3,300	EF-2		570
SU-3	ENTRY VEST. W	0	0	5,400	NONE		150
SU-4	ORCHESTRA	1,640	8,200	8,200	EF-4		2040
SU-5	1ST BALC	2,750	11,000	11,000	EF-5		2750
SU-6	2ND BALC	1,950	7,800	7,800	EF-6		2200
SU-7	NORTH RMS	1,500	2,046	7,000	EF-7		1750
SU-8	SOUTH RMS	1,980	2,602	4800	EF-8		2560
SU-9	AUDITORIUM	19,350	45,350	45,350	EF-9	EF-12	19350
SU-10	DRESSING	6,256	7512	8000	EF-10	*EF-11*	6256 (3880)

Field Test Data

For Air Balancing Specialty's completed air balancing data see *Appendix 3a - 10218 Portland 5 Keller Pretest Air Balancing Report*. The table below is the air balancing summary from the air balancing report.

Air balancing Summary Table

UNIT	Tested Unit SA at Ventilation OA Ratio of: 0% | min | 100% CFM	Tested Unit OA at Ventilation OA Ratio of: 0% | min | max CFM
SU-1	3090 | 3066 | 3888	0
SU-2	3481 | 3877 | 3898	0
SU-3	7605 RA only	0
SU-4	0 | 5580 | 0	0
SU-5	11520 | 10904 | 8780	0
SU-6	8524 | 8421 | 7186	36 | 639 | 10332
SU-7	6392 | 6169 | 6303	1214 | 1193 | 1188
SU-8	6000 | 7258 | 6757	0
SU-9	35167 | 40736 | 44758	20042 | 24564 | 42551
SU-10	3089 | 4442 | 5795	1098 | 2958 | 6174

MFIA, Inc.

OUTSIDE VENTILATION AIRFLOW CODE ANALYSIS CALCULATION TABLE -ARLENE SCHNITZER

UNIT	ROOM	REMARKS	MECH CODE CLASSIFICATION	SPACE AREA (FT^2) - Az	OCCUPANCY MAX(PEOPLE / 1000FT^2)	PLUMBING FIXTURES	OA CFM / PERSON (FIXTURE) - Rp	OA CFM/FT^2 - Ra	EA REQUIRED CFM / FIXTURE OR SF	CODE PEOPLE	OCCUPANT OSA CFM VBzp =Rp*Pz	AREA OSA CFM Vbza =Ra*Az	MECH CODE REQUIRED EXHAUST CFM	PROVIDED 100% EXHAUST CFM (2)	REQUIRED OA CFM Vbz =Sum(Vbz)	MECH CODE REQ'D OA CFM Voz =(Vbz)/Ez	MAXIMUM PROVIDED ROOM SUPPLY AIR CFM	MINIMUM PROVIDED SUPPLY AIR CFM Vpz	ZONE EFFECT. FACTOR Ez(3)	MAXIMUM OUTDOOR AIR FRACTION Zp =Voz/Vpz	SYSTEM VENTILATION EFFICIENCY AT MAX Zp - Ev (4)100%DIRECT OA=1	OCCUPANT DIVERSITY - D =Ps/(sum Pz)	UNCORREC OA INTAKE - Vou = DxSum(Rp x Pz)+Sum(Ra x Az)	MIN CODE OUTDOOR AIR CFM - Vot = Vou / Ev	**REQUIRED OUTDOOR AIR INTAKE CFM - Vot**	**MINIMUM OSA CFM (1)**
	112 - AUDITORIUM		AUDITORIUM	10078	150		5	0.06	0	756	7200	605	0	0	7805	7805	15700	15700	1	49.7%						
	605 - BALCONY		AUDITORIUM	5589	150		5	0.06	0	419	3990	335	0	0	4325	4325	25300	25300	1	17%						
ASU-1	TOTALS			15667						1175	11190	940	0	0	12130	12130	41000	41000	1	50%	0.65	0.7	8773	13497	13497	13,750
	001 - LOBBY		T-LOBBIES	1834	150		5	0.06	0	138	690	110	0	0	800	1000	2400	2400	0.8	42%						
	004 - STORAGE		WAREHOUSE	246	2		10	0.06	0	0	0	14.8	0	0	14.8	19	190	190	0.8	10%						
	005 - OFFICE		OFFICE	134	5		5	0.06	0	0	0	8	0	0	8	10	120	120	0.8	8%						
	006 - MANAGER		OFFICE	266	5		5	0.06	0	1	5	16	0	0	21	26	250	250	0.8	10%						
	007 - VESTIBULE		MAIN LOBBY	150	10		5	0.06	0	1	5	10	0	300	15	19	300	300	0.8	6%						
	008 - TOILET		TOILET	692	20	17	0	0	50	17	0	0	850	1455	0	0	680	680	0.8							
	009 - LOUNGE		BAR, LOUNGES	196	100		7.5	0.18	0	10	80	40	0	0	120	150	300	300	0.8	50%						
	011 - STORAGE		WAREHOUSE	268	2		10	0.06	0	0	0	20	0	0	20	25	100	100	0.8	25%						
	012 - JAN		UTILITY	152	10		0	0	50	1	0	0	50	190	0	0	70	70	0.8							
	014 - JANITOR		UTILITY	118	10		0	0	50	1	0	0	50	170	0	0	100	100	0.8							
	015 - KITCHEN		KITCHEN	240	20		7.5	0.12	0.7	2	20	30	170	200	50	63	180	180	0.8	35%						
	017 - MENS		TOILET	487	20	7	0	0	50	7	0	0	350	1050	0	0	450	450	0.8							
	019 - LOBBY		T-LOBBIES	592	150		5	0.06	0	44	220	40	0	0	260	260	540	540	1	48%						
	020 - LOUNGE		BAR, LOUNGES	382	100		7.5	0.18	0	19	150	70	0	0	220	275	500	500	0.8	55%						
	046 - OFFICE		OFFICE	120	5		5	0.06	0	0	0	10	0	0	10	13	100	100	0.8	13%						
	047 - EQUIP		UTILITY	77	10		0	0	50	0	0	0	0	0	0	0	80	80	0.8							
	101 - TICKET		DATA/TEL ENTRY	28	60		5	0.06	0	1	10	10	0	0	20	25	150	150	0.8	17%						
	102 - VESTIBULE		MAIN LOBBY	438	10		5	0.06	0	2	10	30	0	0	40	50	2000	2000	0.8	3%						
	103 - LOBBY		T-LOBBIES	1673	150		5	0.06	0	125	630	110	0	0	740	740	4400	4400	1	17%						
	104 - LOBBY		T-LOBBIES	755	150		5	0.06	0	57	290	50	0	0	340	425	1000	1000	0.8	43%						
	105 - LOBBY		T-LOBBIES	1321	150		5	0.06	0	99	500	80	0	0	580	580	1200	1200	1	48%						
	111 - LOBBY	[4]	T-LOBBIES	869	150		5	0.06	0	65	330	60	0	0	390	390	710	710	1	55%						
	301 - VESTIBULE		MAIN LOBBY	549	10		5	0.06	0	3	20	40	0	0	60	75	650	650	0.8	12%						
	302 - LOBBY		T-LOBBIES	851	150		5	0.06	0	64	320	60	0	0	380	475	900	900	0.8	53%						
	303 - BALCONY		AUDITORIUM	1003	150		5	0.06	0	75	380	70	0	0	450	450	900	900	1	50%						
	305 - LOBBY	[4]	T-LOBBIES	519	150		5	0.06	0	39	200	40	0	0	240	240	440	440	1	55%						
	403 - LOBBY		T-LOBBIES	761	150		5	0.06	0	57	290	50	0	0	340	425	1000	1000	0.8	43%						
	405 - LOBBY		T-LOBBIES	511	150		5	0.06	0	38	190	40	0	0	230	230	420	420	1	55%						
	407 - JANITOR		UTILITY	43	10		0	0	50	1	0	0	50	75	0	0	0	0	0.8							
	411 - WOMENS		TOILET	437	20	9	0	0	50	9	0	0	450	650	0	0	370	370	0.8							
	410 - MENS		TOILET	495	20	10	0	0	50	10	0	0	500	680	0	0	380	380	0.8							
	413 - LOUNGE	[4]	BAR, LOUNGES	331	100		7.5	0.18	0	17	130	60	0	0	190	238	430	430	0.8	55%						
	416 - FOYER		RECEPTION	701	30		5	0.06	0	11	60	50	0	0	110	138	300	300	0.8	46%						
	417 - FOYER		RECEPTION	827	30		5	0.06	0	12	60	50	0	0	110	138	800	800	0.8	17%						
	501 - FOYER		RECEPTION	363	30		5	0.06	0	5	30	30	0	0	60	75	350	350	0.8	21%						
	502 - STORAGE		WAREHOUSE	150	2		10	0.06	0	0	0	10	0	0	10	13	80	80	0.8	16%						
	503 - LOBBY		T-LOBBIES	396	150		5	0.06	0	30	150	30	0	0	180	225	700	700	0.8	32%						
	504 - STORAGE		WAREHOUSE	400	2		10	0.06	0	0	0	30	0	0	30	38	200	200	0.8	19%						
	505 - FOYER		RECEPTION	537	30		5	0.06	0	8	40	40	0	0	80	100	500	500	0.8	20%						
	506 - STORAGE		WAREHOUSE	122	2		10	0.06	0	0	0	10	0	0	10	13	80	80	0.8	16%						
	601 - PASSAGE		CORRIDOR	144	3		0	0.06	0	0	0	10	0	0	10	13	150	150	0.8	9%						
	603 - FOYER		RECEPTION	450	30		5	0.06	0	7	40	30	0	0	70	88	300	300	0.8	29%						
	604 - PASSAGE		CORRIDOR	239	3		0	0.06	0	0	0	20	0	0	20	25	250	250	0.8	10%						
ASU-2	TOTALS			20867						976	4850	1378.8	2470	4770	6228.8	7069	24250	23500	0.83	55%	0.6	0.75	5016	8360	8360	8,400
	116 - STORE		SALES	723	15		7.5	0.12	0	5	37.5	86.8	0	0	124.3	155	570	570	0.8	27%						
	117 - FOYER		RECEPTION	449	30		5	0.06	0	7	35	26.9	0	0	61.9	77	160	160	0.8	48%						
	202 - HALL		CORRIDOR	166	3		0	0.06	0	0	0	10	0	0	10	13	100	100	0.8							
	311 - DRESSING	[5]	LOCKER DRESSING	602	20		0	0	0.25	6	0	0	160	0	0	0	800	800	0.8							
	312 - HALL		CORRIDOR	167	3		0	0.06	0	0	0	20	0	0	20	25	130	130	0.8	19%						
	313 - TOILET		TOILET	62	20	1	0	0	50	1	0	0	50	75	0	0	0	0	0.8							
	314 - TOILET		TOILET	88	20	2	0	0	50	2	0	0	100	150	0	0	70	70	0.8							
	315 - TOILET		TOILET	39	20	1	0	0	50	1	0	0	50	75	0	0	0	0	0.8							
	316 - REHEARSAL		CLASSROOM-8	911	25		10	0.12	0	11	230	110	0	0	340	425	1500	1500	0.8	28%						
	418 - LIBRARY		LIBRARY	930	10		5	0.12	0	5	50	120	0	0	170	213	1000	1000	0.8	21%						
ASU-3	TOTALS			4137						38	352.5	373.7	360	300	726.2	908	4330	4400	0.8	48%	0.65	1	726	1117	1117	1190

UNIT	ROOM	REMARKS	MECH CODE CLASSIFICATION	SPACE AREA (FT^2) - Az	OCCUPANCY MAX(PEOPLE / 1000FT^2)	PLUMBING FIXTURES	OA CFM / PERSON (FIXTURE) - Rp	OA CFM/FT^2 - Ra	EA REQUIRED CFM / FIXTURE OR SF	CODE PEOPLE	OCCUPANT OSA CFM VBzp =Rp*Pz	AREA OSA CFM Vbza =Ra*Az	MECH CODE REQUIRED EXHAUST CFM	PROVIDED 100% EXHAUST CFM (2)	REQUIRED OA CFM Vbz =Sum(Vbz)	MECH CODE REQ'D OA CFM Voz =(Vbz)/Ez	MAXIMUM PROVIDED ROOM SUPPLY AIR CFM	MINIMUM PROVIDED SUPPLY AIR CFM Vpz	ZONE EFFECT. FACTOR Ez(3)	MAXIMUM OUTDOOR AIR FRACTION Zp =Voz/Vpz	SYSTEM VENTILATION EFFICIENCY AT MAX Zp - Ev (4)100%DIRECT OA=1	OCCUPANT DIVERSITY - D =Ps/(sum Pz)	UNCORREC OA INTAKE - Vou = DxSum(Rp x Pz)+Sum(Ra x Az)	MIN CODE OUTDOOR AIR CFM - Vot = Vou / Ev	**REQUIRED OUTDOOR AIR INTAKE CFM - Vot**	**MINIMUM OSA CFM (1)**
	025 - INSTRUMENTS	[4]	COMPUTER	491	4	1	5	0.06	0	1	10	29.5	0	0	39.5	49	80	80	0.8	61%						
	026 - INSTRUMENTS	[4]	COMPUTER	425	4		5	0.06	0	1	10	25.5	0	0	35.5	44	70	70	0.8	63%						
	027 - EQUIP		UTILITY	61	10		0	0	50	0	0	0	0	160	0	0	100	100	0.8							
	028 - VESTIBULE		MAIN LOBBY	201	10		5	0.06	0	1	5	12.1	0	0	17.1	21	50	50	0.8	42%						
	029 - STORAGE		WAREHOUSE	266	2		10	0.06	0	0	0	20	0	0	20	25	50	50	0.8	50%						
	030 - HALL	[4]	CORRIDOR	679	3		0	0.06	0	0	0	50	0	0	50	63	110	110	0.8	57%						
	031 - LOUNGE		BAR, LOUNGES	712	100		7.5	0.18	0	36	270	130	0	0	400	500	1000	1000	0.8	50%						
	033 - KITCHEN		KITCHEN	54	20		7.5	0.12	0.7	1	7.5	10	40	100	17.5	22	100	100	0.8	22%						
	034 - RESTROOM		TOILET	337	20	7	0	0	50	7	0	0	350	550	0	0	400	400	0.8							
	036 - TOILET		TOILET	74	20	1	0	0	50	1	0	0	50	150	0	0	100	100	0.8							
	037 - JAN		UTILITY	49	10		0	0	50	1	0	0	50	50	0	0	0	0	0.8							
	038 - OFFICE		OFFICE	166	5		5	0.06	0	0	10	10	0	140	20	25	130	130	0.8	19%						
	039 - WORKSHOP		COMPUTER	68	4		5	0.06	0	0	0	10	0	125	10	13	80	80	0.8	16%						
	041 - WORKSHOP		COMPUTER	114	4		5	0.06	0	0	0	10	0	125	10	13	80	80	0.8	16%						
	042 - ELECTRICAL		UTILITY	145	10		0	0	50	0	0	0	50	0	0	0	130	130	0.8							
	044 - ORCHESTRA	[4]	STAGES-STUDIOS	658	70		10	0.06	0	23	230	40	0	0	270	338	550	550	0.8	61%						
	114 - TOILET		TOILET	35	20	1	0	0	50	0	0	0	50	75	0	0	0	0	0.8							
	118 - HALL		CORRIDOR	298	3		0	0.06	0	0	0	20	0	0	20	25	100	100	0.8	25%						
	121 - DRESSING		LOCKER DRESSING	141	20		0	0	0.25	0	0	0	40	50	0	0	200	200	0.8							
	122 - DRESSING		LOCKER DRESSING	188	20		0	0	0.25	0	0	0	50	50	0	0	250	250	0.8							
	126 - HALL		CORRIDOR	267	3		0	0.06	0	0	0	20	0	0	20	25	100	100	0.8	25%						
	203 - HALL		CORRIDOR	285	3		0	0.06	0	0	0	20	0	0	20	25	230	230	0.8	11%						
	204 - DRESSING	[5]	LOCKER DRESSING	97	20		0	0	0.25	0	0	0	30	0	0	0	180	180	0.8							
	205 - DRESSING	[5]	LOCKER DRESSING	75	20		0	0	0.25	0	0	0	20	0	0	0	180	180	0.8							
	206 - TOILET		TOILET	43	20	1	0	0	50	0	0	0	50	100	0	0	0	0	0.8							
	318 - DRESSING	[5]	LOCKER DRESSING	149	20		0	0	0.25	0	0	0	40	0	0	0	200	200	0.8							
	319 - TOILET		TOILET	55	20	1	0	0	50	0	0	0	50	100	0	0	0	0	0.8							
	320 - DRESSING	[5]	LOCKER DRESSING	75	20		0	0	0.25	0	0	0	20	0	0	0	180	180	0.8							
	321 - HALL		CORRIDOR	217	3		0	0.06	0	0	0	20	0	0	20	25	80	80	0.8	31%						
	422 - HALL		CORRIDOR	217	3		0	0.06	0	0	0	20	0	0	20	25	80	80	0.8	31%						
	423 - TOILET		TOILET	55	20	1	0	0	50	0	0	0	50	100	0	0	0	0	0.8							
	424 - DRESSING	[5]	LOCKER DRESSING	149	20		0	0	0.25	0	0	0	40	0	0	0	200	200	0.8							
	425 - DRESSING	[5]	LOCKER DRESSING	79	20		0	0	0.25	0	0	0	20	0	0	0	180	180	0.8							
	507 - HALL		CORRIDOR	272	3		0	0.06	0	0	0	20	0	0	20	25	80	80	0.8	31%						
	508 - DRESSING	[5]	LOCKER DRESSING	183	20		0	0	0.25	0	0	0	50	0	0	0	350	350	0.8							
	509 - TOILET		TOILET	37	20	1	0	0	50	0	0	0	50	100	0	0	0	0	0.8							
	510 - DIMMER		COMPUTER	167	4		5	0.06	0	0	0	20	0	0	20	25	400	400	0.8	6%						
ASU-4	TOTALS			7584						72	542.5	487.1	1100	1975	1029.6	1288	5580	5450	0.8	62.9%	0.5	0.85	948	1896	1896	1900
	401 - SOUND BOOTH		DATA/TEL ENTRY	98	60		5	0.06	0	3	15	5.9	0	0	20.9	26	200	200	0.8	13%						
	402 - EQUIPMENT		DATA/TEL ENTRY	207	60		5	0.06	0	6	30	12.4	0	0	42.4	53	500	500	0.8	11%						
	702 - PROJECTION		DATA/TEL ENTRY	135	60		5	0.06	0	4	20	8.1	0	0	28.1	35	600	600	0.8	6%						
	703 - CORRIDOR		CORRIDOR	66	3		0	0.06	0	0	0	4	0	0	4	5	0	0	0.8							
	704 - LIGHTING		DATA/TEL ENTRY	161	60		5	0.06	0	5	25	9.7	0	0	34.7	43	200	200	0.8	22%						
	705 - PROJECTION		DATA/TEL ENTRY	130	60		5	0.06	0	4	20	7.8	0	0	27.8	35	600	600	0.8	6%						
	706 - SOUND		DATA/TEL ENTRY	149	60		5	0.06	0	4	20	8.9	0	0	28.9	36	250	250	0.8	14%						
	707 - PROJECTION		DATA/TEL ENTRY	189	60		5	0.06	0	6	30	11.3	0	0	41.3	52	550	550	0.8	9%						
ASU-5	TOTALS			1135						32	160	68.1	0	0	228.1	285	2900	2700	0.8	22%	0.9	1	285	317	317	1100
	119 - STAGE		STAGES-STUDIOS	1609	70		10	0.06	0	56	1150	96.5	0	0	1246.5	1247	6000	6000	1	21%						
	120 - STAGE		STAGES-STUDIOS	565	70		10	0.06	0	20	380	33.9	0	0	413.9	414	1900	1900	1	22%						
	128 - MANAGER		OFFICE	67	5		5	0.06	0	0	0	4	0	0	4	5	100	100	0.8	5%						
ASU-6	TOTALS			2241						76	1530	134.4	0	0	1664.4	1666	8000	8000	0.8	22%	0.9	1	1664	1849	1849	1858

NOTES:

(1) OUTDOOR AIR SUPPLIED DIRECTLY THROUGH THE UNIT.

(2) ADDITIONAL EXHAUST AIR WILL BE PROVIDE BY TRANSFER ROOM AIR NOT OSA.

(3) ZONE AIR DISTRIBUTION EFFECTIVENESS PER CODE TABLE 3.1.2

(4) EXISTING SUPPLY AIRFLOW IN THIS SPACE MUST BE REBALANCED TO THE LISTED SUPPLY AIRFLOW.

(5) DIRECT EXHAUST AIRFLOW MUST BE ADDED TO SPACE AS REQUIRED TO MEET CODE.

OUTSIDE VENTILATION AIRFLOW CODE ANALYSIS CALCULATION TABLE - ANTOINETTE HATFIELD HALL

UNIT	ROOM	REMARKS	MECH CODE CLASSIFICATION	SPACE AREA (FT^2) - Az	OCCUPANCY MAX(PEOPLE / 1000FT^2)	PLUMBING FIXTURES	OA CFM / PERSON (FIXTURE) - Rp	OA CFM/FT^2 - Ra	EA REQUIRED CFM / FIXTURE OR SF	CODE PEOPLE	OCCUPANT OSA CFM VBzp =Rp*Pz	AREA OSA CFM Vbza =Ra*Az	MECH CODE REQUIRED EXHAUST CFM	PROVIDED 100% EXHAUST CFM (2)	REQUIRED OA CFM Vbz =Sum(Vbz)	MECH CODE REQ'D OA CFM Voz =(Vbz)/Ez	MAXIMUM PROVIDED ROOM SUPPLY AIR CFM	MINIMUM PROVIDED SUPPLY AIR CFM Vpz	ZONE EFFECT. FACTOR Ez(3)	MAXIMUM OUTDOOR AIR FRACTION Zp =Voz/Vpz	SYSTEM VENTILATION EFFICIENCY AT MAX Zp - Ev (4)100%DIRECT OA=1	OCCUPANT DIVERSITY - D =Ps/(sum Pz)	UNCORREC OA INTAKE - Vou = DxSum(Rp x Pz)+Sum(Ra x Az)	MIN CODE OUTDOOR AIR CFM - Vot = Vou / Ev	REQUIRED OUTDOOR AIR INTAKE CFM - Vot	MINIMUM OSA CFM (1)
																								-		
TU-101	615 - MANAGER		OFFICE	340	5		5	0.06	0	1	5	20	0	0	25	31	410	205	0.8	15.2%				52		
																								-		
TU-102	616 - RECEPTION		RECEPTION	428	30		5	0.06	0	9	45	26	0	0	71	89	1200	600	0.8	14.8%				148		
																								-		
TU-103	617 - DEVELOPMENT		OFFICE	247	5		5	0.06	0	1	5	15	0	0	20	25	450	225	0.8	11.1%				42		
																								-		
TU-104	618 - ACCOUNTING		OFFICE	179	5		5	0.06	0	1	5	11	0	0	16	20	250	125	0.8	16.0%				33		
	619 - CORRIDOR		CORRIDOR	583	3		0	0.06	0	1	0	35	0	0	35	44	270	135	0.8	32.4%				73		
	620 - COPY	[5]	COPY PRINTING	66	4		5	0.06	0.5	0	0	4	40	0	4	5	230	115	0.8	4.3%				8		
	621 - WOMEN		TOILET	33	20	1	0	0	50	1	0	0	50	50	0	0	0	0	0.8					-		
	622 - MEN		TOILET	33	20	1	0	0	50	1	0	0	50	50	0	0	0	0	0.8					-		
	623 - STORAGE		STORAGE-RET	67	2		0	0.12	0	0	0	8	0	0	8	10	0	0	0.8					17		
																								-		
TU-105	624 - OFFICE		OFFICE	371	5		5	0.06	0	1	5	22	0	0	27	34	680	340	0.8	9.9%				56		
																								-		
TU-106	625A - RECEPTION		RECEPTION	371	30		5	0.06	0	7	35	22	0	0	57	71	480	240	0.8	29.7%				119		
																								-		
TU-107	625 - RECEPTION		RECEPTION	362	30		5	0.06	0	7	35	22	0	0	57	71	960	480	0.8	14.8%				119		
	626 - CANTEEN		DINING	39	70		7.5	0.18	0	2	15	7	0	0	22	28	0	0	0.8					46		
																								-		
TU-108	627 - CONFERENCE		CONFERENCE	281	50		5	0.06	0	9	45	17	0	0	62	78	850	425	0.8	18.2%				129		
																								-		
TU-110	628 - OFFICE		OFFICE	1795	5		5	0.06	0	6	30	108	0	0	138	173	1180	590	0.8	29.2%				288		
																								-		
TU-111	515 - COSTUME		LOCKER DRESSING	474	20		0	0	0.25	6	0	0	120	200	0	0	250	125	0.8					-		
																								-		
TU-112	516 - TOILET		TOILET	32	20	1	0	0	50	1	0	0	50	50	0	0	0	0	0.8					-		
	517 - STUDIO	[4]	STAGES-STUDIOS	681	70		10	0.06	0	19	190	41	0	0	231	289	600	600	0.8	48.1%				481		
	518 - CANTEEN		DINING	181	70		7.5	0.18	0	8	60	33	0	150	93	116	0	0	0.8					194		
																								-		
TU-114	519 - MANAGER		OFFICE	286	5		5	0.06	0	1	5	17	0	0	22	28	150	75	0.8	36.7%				46		
																								-		
TU-116	415 - TOILET		TOILET	87	20	2	0	0	50	2	0	0	100	190	0	0	100	50	0.8					-		
	416 - DRESS	[5]	LOCKER DRESSING	372	20		0	0	0.25	5	0	0	100	0	0	0	700	350	0.8					-		
																								-		
TU-117	418 - GREEN	[4]	ASSEMBLY-MULTIUSE	832	100		7.5	0.06	0	41	309.4	50	0	0	359.4	449	910	910	0.8	49.4%				749		
																								-		
TU-118	417 - TOILET		TOILET	31	20	1	0	0	50	1	0	0	50	50	0	0	0	0	0.8					-		
	420 - DRESS	[5]	LOCKER DRESSING	87	20		0	0	0.25	1	0	0	30	0	0	0	70	35	0.8					-		
	421 - TOILET		TOILET	49	20	1	0	0	50	1	0	0	50	170	0	0	70	35	0.8					-		
	422 - TOILET		TOILET	46	20	1	0	0	50	1	0	0	50	200	0	0	70	35	0.8					-		
	423 - DRESS	[5]	LOCKER DRESSING	76	20		0	0	0.25	1	0	0	20	0	0	0	100	50	0.8					-		
																								-		
TU-119	324 - TOILET		TOILET	87	20	2	0	0	50	2	0	0	100	200	0	0	120	60	0.8					-		
	325 - DRESS	[5]	LOCKER DRESSING	317	20		0	0	0.25	4	0	0	80	0	0	0	870	435	0.8					-		
																								-		
TU-120	327 - CONFERENCE		CONFERENCE	406	50		5	0.06	0	14	70	24	0	0	94	118	810	405	0.8	29.0%				196		
																								-		
TU-122	329 - DRESS	[5]	LOCKER DRESSING	82	20		0	0	0.25	1	0	0	30	0	0	0	90	45	0.8					-		
	330 - TOILET		TOILET	46	20	1	0	0	50	1	0	0	50	200	0	0	70	35	0.8					-		
	331 - TOILET		TOILET	49	20	1	0	0	50	1	0	0	50	175	0	0	70	35	0.8					-		
	332 - DRESS	[5]	LOCKER DRESSING	93	20		0	0	0.25	1	0	0	30	0	0	0	140	70	0.8					-		
																								-		
TU-123	123 - CLOSET		STORAGE-RET	53	2		0	0.12	0	0	0	6	0	0	6	8	50	25	0.8	30.0%				13		
	124 - OFFICE		OFFICE	307	5		5	0.06	0	1	5	18	0	0	23	29	360	180	0.8	16.0%				48		
																								-		
TU-124	131 - STORAGE		STORAGE-RET	145	2		0	0.12	0	0	0	17	0	0	17	21	230	115	0.8	18.5%				35		
	132 - WAITING		RECEPTION	123	30		5	0.06	0	2	10	7	0	0	17	21	230	115	0.8	18.5%				35		
																								-		
TU-125	140 - DRESS	[5]	LOCKER DRESSING	298	20		0	0	0.25	4	0	0	80	0	0	0	300	240	0.8					-		
	141 - STORAGE		STORAGE-RET	284	2		0	0.12	0	0	0	34	0	0	34	43	150	120	0.8	35.4%				71		
	143 - UNDERSTAGE		COMPUTER	561	4		5	0.06	0	1	5	34	0	0	39	49	280	224	0.8	21.8%				81		
	145 - STORAGE		STORAGE-RET	132	2		0	0.12	0	0	0	16	0	0	16	20	50	40	0.8	50.0%				33		
																								-		
TU-126	135 - MEN		TOILET	54	20	1	0	0	50	1	0	0	50	75	0	0	0	0	0.8					-		
	136 - WOMEN		TOILET	54	20	1	0	0	50	1	0	0	50	75	0	0	0	0	0.8					-		
	138 - MANAGER		OFFICE	273	5		5	0.06	0	1	5	16	0	0	21	26	200	110	0.8	23.9%				44		
	139 - CREW		COMPUTER	286	4		5	0.06	0	1	5	17	0	0	22	28	230	126.5	0.8	21.7%				46		
	142 - CORRIDOR		CORRIDOR	764	3		0	0.06	0	2	0	46	0	200	46	58	200	110	0.8	52.3%				96		
	119 - STORAGE		STORAGE-RET	93	2		0	0.12	0	0	0	11	0	0	11	14	50	27.5	0.8	50.0%				23		
																								-		
TU-127	121 - OFFICE		OFFICE	264	5		5	0.06	0	1	5	16	0	0	21	26	280	140	0.8	18.8%				44		
	123A - STAIR		CORRIDOR	233	3		0	0.06	0	0	0	14	0	0	14	18	150	75	0.8	23.3%				29		
	126 - VESTIBULE		MAIN LOBBY	390	10		5	0.06	0	3	15	23	0	0	38	48	200	100	0.8	47.5%				79		

9/10/2021

UNIT	ROOM	REMARKS	MECH CODE CLASSIFICATION	SPACE AREA (FT^2) - Az	OCCUPANCY MAX(PEOPLE / 1000FT^2)	PLUMBING FIXTURES	OA CFM / PERSON (FIXTURE) - Rp	OA CFM/FT^2 - Ra	EA REQUIRED CFM / FIXTURE OR SF	CODE PEOPLE	OCCUPANT OSA CFM VBzp =Rp*Pz	AREA OSA CFM Vbza =Ra*Az	MECH CODE REQUIRED EXHAUST CFM	PROVIDED 100% EXHAUST CFM (2)	REQUIRED OA CFM Vbz =Sum(Vbz)	MECH CODE REQ'D OA CFM Voz =(Vbz)/Ez	MAXIMUM PROVIDED ROOM SUPPLY AIR CFM	MINIMUM PROVIDED SUPPLY AIR CFM Vpz	ZONE EFFECT. FACTOR Ez(3)	MAXIMUM OUTDOOR AIR FRACTION Zp =Voz/Vpz	SYSTEM VENTILATION EFFICIENCY AT MAX Zp - Ev (4)100%DIRECT OA=1	OCCUPANT DIVERSITY - D =Ps/(sum Pz)	UNCORRECT OA INTAKE - Vou = DxSum(Rp x Pz)+Sum(Ra x Az)	MIN CODE OUTDOOR AIR CFM - Vot = Vou / Ev	REQUIRED OUTDOOR AIR INTAKE CFM - Vot	MINIMUM OSA CFM (1)
	128 - TICKET	[4]	DATA/TEL ENTRY	107	60		5	0.06	0	4	20	6	0	0	26	33	150	75	0.8	43.3%				54		
																								-		
TU-128	111 - STORAGE	[4]	STORAGE-RET	146	2		0	0.12	0	0	0	18	0	0	18	23	100	50	0.8	45.0%				38		
	112 - COATS		STORAGE-RET	304	2		0	0.12	0	0	0	36	0	0	36	45	530	265	0.8	17.0%				75		
	114 - CORRIDOR		CORRIDOR	260	3		0	0.06	0	1	0	16	0	0	16	20	150	75	0.8	26.7%				33		
	146 - HALL		CORRIDOR	387	3		0	0.06	0	1	0	23	0	0	23	29	200	100	0.8	28.8%				48		
																								-		
TU-129	118 - RESTAURANT	[4]	DINING	1191	70		7.5	0.18	0	42	315	214	0	0	529	661	1700	1360	0.8	48.6%				1,102		
																								-		
TU-130	117 - KITCHEN	[4]	KITCHEN	472	20		7.5	0.12	0.7	6	45	57	340	0	102	128	500	375	0.8	34.0%				213		
																								-		
TU-133	104 - CONTROL		COMPUTER	110	4		5	0.06	0	0	0	7	0	0	7	9	450	225	0.8	3.9%				15		
																								-		
TU-134	107 - WOMEN		TOILET	248	20	7	0	0	50	7	0	0	350	350	0	0	200	160	0.8					-		
	108 - MEN		TOILET	214	20	6	0	0	50	6	0	0	300	300	0	0	200	160	0.8					-		
	203 - OFFICE		OFFICE	249	5		5	0.06	0	1	5	15	0	0	20	25	150	120	0.8	20.8%				42		
	204 - STORE	[4]	SALES	282	15		7.5	0.12	0	3	22.5	34	0	0	56.5	71	170	136	0.8	51.9%				118		
	308 - MEN		TOILET	239	20	6	0	0	50	6	0	0	300	300	0	0	200	160	0.8					-		
	309 - WOMEN		TOILET	270	20	7	0	0	50	7	0	0	350	350	0	0	200	160	0.8					-		
	405 - MEN		TOILET	216	20	6	0	0	50	6	0	0	300	300	0	0	200	160	0.8					-		
	406 - WOMEN		TOILET	242	20	7	0	0	50	7	0	0	350	350	0	0	200	160	0.8					-		
	507 - MEN		TOILET	214	20	6	0	0	50	6	0	0	300	300	0	0	200	160	0.8					-		
	508 - WOMEN		TOILET	243	20	7	0	0	50	7	0	0	350	350	0	0	200	160	0.8					-		
																								-		
TU-135	011 - DRESS	[5]	LOCKER DRESSING	85	20		0	0	0.25	1	0	0	30	0	0	0	150	75	0.8					-		
	012 - TOILET		TOILET	52	20	1	0	0	50	1	0	0	50	100	0	0	0	0	0.8					-		
	013 - TOILET		TOILET	53	20	1	0	0	50	1	0	0	50	100	0	0	0	0	0.8					-		
	014 - DRESS	[5]	LOCKER DRESSING	80	20		0	0	0.25	1	0	0	20	0	0	0	150	75	0.8					-		
	015 - HALL		CORRIDOR	255	3		0	0.06	0	1	0	15	0	0	15	19	200	100	0.8	18.8%				31		
																								-		
TU-136	002 - GARBAGE		STORAGE-RET	348	2		0	0.12	0	0	0	42	0	295	42	53	200	100	0.8	52.5%				88		
	003 - DRESS	[5]	LOCKER DRESSING	220	20		0	0	0.25	3	0	0	60	0	0	0	240	120	0.8					-		
	004 - TOILET		TOILET	76	20	2	0	0	50	2	0	0	100	150	0	0	80	40	0.8					-		
	006 - CORRIDOR		CORRIDOR	809	3		0	0.06	0	2	0	49	0	0	49	61	380	190	0.8	32.2%				102		
	007 - UNDERSTAGE		COMPUTER	356	4		5	0.06	0	1	5	21	0	0	26	33	200	100	0.8	32.5%				54		
	024 - JANITOR		UTILITY	54	10		0	0.12	0	1	0	6	0	75	6	8	0	0	0.8					13		
																								-		
TU-137	018 - TOILET		TOILET	25	20	1	0	0	50	1	0	0	50	75	0	0	0	0	0.8					-		
	020 - DRESS		LOCKER DRESSING	336	20		0	0	0.25	4	0	0	90	100	0	0	350	175	0.8					-		
	023 - DRESS		LOCKER DRESSING	376	20		0	0	0.25	5	0	0	100	100	0	0	350	175	0.8					-		
	025 - TOILET		TOILET	24	20	1	0	0	50	1	0	0	50	75	0	0	0	0	0.8					-		
	027 - ELEV LOBBY		CORRIDOR	336	3		0	0.06	0	1	0	20	0	0	20	25	180	90	0.8	27.8%				42		
	028 - JANITOR		UTILITY	82	10		0	0.12	0	1	0	10	0	75	10	13	0	0	0.8					21		
																								-		
TU-138	030 - WORKSHOP	[4][5]	WOOD-METAL SHOPS	163	20		10	0.18	0.5	2	20	29	90	0	49	61	190	152	0.8	40.3%				102		
	031A - CORRIDOR		CORRIDOR	602	3		0	0.06	0	1	0	36	0	0	36	45	150	120	0.8	37.5%				75		
	033 - MAINTENANCE	[5]	SHOP-AUTO REPAIR	363	10		0	0.05	1	2	0	18	370	0	18	23	280	224	0.8	10.0%				38		
	034 - OFFICE		OFFICE	160	5		5	0.06	0	1	5	10	0	0	15	19	130	104	0.8	18.0%				31		
	046 - CLEANERS	[4]	LAUNDRY	362	20		7.5	0.12	0	3	22.5	43	0	0	65.5	82	200	160	0.8	51.2%				136		
																								-		
TU-139	041 - MEN		TOILET	36	20	1	0	0	50	1	0	0	50	50	0	0	0	0	0.8					-		
	043 - WOMEN		TOILET	37	20	1	0	0	50	1	0	0	50	50	0	0	0	0	0.8					-		
	045 - CORRIDOR		CORRIDOR	752	3		0	0.06	0	2	0	45	0	0	45	56	200	170	0.8	33.1%				94		
	048 - WORKSHOP	[4][5]	WOOD-METAL SHOPS	434	20		10	0.18	0.5	5	50	78	220	0	128	160	340	289	0.8	55.4%				267		
	049 - CARPENTRY	[4][5]	WOOD-METAL SHOPS	502	20		10	0.18	0.5	7	70	90	260	0	160	200	430	365.5	0.8	54.7%				333		
	050 - DIMMERS	[4]	COMPUTER	170	4		5	0.06	0	0	0	10	0	0	10	13	420	357	0.8	3.5%				21		
	051 - STORE	[4]	SALES	332	15		7.5	0.12	0	3	22.5	40	0	0	62.5	78	220	187	0.8	41.8%				130		
																								-		
TU-140	031 - STORAGE		STORAGE-RET	354	2		0	0.12	0	0	0	42	0	0	42	53	190	130	0.8	40.4%				88		
	047 - STORAGE		STORAGE-RET	1490	2		0	0.12	0	2	0	179	0	0	179	224	760	510	0.8	43.9%				373		
																								-		
TU-141	035 - MECH	[5]	UTILITY	506	10		0	0.12	0	3	0	61	0	0	61	76	250	150	0.8	50.8%				127		
	036 - TELEPHONE	[4]	DATA/TEL ENTRY	240	60		5	0.06	0	7	35	14	0	0	49	61	190	114	0.8	53.7%				102		
	037 - ELECTRICAL		UTILITY	246	10		0	0.12	0	2	0	30	0	0	30	38	120	72	0.8	52.1%				63		
	038 - ELECTRICAL		UTILITY	312	10		0	0.12	0	2	0	37	0	0	37	46	240	144	0.8	32.1%				77		
	038A - ELECTRICAL		UTILITY	99	10		0	0.12	0	1	0	12	0	0	12	15	100	60	0.8	25.0%				25		
	040 - LAUNDRY		LAUNDRY	151	20		7.5	0.12	0	2	15	18	0	600	33	41	150	90	0.8	45.8%				69		
	042 - WORKSHOP	[4][5]	WOOD-METAL SHOPS	131	20		10	0.18	0.5	2	20	24	70	0	44	55	170	102	0.8	53.9%				92		
	044 - COSTUME	[5]	LOCKER DRESSING	345	20		0	0	0.25	5	0	0	90	0	0	0	130	78	0.8					-		
																								-		
																								-		
ASU-1	TOTALS	[6]		30571						368.25	1582	2162	5970	6480	3744	4680	28150	17457.5	0.800	55%	0.6	0.75	3348	5580	5580	5,580
	314 - VESTIBULE		MAIN LOBBY	115	10		5	0.06	0	1	5	7	0	0	12	12	0	0	1							
	319 - AUDITORIUM		AUDITORIUM	3590	150		5	0.06	0	359	1795	215	0	0	2010	2010	8640	8640	1	23.3%						
	322 - VESTIBULE		MAIN LOBBY	90	10		5	0.06	0	1	5	5	0	0	10	10	0	0	1							
	410 - VESTIBULE		MAIN LOBBY	96	10		5	0.06	0	1	5	6	0	0	11	11	0	0	1							

9/10/2021

UNIT	ROOM	REMARKS	MECH CODE CLASSIFICATION	SPACE AREA (FT^2) - Az	OCCUPANCY MAX(PEOPLE / 1000FT^2)	PLUMBING FIXTURES	OA CFM / PERSON (FIXTURE) - Rp	OA CFM/FT^2 - Ra	EA REQUIRED CFM / FIXTURE OR SF	CODE PEOPLE	OCCUPANT OSA CFM VBzp =Rp*Pz	AREA OSA CFM Vbza =Ra*Az	MECH CODE REQUIRED EXHAUST CFM	PROVIDED 100% EXHAUST CFM (2)	REQUIRED OA CFM Vbz =Sum(Vbz)	MECH CODE REQ'D OA CFM Voz =(Vbz)/Ez	MAXIMUM PROVIDED ROOM SUPPLY AIR CFM	MINIMUM PROVIDED SUPPLY AIR CFM Vpz	ZONE EFFECT. FACTOR Ez(3)	MAXIMUM OUTDOOR AIR FRACTION Zp =Voz/Vpz	SYSTEM VENTILATION EFFICIENCY AT MAX Zp - Ev (4)100%DIRECT OA=1	OCCUPANT DIVERSITY - D =Ps/(sum Pz)	UNCORRECT OA INTAKE - Vou = DxSum(Rp x Pz)+Sum(Ra x Az)	MIN CODE OUTDOOR AIR CFM - Vot = Vou / Ev	REQUIRED OUTDOOR AIR INTAKE CFM - Vot	MINIMUM OSA CFM (1)
	412 - BALCONY		AUDITORIUM	2209	150		5	0.06	0	221	1105	133	0	0	1238	1238	3500	3500	1	35.4%						
	413 - VESTIBULE		MAIN LOBBY	90	10		5	0.06	0	1	5	5	0	0	10	10	0	0	1							
	510 - VESTIBULE		MAIN LOBBY	96	10		5	0.06	0	1	5	6	0	0	11	11	0	0	1							
	512 - BALCONY		AUDITORIUM	2208	150		5	0.06	0	221	1105	132	0	0	1237	1237	3500	3500	1	35.3%						
	513 - VESTIBULE		MAIN LOBBY	90	10		5	0.06	0	1	5	5	0	0	10	10	0	0	1							
	334 - STAGE		STAGES-STUDIOS	2547	70		10	0.06	0	119	1190	153	0	0	1343	1343	6000	6000	1	22.4%						
	334A - ORCHESTRA		STAGES-STUDIOS	942	70		10	0.06	0	44	440	57	0	0	497	497	3250	3250	1	15.3%						
	353 - BACKSTAGE		STORAGE-RET	1807	2		0	0.12	0	2	0	217	0	0	217	217	750	750	1	28.9%						
ASU-2	TOTALS			13880						972	5665	941	0	0	6606	6606	25640	21600	1	35%	0.8	0.9	6040	7550	7550	7,550
																		30120								
				1074	150		5	0.06	0	107	537	64	0	0	601	601	2140	2140	1	28.1%						
	103 - LOBBY		T-LOBBIES	902	150		5	0.06	0	90	450	54	0	0	504	630	4000	4000	0.8	15.8%						
	103A - STAIR		CORRIDOR	491	3		0	0.06	0	1	0	29	0	0	29	36	200	200	0.8	18.0%						
	115 - LOBBY		T-LOBBIES	4348	150		5	0.06	0	435	2175	261	0	0	2436	2436	9950	9950	1	24.5%						
	115A - STAIR		CORRIDOR	785	3		0	0.06	0	2	0	47	0	0	47	59	400	400	0.8	14.8%						
	115B - STAIR		CORRIDOR	525	3		0	0.06	0	1	0	32	0	0	32	40	400	400	0.8	10.0%						
	115C - LOBBY		T-LOBBIES	1032	150		5	0.06	0	77	386.3	62	0	0	448.3	448	1930	1930	1	23.2%						
	306 - LOBBY		T-LOBBIES	826	150		5	0.06	0	83	415	50	0	0	465	465	6600	6600	1	7.0%						
	323 - BAR		BAR, LOUNGES	1266	100		7.5	0.18	0	63	472.5	228	0	0	700.5	701	1500	1500	1	46.7%						
	414 - BAR		BAR, LOUNGES	1280	100		7.5	0.18	0	64	478.1	230	0	0	708.1	708	1500	1500	1	47.2%						
	514 - BAR		BAR, LOUNGES	1232	100		7.5	0.18	0	62	461.3	222	0	0	683.3	683	1500	1500	1	45.5%						
ASU-3	TOTALS			13761						985	5375	1279	0	0	6654.2	6807	30120	29000	0.93	47%	0.65	0.75	5310	8169	8169	8200
	105 - REHEARSAL		MUSIC-DANCE	2182	35		10	0.06	0	51	509	131	0	0	640	800	7500	7500	0.8	10.7%						
	105A - STAGE		STAGES-STUDIOS	1288	70		10	0.06	0	60	601	77	0	0	678	848	3800	3800	0.8	22.3%						
	105B - HALL		CORRIDOR	144	3		0	0.06	0	0	0	9	0	0	9	9	50	50	1	18.0%						
	105C - HALL		CORRIDOR	152	3		0	0.06	0	0	0	9	0	0	9	9	50	50	1	18.0%						
	202 - BALCONY		AUDITORIUM	923	150		5	0.06	0	92	461.5	55	0	0	516.5	517	1000	1000	1	51.7%						
	202A - HALL		CORRIDOR	152	3		0	0.06	0	0	0	9	0	0	9	9	50	50	1	18.0%						
	202B - HALL		CORRIDOR	157	3		0	0.06	0	0	0	9	0	0	9	9	50	50	1	18.0%						
	304 - BALCONY		AUDITORIUM	923	150		5	0.06	0	92	461.5	55	0	0	516.5	517	1000	1000	1	51.7%						
	304A - HALL		CORRIDOR	152	3		0	0.06	0	0	0	9	0	0	9	11	50	50	0.8	22.0%						
	304B - HALL		CORRIDOR	157	3		0	0.06	0	0	0	9	0	0	9	11	50	50	0.8	22.0%						
	403A - STAIR		CORRIDOR	145	3		0	0.06	0	0	0	9	0	0	9	11	50	50	0.8	22.0%						
	403B - STAIR		CORRIDOR	141	3		0	0.06	0	0	0	8	0	0	8	10	50	50	0.8	20.0%						
	409 - DIMMERS		COMPUTER	174	4		5	0.06	0	1	2.5	10	0	0	12.5	16	380	380	0.8	4.2%						
ASU-4	TOTALS			6690						298.5	2036	399	0	0	2434.5	2777	14200	14200	0.89	52%	0.6	0.9	2231	3718	3718	3750
	316 - LOBBY		T-LOBBIES	4332	150		5	0.06	0	325	1625	260	0	0	1884.5	2356	4950	4950	0.8	47.6%						
	316A - STAIR		CORRIDOR	795	3		0	0.06	0	0	0	48	0	0	48	60	150	150	0.8	40.0%						
	316B - STAIR		CORRIDOR	516	3		0	0.06	0	0	0	31	0	0	31	39	100	100	0.8	39.0%						
	411 - LOBBY		T-LOBBIES	4134	150		5	0.06	0	310	1550	248	0	0	1798.3	2248	4600	4600	0.8	48.9%						
	411B - STAIR		CORRIDOR	518	3		0	0.06	0	0	0	31	0	0	31	39	200	200	0.8	19.5%						
	511 - LOBBY		T-LOBBIES	4326	150		5	0.06	0	324	1622	260	0	0	1882.3	2353	5500	5500	0.8	42.8%						
	511B - STAIR		CORRIDOR	504	3		0	0.06	0	0	0	30	0	0	30	38	500	500	0.8	7.6%						
ASU-5	TOTALS			15125						959	4797	908	0	0	5705.1	7133	16800	16800	0.8	48.9%	0.65	0.86	5034	7745	7745	7750
	303 - LIGHTING		COMPUTER	89	4		5	0.06	0	0	1	5	0	0	6	8	100	100	0.8	8.0%						
	315 - RECEPTION		RECEPTION	80	30		5	0.06	0	2	8	5	0	0	13	16	40	40	0.8	40.0%						
	317 - BROADCAST		COMPUTER	122	4		5	0.06	0	0	1.5	7	0	0	8.5	11	80	80	0.8	13.8%						
	318 - SOUND		COMPUTER	178	4		5	0.06	0	1	2.5	11	0	0	13.5	17	800	800	0.8	2.1%						
	320 - OFFICE		OFFICE	124	5		5	0.06	0	0	2	7	0	0	9	11	80	80	0.8	13.8%						
	321 - RECEPTION		RECEPTION	85	30		5	0.06	0	2	8.5	5	0	0	13.5	17	40	40	0.8	42.5%						
	605 - CORRIDOR		CORRIDOR	124	3		0	0.06	0	0	0	7	0	0	7	9	0	0	0.8							
	606 - DIMMERS		COMPUTER	123	4		5	0.06	0	0	1.5	7	0	0	8.5	11	200	200	0.8	5.5%						
	606A - STAIR		CORRIDOR	335	3		0	0.06	0	0	0	20	0	0	20	25	400	400	0.8	6.3%						
	607 - JAN		UTILITY	52	10		0	0.12	0	0	0	6	0	75	6	8	0	0	0.8							
	608 - TOILET		TOILET	69	20	1	0	0	50	0	0	0	50	50	0	0	0	0	0.8							
	609 - LOBBY		T-LOBBIES	187	150		5	0.06	0	14	70.1	11	0	0	81.1	101	180	180	0.8	56.1%						
	610 - OFFICE		OFFICE	183	5		5	0.06	0	1	3	11	0	0	14	18	160	160	0.8	11.3%						
	611 - MULTI-PURPOSE	[4]	MUSEUM GALLERIES	2452	40		7.5	0.06	0	34	255.4	147	0	0	402.4	503	900	900	0.8	55.9%						
	612 - CORRIDOR		CORRIDOR	508	3		0	0.06	0	0	0	30	0	0	30	38	0	0	0.8							
	613 - PROJECTION		COMPUTER	277	4		5	0.06	0	1	3.5	17	0	0	20.5	26	400	400	0.8	6.5%						
	613A - STAIR		CORRIDOR	172	3		0	0.06	0	0	0	10	0	0	10	13	100	100	0.8	13.0%						
ASU-7	TOTALS			5160						54	357	306	50	125	663	832	3380	3200	0.8	56%	0.55	0.75	717	1304	1304	1310
	511A - STAIR		CORRIDOR	785	3		0	0.06	0	0	0	47	0	0	47	47	1400	1400	1	3.4%						
	502 - REHEARSAL		MUSIC-DANCE	2284	35		10	0.06	0	155	1550	137	0	0	1687	1687	6470	6470	1	26.1%						
	504 - MEN		TOILET	30	20	1	0	0	50	0	0	0	50	50	0	0	0	0	1							
	505 - WOMEN		TOILET	30	20	1	0	0	50	0	0	0	50	50	0	0	0	0	0.8							
	506 - DRESS	[5]	LOCKER DRESSING	75	20		0	0	0.25	0	0	0	20	0	0	0	30	30	0.8							
	520 - DRESS	[5]	LOCKER DRESSING	83	20		0	0	0.25	0	0	0	30	0	0	0	30	30	0.8							
	522A - STAIR		T-LOBBIES	511	3		0	0.06	0	0	0	31	0	0	31	39	100	100	0.8	39.0%						
ASU-8	TOTALS			3798						155	1550	215	150	100	1765	1773	7950	7950	0.8	39%	0.75	1	1765	2353	2353	3720

9/10/2021

UNIT	ROOM	REMARKS	MECH CODE CLASSIFICATION	SPACE AREA (FT^2) - Az	OCCUPANCY MAX(PEOPLE / 1000FT^2)	PLUMBING FIXTURES	OA CFM / PERSON (FIXTURE) - Rp	OA CFM/FT^2 - Ra	EA REQUIRED CFM / FIXTURE OR SF	CODE PEOPLE	OCCUPANT OSA CFM VBzp =Rp*Pz	AREA OSA CFM Vbza =Ra*Az	MECH CODE REQUIRED EXHAUST CFM	PROVIDED 100% EXHAUST CFM (2)	REQUIRED OA CFM Vbz =Sum(Vbz)	MECH CODE REQ'D OA CFM Voz =(Vbz)/Ez	MAXIMUM PROVIDED ROOM SUPPLY AIR CFM	MINIMUM PROVIDED SUPPLY AIR CFM Vpz	ZONE EFFECT. FACTOR Ez(3)	MAXIMUM OUTDOOR AIR FRACTION Zp =Voz/Vpz	SYSTEM VENTILATION EFFICIENCY AT MAX Zp - Ev (4)100%DIRECT OA=1	OCCUPANT DIVERSITY - D =Ps/(sum Pz)	UNCORREC OA INTAKE - Vou = DxSum(Rp x Pz)+Sum(Ra x Az)	MIN CODE OUTDOOR AIR CFM - Vot = Vou / Ev	REQUIRED OUTDOOR AIR INTAKE CFM - Vot	MINIMUM OSA CFM (1)
	301 - LOBBY		T-LOBBIES	712	150		5	0.06	0	53	267	43	0	0	310	388	2500	2500	0.8	15.5%						
	302A - STAIR		CORRIDOR	502	3		0	0.06	0	0	0	30	0	0	30	38	300	300	0.8	12.7%						
ASU-9	TOTALS			1214						53	267	73	0	0	340	426	2800	2800	0.8	16%	1	1	340	340	340	340

NOTES:

(1) OUTDOOR AIR SUPPLIED DIRECTLY THROUGH THE UNIT.

(2) ADDITIONAL EXHAUST AIR WILL BE PROVIDE BY TRANSFER ROOM AIR NOT OSA.

(3) ZONE AIR DISTRIBUTION EFFECTIVENESS PER CODE TABLE 3.1.2

(4) EXISTING SUPPLY AIRFLOW IN THIS SPACE MUST BE REBALANCED TO THE LISTED SUPPLY AIRFLOW.

(5) DIRECT EXHAUST AIRFLOW MUST BE ADDED TO SPACE AS REQUIRED TO MEET CODE.

(6) ADDITIONAL EXHAUST AIRFLOW PROVIDED BY TRANSFER AIR FROM OTHER SYSTEMS AND NOT BY DIRECT OUTDOOR AIRFLOW.

OUTSIDE VENTILATION AIRFLOW CODE ANALYSIS CALCULATION TABLE - KELLER AUDITORIUM

UNIT	ROOM	REMARKS	MECH CODE CLASSIFICATION	SPACE AREA (FT^2) - Az	OCCUPANCY MAX(PEOPLE / 1000FT^2)	PLUMBING FIXTURES	OA CFM / PERSON (FIXTURE) - Rp	OA CFM/FT^2 - Ra	EA REQUIRED CFM / FIXTURE OR SF	CODE PEOPLE	OCCUPANT OSA CFM VBzp =Rp*Pz	AREA OSA CFM Vbza =Ra*Az	MECH CODE REQUIRED EXHAUST CFM	PROVIDED 100% EXHAUST CFM (2)	REQUIRED OA CFM Vbz =Sum(Vbz)	MECH CODE REQ'D OA CFM Voz =(Vbz)/Ez	MAXIMUM PROVIDED ROOM SUPPLY AIR CFM	MINIMUM PROVIDED SUPPLY AIR CFM Vpz	ZONE EFFECT. FACTOR Ez(3)	MAXIMUM OUTDOOR AIR FRACTION Zp =Voz/Vpz	SYSTEM VENTILATION EFFICIENCY AT MAX Zp - Ev (4)100%DIRECT OA=1	OCCUPANT DIVERSITY - D =Ps/(sum Pz)	UNCORREC OA INTAKE - Vou = DxSum(Rp x Pz)+Sum(Ra x Az)	MIN CODE OUTDOOR AIR CFM - Vot = Vou / Ev	**REQUIRED OUTDOOR AIR INTAKE CFM - Vot**	**SYSTEM MINIMUM OSA CFM (1)**
	230 - STAGE		STAGES-STUDIOS	4822	70		10	0.06	0	161	1610	289	0	0	1899	1899	2650	2650	1	71.7%						
	230B - BACKSTAGE		STORAGE-RET	2048	2		0	0.12	0	2	0	246	0	0	246	246	350	350	1	70.3%						
	238 - REHEARSAL	[4]	MUSIC-DANCE	2014	35		10	0.06	0	38	376	121	0	0	467	467	810	810	1	57.7%						
SU-101	TOTALS			8884						200.6	1986	656	0	0	2612	2612	3810	3810	1	72%	0.4	0.75	2123	5308	5308	1,750
	538 - REHEARSAL		MUSIC-DANCE	1848	35		10	0.06	0	43	430	111	0	0	541	676	3300	3300	0.8	20.5%						
SU-102	TOTALS			1848						43	430	111	0	0	541	676	3300	3300	0.8	20%	0.95	1	541	569	569	570
	326 - VESTIBULE		MAIN LOBBY	147	10		5	0.06	0	1	5	9	0	0	14	14	980	980	1	1.4%						
	327 - TICKET		DATA/TEL ENTRY	127	60		5	0.06	0	5	25	8	0	0	33	33	100	100	1	33.0%						
	328 - VESTIBULE		MAIN LOBBY	405	10		5	0.06	0	3	15	24	0	0	39	39	2160	2160	1	1.8%						
	330 - VESTIBULE		MAIN LOBBY	352	10		5	0.06	0	2	10	21	0	0	31	31	2160	2160	1	1.4%						
SU-103	TOTALS			1031						11	55	62	0	0	117	117	5400	5400	1	33%	0.8	1	117	146	146	150
	304 - LOBBY		T-LOBBIES	671	150		5	0.06	0	67	335	40	0	0	375	375	750	750	1	50.0%						
	305A - VESTIBULE		MAIN LOBBY	138	10		5	0.06	0	1	5	8	0	0	13	13	50	50	1	26.0%						
	329 - FOYER		RECEPTION	4967	30		5	0.06	0	99	495	298	0	0	793	793	6200	6200	1	12.8%						
	331 - COATS		STORAGE-RET	332	2		0	0.12	0	0	0	40	0	0	40	40	400	400	1	10.0%						
	333 - OFFICE		OFFICE	102	5		5	0.06	0	0	0	6	0	0	6	6	30	30	1	20.0%						
	338 - OFFICE		OFFICE	115	5		5	0.06	0	0	0	7	0	0	7	7	30	30	1	23.3%						
	341 - LOBBY		T-LOBBIES	652	150		5	0.06	0	65	325	39	0	0	364	364	750	750	1	48.5%						
	345 - VESTIBULE		MAIN LOBBY	136	10		5	0.06	0	1	5	8	0	0	13	13	50	50	1	26.0%						
SU-104	TOTALS			7113						233	1165	446	0	0	1611	1611	8320	8320	1	50%	0.65	0.75	1320	2031	2031	2040
	401 - FOYER		RECEPTION	796	30		5	0.06	0	16	80	48	0	0	128	160	950	950	0.8	16.8%						
	401B - HALL		CORRIDOR	144	3		0	0.06	0	0	0	9	0	0	9	11	50	50	0.8	22.0%						
	502 - LOBBY		T-LOBBIES	932	150		5	0.06	0	93	465	56	0	0	521	651	1300	1300	0.8	50.1%						
	502B - HALL		CORRIDOR	230	3		0	0.06	0	0	0	14	0	0	14	18	50	50	0.8	36.0%						
	521 - FOYER		RECEPTION	4176	30		5	0.06	0	84	420	251	0	0	671	839	8280	8280	0.8	10.1%						
	529 - LOBBY		T-LOBBIES	948	150		5	0.06	0	95	475	57	0	0	532	665	1350	1350	0.8	49.3%						
SU-105	TOTALS			7226	1.65790202					288	1440	435	0	0	1875	2344	11980	11980	0.8	50.1%	0.65	0.95	1803	2774	2774	2750
	702 - LOBBY		T-LOBBIES	930	150		5	0.06	0	93	465	56	0	0	521	651	1530	1530	0.8	42.5%						
	712 - FOYER		RECEPTION	2587	30		5	0.06	0	52	260	155	0	0	415	519	4740	4740	0.8	10.9%						
	719 - LOBBY		T-LOBBIES	940	150		5	0.06	0	94	470	56	0	0	526	658	1530	1530	0.8	43.0%						
																	7800	7800								28%
SU-106	TOTALS			4457						239	1195	267	0	0	1462	1828	7800	7800	0.8	43%	0.7	0.8	1529	2184	2184	2200
	108 - EQUIPMENT		COMPUTER	200	4		5	0.06	0	1	5	12	0	300	17	17	0	0	1							
	109 - JAN	[5]	UTILITY	33	10		0	0	50	0	0	0	50	30	0	0	0	0	1							
	202 - MANAGER		OFFICE	255	5		5	0.06	0	1	5	15	0	0	20	25	230	230	0.8	10.9%						
	204A - TOILET	[5]	TOILET	23	20	1	0	0	50	0	0	0	50	0	0	0	0	0	0.8							
	206 - OFFICE		OFFICE	226	5		5	0.06	0	1	5	14	0	0	19	24	210	210	0.8	11.4%						
	207 - VESTIBULE		MAIN LOBBY	221	10		5	0.06	0	1	5	13	0	0	18	18	0	0	1							
	208 - STAIR		CORRIDOR	323	3		0	0.06	0	0	0	19	0	0	19	24	60	60	0.8	40.0%						
	209 - CORRIDOR		CORRIDOR	190	3		0	0.06	0	0	0	11	0	0	11	14	0	0	0.8							
	226 - OFFICE	[4]	OFFICE	259	5		5	0.06	0	1	5	16	0	0	21	26	50	50	0.8	52.0%						
	231 - OFFICE	[4]	OFFICE	234	5		5	0.06	0	1	5	14	0	0	19	24	50	50	0.8	48.0%						
	305 - CORRIDOR		CORRIDOR	197	3		0	0.06	0	0	0	12	0	0	12	15	50	50	0.8	30.0%						
	306 - LOUNGE		BAR, LOUNGES	187	100		7.5	0.18	0	9	67.5	34	0	180	101.5	127	230	230	0.8	55.2%						
	308 - MEN	[5]	TOILET	509	20	14	0	0	50	0	0	0	700	450	0	0	250	250	0.8							
	402 - CORRIDOR		CORRIDOR	512	3		0	0.06	0	0	0	31	0	0	31	39	100	100	0.8	39.0%						
	404 - MEETING		CONFERENCE	266	50		5	0.06	0	9	45	16	0	0	61	76	550	550	0.8	13.8%						
	503 - LOUNGE		BAR, LOUNGES	201	100		7.5	0.18	0	10	75	36	0	160	111	139	240	240	0.8	57.9%						
	504 - WOMEN	[5]	TOILET	248	20	6	0	0	50	0	0	0	300	260	0	0	80	80	0.8							
	505 - JAN		UTILITY	68	10		0	0	50	0	0	0	50	50	0	0	0	0	0.8							
	506 - MEETING		CONFERENCE	507	50		5	0.06	0	17	85	30	0	0	115	144	1050	1050	0.8	13.7%						
	507 - CORRIDOR		CORRIDOR	502	3		0	0.06	0	0	0	30	0	0	30	38	100	100	0.8	38.0%						
	509 - MEETING		CONFERENCE	280	50		5	0.06	0	9	45	17	0	0	62	78	580	580	0.8	13.4%						
	602 - CORRIDOR		CORRIDOR	445	3		0	0.06	0	0	0	27	0	0	27	34	100	100	0.8	34.0%						
	702B - HALL		CORRIDOR	192	3		0	0.06	0	0	0	12	0	0	12	15	70	70	0.8	21.4%						
	703 - LOUNGE		BAR, LOUNGES	180	100		7.5	0.18	0	9	67.5	32	0	230	99.5	124	220	220	0.8	56.4%						

UNIT	ROOM	REMARKS	MECH CODE CLASSIFICATION	SPACE AREA (FT^2) - Az	OCCUPANCY MAX(PEOPLE / 1000FT^2)	PLUMBING FIXTURES	OA CFM / PERSON (FIXTURE) - Rp	OA CFM/FT^2 - Ra	EA REQUIRED CFM / FIXTURE OR SF	CODE PEOPLE	OCCUPANT OSA CFM VBzp =Rp*Pz	AREA OSA CFM Vbza =Ra*Az	MECH CODE REQUIRED EXHAUST CFM	PROVIDED 100% EXHAUST CFM (2)	REQUIRED OA CFM Vbz =Sum(Vbz)	MECH CODE REQ'D OA CFM Voz =(Vbz)/Ez	MAXIMUM PROVIDED ROOM SUPPLY AIR CFM	MINIMUM PROVIDED SUPPLY AIR CFM Vpz	ZONE EFFECT. FACTOR Ez(3)	MAXIMUM OUTDOOR AIR FRACTION Zp =Voz/Vpz	SYSTEM VENTILATION EFFICIENCY AT MAX Zp - Ev (4)100%DIRECT OA=1	OCCUPANT DIVERSITY - D =Ps/(sum Pz)	UNCORREC OA INTAKE - Vou = DxSum(Rp x Pz)+Sum(Ra x Az)	MIN CODE OUTDOOR AIR CFM - Vot = Vou / Ev	**REQUIRED OUTDOOR AIR INTAKE CFM - Vot**	**SYSTEM MINIMUM OSA CFM (1)**
	704 - MEN		TOILET	194	20	5	0	0	50	0	0	0	250	380	0	0	220	220	0.8							
	705 - JANITOR		UTILITY	63	10		0	0	50	0	0	0	50	50	0	0	0	0	0.8							
	706 - CORRIDOR		CORRIDOR	530	3		0	0.06	0	0	0	32	0	0	32	40	100	100	0.8	40.0%						
	707 - MEETING		CONFERENCE	562	50		5	0.06	0	19	95	34	0	0	129	161	1280	1280	0.8	12.6%						
SU-107	TOTALS	[6]		7607						88	510	457	1450	2090	967	1202	5770	5770	0.8	58%	0.55	1	967	1758	2090	1750
	235 - REHEARSAL	[4]	MUSIC-DANCE	395	35		10	0.06	0	7	70	24	0	0	94	94	110	110	1	85.5%						
	237 - EQUIPMENT		COMPUTER	272	4		5	0.06	0	1	5	16	0	0	21	26	260	260	0.8	10.0%						
	346 - LOUNGE		BAR, LOUNGES	278	100		7.5	0.18	0	14	105	50	0	400	155	194	400	400	0.8	48.5%						
	348 - CORRIDOR		CORRIDOR	480	3		0	0.06	0	0	0	29	0	0	29	36	100	100	0.8	36.0%						
	349 - WOMEN	[5]	TOILET	488	20	12	0	0	50	0	0	0	600	440	0	0	350	350	0.8							
	421 - FOYER		RECEPTION	606	30		5	0.06	0	12	60	36	0	0	96	120	750	750	0.8	16.0%						
	421A - CORRIDOR		CORRIDOR	146	3		0	0.06	0	0	0	9	0	0	9	11	50	50	0.8	22.0%						
	422 - CORRIDOR		CORRIDOR	569	3		0	0.06	0	0	0	34	0	0	34	43	100	100	0.8	43.0%						
	531 - LOUNGE		BAR, LOUNGES	301	100		7.5	0.18	0	13	97.5	54	0	350	151.5	189	350	350	0.8	54.0%						
	532 - WOMEN	[5]	TOILET	205	20	4	0	0	50	0	0	0	200	300	0	0	200	200	0.8							
	533 - JAN		UTILITY	54	10		0	0	50	0	0	0	50	50	0	0	0	0	0.8							
	534 - CORRIDOR		CORRIDOR	868	3		0	0.06	0	0	0	52	0	0	52	65	100	100	0.8	65.0%						
	535 - MEETING		CONFERENCE	531	50		5	0.06	0	18	90	32	0	0	122	153	1250	1250	0.8	12.2%						
	619 - CORRIDOR		CORRIDOR	637	3		0	0.06	0	0	0	38	0	0	38	48	100	100	0.8	48.0%						
	721 - LOUNGE		BAR, LOUNGES	218	100		7.5	0.18	0	11	82.5	39	0	180	121.5	152	360	360	0.8	42.2%						
	722 - CORRIDOR		CORRIDOR	824	3		0	0.06	0	0	0	49	0	0	49	61	220	220	0.8	27.7%						
	723 - JAN		UTILITY	63	10		0	0	50	0	0	0	50	50	0	0	0	0	0.8							
	724 - WOMEN	[5]	TOILET	188	20	4	0	0	50	0	0	0	200	180	0	0	260	260	0.8							
SU-108	TOTALS			7123						76	510	462	1100	1950	972	1192	4960	4960	0.8	85%	0.35	0.85	896	2560	2560	2560
	112 - ORCHESTRA	[4]	STAGES-STUDIOS	1462	70		10	0.06	0	49	490	88	0	0	578	723	1450	1450	0.8	49.9%						
	236 - CORRIDOR		CORRIDOR	184	3		0	0.06	0	0	0	11	0	0	11	14	0	0	0.8							
	340 - AUDITORIUM		AUDITORIUM	13340	150		5	0.06	0	1334	6670	800	0	0	7470	9338	18800	18800	0.8	49.7%						
	528 - BALCONY		AUDITORIUM	6709	150		5	0.06	0	671	3355	403	0	0	3758	4698	12050	12050	0.8	39.0%						
	718 - BALCONY		AUDITORIUM	5244	150		5	0.06	0	524	2620	315	0	0	2935	3669	12300	12300	0.8	29.8%						
	803 - PROJECTION		COMPUTER	396	4		5	0.06	0	1	5	24	0	0	29	36	750	750	0.8	4.8%						
	804 - TOILET	[5]	TOILET	28	20	1	0	0	50	0	0	0	50	30	0	0	0	0	0.8							
SU-109	TOTALS			27363						2579	13140	1641	50	30	14781	18478	45350	45350	0.8	49.9%	0.65	0.83	12547	19303	19303	19350
	101 - MEN	[5]	TOILET	210	20	5	0	0	50	0	0	0	250	160	0	0	120	60	0.8							
	102 - WOMEN	[5]	TOILET	173	20	4	0	0	50	0	0	0	200	160	0	0	110	50	0.8							
	103 - LOCKER		LOCKER SPORTS	165	20		0	0	0.5	0	0	0	90	160	0	0	100	50	0.8							
	103A - HALL		CORRIDOR	98	3		0	0.06	0	0	0	6	0	0	6	8	70	30	0.8	26.7%						
	104 - LOCKER		LOCKER SPORTS	158	20		0	0	0.5	0	0	0	80	90	0	0	90	40	0.8							
	105 - LIBRARY		LIBRARY	226	10		5	0.12	0	2	10	27	0	0	37	46	200	90	0.8	51.1%						
	106 - CORRIDOR		CORRIDOR	568	3		0	0.06	0	0	0	34	0	0	34	43	100	50	0.8	86.0%						
	107 - LOUNGE		BAR, LOUNGES	467	100		7.5	0.18	0	23	172.5	84	0	300	256.5	321	450	210	0.8	152.9%						
	107B - STORAGE		STORAGE-RET	88	2		0	0.12	0	0	0	11	0	40	11	14	0	0	0.8							
	210 - MEN	[5]	TOILET	73	20	2	0	0	50	0	0	0	100	80	0	0	60	30	0.8							
	211 - WOMEN		TOILET	68	20	1	0	0	50	0	0	0	50	60	0	0	40	20	0.8							
	212 - STAIR		CORRIDOR	99	3		0	0.06	0	0	0	6	0	0	6	8	80	40	0.8	20.0%						
	213 - CORRIDOR		CORRIDOR	428	3		0	0.06	0	0	0	26	0	0	26	33	150	70	0.8	47.1%						
	214 - DRESS	[5]	LOCKER DRESSING	62	20		0	0	0.25	0	0	0	20	0	0	0	80	40	0.8							
	215 - JAN	[5]	UTILITY	36	10		0	0	50	0	0	0	50	30	0	0	0	0	0.8							
	216 - TOILET		TOILET	42	20	1	0	0	50	0	0	0	50	75	0	0	0	0	0.8							
	217 - VESTIBULE		MAIN LOBBY	65	10		5	0.06	0	0	0	4	0	0	4	5	0	0	0.8							
	218 - HALL		CORRIDOR	136	3		0	0.06	0	0	0	8	0	0	8	10	50	20	0.8	50.0%						
	219 - STAIR		CORRIDOR	101	3		0	0.06	0	0	0	6	0	0	6	8	80	40	0.8	20.0%						
	220 - DRESS		LOCKER DRESSING	62	20		0	0	0.25	0	0	0	20	30	0	0	80	40	0.8							
	221 - TOILET		TOILET	46	20	1	0	0	50	0	0	0	50	50	0	0	0	0	0.8							
	222 - GREEN		ASSEMBLY-MULTIUSE	509	100		7.5	0.06	0	34	255	31	0	0	286	358	410	190	0.8	188.4%						
	223 - MANAGER		OFFICE	140	5		5	0.06	0	0	0	8	0	0	8	10	100	50	0.8	20.0%						
	311 - SHOWER	[5]	SHOWER	107	20		0	0	50	0	0	0	200	150	0	0	100	50	0.8							
	313 - TOILET	[5]	TOILET	15	20	1	0	0	50	0	0	0	50	25	0	0	60	30	0.8							
	314 - CORRIDOR		CORRIDOR	347	3		0	0.06	0	0	0	21	0	0	21	26	100	50	0.8	52.0%						
	315 - DRESS		LOCKER DRESSING	74	20		0	0	0.25	0	0	0	20	55	0	0	160	70	0.8							
	316 - DRESS		LOCKER DRESSING	68	20		0	0	0.25	0	0	0	20	50	0	0	80	40	0.8							
	317 - JAN	[5]	UTILITY	34	10		0	0	50	0	0	0	50	30	0	0	0	0	0.8							
	318 - TOILET	[5]	TOILET	17	20	1	0	0	50	0	0	0	50	25	0	0	0	0	0.8							
	319 - TOILET	[5]	TOILET	14	20	1	0	0	50	0	0	0	50	25	0	0	0	0	0.8							
	320 - DRESS		LOCKER DRESSING	153	20		0	0	0.25	0	0	0	40	200	0	0	250	120	0.8							
	321A - TOILET	[5]	TOILET	12	20	1	0	0	50	0	0	0	50	25	0	0	0	0	0.8							
	322 - TOILET		TOILET	43	20	2	0	0	50	0	0	0	100	150	0	0	0	0	0.8							
	324 - CHOIR		MUSIC-DANCE	513	35		10	0.06	0	12	120	31	0	150	151	189	600	280	0.8	67.5%						
	325 - PATCH	[5]	SHOP-AUTO REPAIR	427	10		0	0.05	1	0	0	21	430	0	21	26	300	140	0.8	18.6%						
	405A - TOILET	[5]	TOILET	12	20	1	0	0	50	0	0	0	50	25	0	0	0	0	0.8							
	406 - CORRIDOR		CORRIDOR	274	3		0	0.06	0	0	0	16	0	0	16	20	100	50	0.8	40.0%						
	407 - SHOWER	[5]	SHOWER	76	20		0	0	50	0	0	0	100	120	0	0	70	30	0.8							

UNIT	ROOM	REMARKS	MECH CODE CLASSIFICATION	SPACE AREA (FT^2) - Az	OCCUPANCY MAX(PEOPLE / 1000FT^2)	PLUMBING FIXTURES	OA CFM / PERSON (FIXTURE) - Rp	OA CFM/FT^2 - Ra	EA REQUIRED CFM / FIXTURE OR SF	CODE PEOPLE	OCCUPANT OSA CFM VBzp =Rp*Pz	AREA OSA CFM Vbza =Ra*Az	MECH CODE REQUIRED EXHAUST CFM	PROVIDED 100% EXHAUST CFM (2)	REQUIRED OA CFM Vbz =Sum(Vbz)	MECH CODE REQ'D OA CFM Voz =(Vbz)/Ez	MAXIMUM PROVIDED ROOM SUPPLY AIR CFM	MINIMUM PROVIDED SUPPLY AIR CFM Vpz	ZONE EFFECT. FACTOR Ez(3)	MAXIMUM OUTDOOR AIR FRACTION Zp =Voz/Vpz	SYSTEM VENTILATION EFFICIENCY AT MAX Zp - Ev (4)100%DIRECT OA=1	OCCUPANT DIVERSITY - D =Ps/(sum Pz)	UNCORREC OA INTAKE - Vou = DxSum(Rp x Pz)+Sum(Ra x Az)	MIN CODE OUTDOOR AIR CFM - Vot = Vou / Ev	**REQUIRED OUTDOOR AIR INTAKE CFM - Vot**	**SYSTEM MINIMUM OSA CFM (1)**
	410 - DRESS		LOCKER DRESSING	103	20		0	0	0.25	0	0	0	30	100	0	0	130	60	0.8							
	411 - DRESS		LOCKER DRESSING	72	20		0	0	0.25	0	0	0	20	70	0	0	100	50	0.8							
	411A - TOILET	[5]	TOILET	19	20	1	0	0	50	0	0	0	50	25	0	0	0	0	0.8							
	412 - JAN	[5]	UTILITY	33	10		0	0	50	0	0	0	50	30	0	0	0	0	0.8							
	415 - DRESS		LOCKER DRESSING	162	20		0	0	0.25	0	0	0	50	210	0	0	240	110	0.8							
	415A - TOILET	[5]	TOILET	13	20	1	0	0	50	0	0	0	50	25	0	0	0	0	0.8							
	417A - TOILET	[5]	TOILET	22	20	1	0	0	50	0	0	0	50	25	0	0	0	0	0.8							
	419A - TOILET	[5]	TOILET	22	20	1	0	0	50	0	0	0	50	25	0	0	0	0	0.8							
	420 - DRESS		LOCKER DRESSING	532	20		0	0	0.25	0	0	0	140	250	0	0	600	280	0.8							
	511 - CORRIDOR		CORRIDOR	368	3		0	0.06	0	0	0	22	0	0	22	28	100	50	0.8	56.0%						
	512 - DRESS	[5]	LOCKER DRESSING	111	20		0	0	0.25	0	0	0	30	130	0	0	130	60	0.8							
	514 - DRESS		LOCKER DRESSING	181	20		0	0	0.25	0	0	0	50	220	0	0	230	110	0.8							
	515 - JAN	[5]	UTILITY	33	10		0	0	50	0	0	0	50	30	0	0	0	0	0.8							
	516 - SHOWER		SHOWER	69	20		0	0	50	0	0	0	100	150	0	0	90	40	0.8							
	517 - DRESS		LOCKER DRESSING	142	20		0	0	0.25	0	0	0	40	205	0	0	210	100	0.8							
	519 - TOILET		TOILET	113	20	3	0	0	50	0	0	0	150	150	0	0	90	40	0.8							
	520 - DRESS		LOCKER DRESSING	670	20		0	0	0.25	0	0	0	170	350	0	0	700	320	0.8							
	606 - CORRIDOR		CORRIDOR	375	3		0	0.06	0	0	0	23	0	0	23	29	100	50	0.8	58.0%						
	607 - DRESS		LOCKER DRESSING	111	20		0	0	0.25	0	0	0	30	130	0	0	130	60	0.8							
	609 - DRESS		LOCKER DRESSING	181	20		0	0	0.25	0	0	0	50	220	0	0	220	100	0.8							
	610 - JAN	[5]	UTILITY	36	10		0	0	50	0	0	0	50	30	0	0	0	0	0.8							
	611 - SHOWER	[5]	SHOWER	64	20		0	0	50	0	0	0	100	75	0	0	90	40	0.8							
	612A - DRESS		LOCKER DRESSING	133	20		0	0	0.25	0	0	0	40	210	0	0	210	100	0.8							
	614 - TOILET		TOILET	97	20	3	0	0	50	0	0	0	150	150	0	0	90	40	0.8							
	615 - DRESS		LOCKER DRESSING	604	20		0	0	0.25	0	0	0	160	300	0	0	630	290	0.8							
	710 - JAN	[5]	UTILITY	36	10		0	0	50	0	0	0	50	30	0	0	0	0	0.8							
SU-110	TOTALS			10508						71	557.5	385	3880	5405	942.5	1182	8230	3800	0.8	188%	0.3	1	943	3143	3880	6256

NOTES:

(1) OUTDOOR AIR SUPPLIED DIRECTLY THROUGH THE UNIT.

(2) ADDITIONAL EXHAUST AIR WILL BE PROVIDE BY TRANSFER ROOM AIR NOT OSA.

(3) ZONE AIR DISTRIBUTION EFFECTIVENESS PER CODE TABLE 3.1.2

(4) EXISTING SUPPLY AIRFLOW IN THIS SPACE MUST BE REBALANCED TO THE LISTED SUPPLY AIRFLOW.

(5) DIRECT EXHAUST AIRFLOW MUST BE ADDED TO SPACE AS REQUIRED TO MEET CODE.

(6) ADDITIONAL EXHAUST AIRFLOW PROVIDED BY TRANSFER AIR FROM OTHER SYSTEMS AND NOT BY DIRECT OUTDOOR AIRFLOW.

AIR BALANCING SPECIALTY INC.

METRO PORTLAND
5 THEATERS
PORTLAND, OREGON

PROJECT NO: 21-4266-DW

AIR BALANCING SPECIALTY INC. 3532 S.E. MILWAUKIE AVENUE PORTLAND, OREGON 97202-2751
IN BUSINESS SINCE 1964 CERTIFIED NEBB FIRM - CERTIFICATION NO. 2984
PHONE (503) 230-2332 FAX (503) 230-2820

PROJECT NAME: **METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON**

ARCHITECT:

DATE STARTED: 05/24/21 DATE FINISHED: 08/03/21

MECHANICAL ENGINEER: MFIA INC. CONSULTING ENGINEERS
2007 SE ASH ST.
PORTLAND, OR. 97214

WORK PERFORMED BY: DALE NEFFENDORF
WILLIAM NEFENDORF

GENERAL CONTRACTOR:

CERTIFIED BY: *Dale Neffendorf*

DATE: 9/9/2021

MECHANICAL CONTRACTOR:

SHEET METAL CONTRACTOR:

CONTROL CONTRACTOR:

Air Balancing Specialty Inc.
NEBB
DALE W. NEFFENDORF
CERTIFICATION
2984
Exp. 3/31/22
Air and Hydronic testing

IN BUSINESS SINCE 1964

AIR BALANCING SPECIALTY INC.

CERTIFIED NEBB No. 2984

3532 SE Milwaukie Avenue Portland, Oregon 97202-2751 Phone (503) 230-2332 Fax (503) 230-2820

CERTIFIED TEST AND BALANCE REPORT

PROJECT NO.: 21-4266-DW

INSTRUMENT	MODEL NO.	SERIAL NO.	RANGE	CALIBRATION DATE
AIR				
(D) Shortridge Airdata Multimeter	ADM860	M98375	0.0001 to 60.00" WC.	1/12/2021
ADM Accessories				
(DH) Datameter Flow Hood	8400		25 - 2500 CFM	
(DP) Datameter Pitot Tube	12", 18", 24", 36", 48" & 60"		50 - 30000 FPM	
(DA) Datameter Airfoil	AFP18		50 - 5000 FPM	
(DG) Datameter Velgrid	VLG84		50 - 2500 FPM	
Rotating Vane Anemometer	A4/-4"	83072B	200 - 10000 FPM	1/14/2021
Amprobe Ammeter	Fluke 335	99330394	0 - 750 Volts / 0 - 300 Amps	1/8/2021
Shimpo Tachometer	DT-207L	D26B0033	6 - 30,000 RPM	1/12/2021
WATER				
Hydrodata Meter	HDM-250	W01025	DP -10 to +300 PSI	1/12/2021

IN BUSINESS SINCE 1964

AIR BALANCING SPECIALTY INC.

CERTIFIED NEBB No. 2984

3532 SE Milwaukie Avenue Portland, Oregon 97202-2751 Phone (503) 230-2332 Fax (503) 230-2820

EQUIPMENT USED IN BALANCING

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON **PROJECT NO.: 21-4266-DW**

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	Size	Blow	DESIGN AK	Vel	CFM	TEST #1 FPM	TEST #1 CFM	TEST #2 FPM	TEST #2 CFM	TEST #3 FPM	TEST #3 CFM	FINAL FPM	FINAL CFM	Pct
										PRE-TEST		**POST-TEST**						
		KELLER AUDITORIUM																
		SU-1																
	DG	Fan Total @ discharge -0% OSA			36x12		3.00			1055	3165	1030	3090					
	DG	Fan Total @ discharge -20% Min OSA			36x12		3.00			1067	3201	1022	3066					
	DG	Fan Total @ discharge -100% OSA			36x12		3.00			1280	3840	1296	3888					
1		OSA (by temp)																
		SU-2																
	DG	Fan Total @ discharge -0% OSA			24x14		2.33			1706	3975	1494	3481					
	DG	Fan Total @ discharge -20% Min OSA			24x14		2.33			1689	3935	1664	3877					
	DG	Fan Total @ discharge -100% OSA			24x14		2.33			1665	3879	1673	3898					
1		OSA (by temp)																
		SU-3																
	DA	Fan Total @ Return			60x36		15.00			425	6375	507	7605					
		SU-4																
		Coil or coils are plugged. Supply has high suction pressure and the exhaust has high discharge pressure. This is observed when in 100% return.																
	DG	Fan Total @ discharge -20% Min OSA			30x36		7.50					744	5580					
		SU-4 in 0% OSA - BFF +0.79 / FS -2.07 / FD +0.89																
		SU-4 in 100% OSA - BFF -0.39 / FS -2.72 / FD +0.70																
		SU-5																
	DA	Fan Total @ discharge -0% OSA			50x24		8.33			1388	11562	1383	11520					
	DA	Fan Total @ discharge -20% Min OSA			50x24		8.33			1346	11212	1309	10904					
	DA	Fan Total @ discharge -100% OSA			50x24		8.33			998	8313	1054	8780					
1		OSA (by temp)																

Ref. Note: (1) System layout does not allow for a OSA reading. Attempted to measure OSA by temperature but the differental was insuffcient for an accurate OSA%.

AIR BALANCING SPECIALTY, INC. 3532 SE Milwaukie Avenue, Portland, Oregon 97202-2751 Phone: (503) 230-2332 Fax: (503) 230-2820

CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (KELLER AUDITORIUM)

DATE START: 05/24/21 FINISH: 08/03/21

SYSTEM: SU-1, SU-2, SU-3, SU-4 & SU-5

SECTION:

BY: DN / WN

PAGE: 1 OF 4

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	OUTLET Size	OUTLET Blow	DESIGN AK	DESIGN Vel	DESIGN CFM	TEST #1 FPM	TEST #1 CFM	TEST #2 FPM	TEST #2 CFM	TEST #3 FPM	TEST #3 CFM	FINAL FPM	FINAL CFM	Pct
										PRE-TEST		**POST-TEST**						
		KELLER AUDITORIUM																
		SU-6																
	DG	Fan Total @ filter -0% OSA			76x32.5		17.15			490	8404	497	8524					
	DG	Fan Total @ filter -100% OSA			76x32.5		17.15			456	7820	419	7186					
	DG	Fan Total @ filter - 20% Min OSA			76x32.5		17.15					491	8421					
	DG	OSA - 0% OSA			24x54		9.00					4	36					
	DG	OSA - 20% Min OSA			24x54		9.00			101	909	71	639					
	DG	OSA -100% OSA			24x54		9.00			878	7902	1148	10332					
		SU-7																
	DG	Fan Total @ filter -0% OSA			56x37		14.90			490	7301	429	6392					
	DG	Fan Total @ filter -100% OSA			56x37		14.90			477	7107	423	6303					
	DG	Fan Total @ filter - 20% Min OSA			56x37		14.90					414	6169					
	DG	OSA - 0% OSA (1)			16x16		1.77			805	1425	718	1271					
	DG	OSA - Min OSA (1)			16x16		1.77					715	1266					
	DG	OSA -100% OSA (1)			16x16		1.77			818	1448	730	1292					
	DG	OSA - 0% OSA (2)			16x16		1.77			673	1191	686	1214					
	DG	OSA - 20% Min OSA (2)			16x16		1.77					674	1193					
	DG	OSA -100% OSA (2)			16x16		1.77			713	1262	667	1181					
		SU-8																
	DG	Fan Total @ suction -0% OSA			61x27.5		11.65			505	5883	515	6000					
	DG	Fan Total @ suction - 20% Min OSA			61x27.5		11.65			512	5965	623	7258					
	DG	Fan Total @ suction -100% OSA			61x27.5		11.65			519	6046	580	6757					
1		OSA (by temp)																

Ref. Note: (1) System layout does not allow for a OSA reading. Attempted to measure OSA by temperature but the differental was insuffcient for an accurate OSA%.

AIR BALANCING SPECIALTY, INC. 3532 SE Milwaukie Avenue, Portland, Oregon 97202-2751 Phone: (503) 230-2332 Fax: (503) 230-2820

CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (KELLER AUDITORIUM)

DATE START: 05/24/21 FINISH: 08/03/21

SYSTEM: SU-6, SU-7 & SU-8

SECTION:

BY: DN / WN

PAGE: 2 OF 4

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	Size	Blow	DESIGN AK	Vel	CFM	TEST #1 FPM	CFM	TEST #2 FPM	CFM	TEST #3 FPM	CFM	FINAL FPM	CFM	Pct
										PRE-TEST		**POST-TEST**						
		KELLER AUDITORIUM																
		SU-9								**60 HZ**								
	DG	Fan Total @ filter -0% OSA			150x99		103.13			330	34033	341	35167					
	DG	Fan Total @ filter -20% OSA			150x99		103.13					395	40736					
	DG	Fan Total @ filter -100% OSA			150x99		103.13			427	44037	434	44758					
2	DG	OSA - 0% OSA			148x100		102.78			125	12848	195	20042					
	DG	OSA - 20% Min			148x100		102.78					239	24564					
	DG	OSA -100% OSA			148x100		102.78			472	48512	414	42551					
		SU-10																
		The only return duct for this fan is a 12x12 duct so the fan is under high suction pressure. The fan is being starved in this mode.																
	DG	Fan Total @ filter -0% OSA			56x47		18.28			153	2797	169	3089					
	DG	Fan Total @ filter -20% OSA			56x47		18.28			214	3912	243	4442					
	DG	Fan Total @ filter -100% OSA			56x47		18.28			352	6435	317	5795					
	DG	OSA - 0% OSA			36x24		6.00			225	1350	183	1098					
	DG	OSA - 20% Primary Min			36x24		6.00			323	1938	493	2958					
	DG	OSA -100% OSA			36x24		6.00			1148	6888	1029	6174					

Ref. Note: (2) Primary and minimum damper not closed 100%. Bottom 15%. Top 20%.

AIR BALANCING SPECIALTY, INC. 3532 SE Milwaukie Avenue, Portland, Oregon 97202-2751 Phone: (503) 230-2332 Fax: (503) 230-2820

CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (KELLER AUDITORIUM)

DATE START: 05/24/21 FINISH: 08/03/21

SYSTEM: SU-9 & SU-10

SECTION:

BY: DN / WN

PAGE: 3 OF 4

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	Size	Blow	DESIGN AK	Vel	CFM	TEST #1 FPM	CFM	TEST #2 FPM	CFM	TEST #3 FPM	CFM	FINAL FPM	CFM	Pct
		KELLER AUDITORIUM																
		EF-12																
	DA				16x16		0.25			300	75							
		EF-8																
	DA				20x18		2.50			729	1823							
		EF-9																
	DG				126x46		40.25			662	26646							
		EF-2																
	DA	0% OSA			20x20		2.78			1230	3419							
	DA	20$ Min. OSA			20x20		2.78			1214	3375							
	DA	100% OSA			20x20		2.78			890	2474							
		EF-5																
	DG	Fan Intake			96x62		41.33			420	17359							
		EF-6																
	DG	0% OSA			24x54		9.00			801	7209							
	DG	100% OSA			24x54		9.00			723	6507							
3		**EF-7**																
	DG	0% OSA			16x16		1.78			100	178							
	DG	100% OSA			16x16		1.78			844	1502							
		EF-11																
	DA				28x14		2.72			686	1866							
		EF-10																
3	DA	Fan Disc 100% OSA			35x24		5.67			817	4632							
		EF-1																
	DA	Fan Suction			16x16		1.78			717	1276							
		EF-2																
	DA	100% OSA			20x20		2.78			896	2491							
		EF-4								High								
	DA	100% OSA			30x30		6.25			2105	13156							

Ref. Note: (3) At 0% OSA on SU-7 discharge damper ia closed modulates open with OSA command to SU-7.

AIR BALANCING SPECIALTY, INC. 3532 SE Milwaukie Avenue, Portland, Oregon 97202-2751 Phone: (503) 230-2332 Fax: (503) 230-2820

CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (KELLER AUDITORIUM)

DATE START: 05/24/21 FINISH: 8/03/21

SYSTEM: SU-9 & SU-10

SECTION:

BY: DN / WN

PAGE: 4 OF 4

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	Size	Blow	DESIGN AK	Vel	CFM	TEST #1 FPM	TEST #1 CFM	TEST #2 FPM	TEST #2 CFM	TEST #3 FPM	TEST #3 CFM	FINAL FPM	FINAL CFM	Pct
										PRE-TEST		**PRE-TEST**		**POST-TEST**				
		HATFIELD HALL																
		ASU-1								**58.2 HZ**		**60 HZ**		**60 HZ**				
	DG	Fan Total @ filter -0% OSA			100x70		48.61			581	28242	587	28534	564	27416			
	DG	Fan Total @ Minimum			100x70		48.61					591	28729	587	28534			
1	DG	Fan Total @ filter -100% OSA			100x70		48.61			593	28826	605	29409	545	26492			
	DG	OSA @ 0% OSA			79.5x45.5	Plenum	25.12			59	1482	80	2010	21	528			
	DG	OSA @ Low Minimum			79.5x44.5	Plenum	25.12											
	DG	OSA @ High Minimum @ 25%			79.5x44.5	Plenum	25.12			147	3693	140	3517	51	1281			
1	DG	OSA @ 100% OSA			79.5x44.5	Plenum	25.12			946	23764	893	22432	881	22131			
		ASU-2								**60 HZ**		**60 HZ**		**60 HZ**				
	DG	Fan Total @ filter -0% OSA			108x60		44.00			456	20064	372	16368	370	16280			
	DG	Fan Total @ Minimum			108x60		44.00					423	18612	426	18744			
	DG	Fan Total @ filter -100% OSA			108x60		44.00			480	21120	476	20944	451	19844			
2	DG	OSA @ 0% OSA			91.25x31.5	Plenum	19.96			198	3952	193	3852	165	3293			
	DG	OSA @ Low Minimum			91.25x31.5	Plenum	19.96											
	DG	OSA @ High Minimum @ 25%			91.25x31.5	Plenum	19.96			370	7385	358	7146	347	6926			
	DG	OSA @ 100% OSA			91.25x31.5	Plenum	19.96			967	19301	900	17964	885	17665			
		ASU-3								**HIGH SPEED**				**HIGH SPEED**				
	DG	Fan Total @ filter -0% OSA			108x72		54.00			507	27378	490	26460	482	26028			
	DG	Fan Total @ Minimum			108x72		54.00					575	31050	567	30618			
	DG	Fan Total @ filter -100% OSA			108x72		54.00			657	35478	531	28674	604	32616			
	DG	OSA @ 0% OSA			106.5x33	Plenum	24.41			64	1562	37	903	46	1123			
	DG	OSA @ Low Minimum			106.5x33	Plenum	24.41											
	DG	OSA @ High Minimum @ 25%			106.5x33	Plenum	24.41			338	8251	333	8129	326	7958			
	DG	OSA @ 100% OSA			106.5x33	Plenum	24.41			1181	28828	1060	25875	1187	28975			

Ref. Note: (1) RA damper approximately 10% open when in 100% OSA. (2) Minimum OSA damper closed, primary OSA damper is 15% open.

AIR BALANCING SPECIALTY, INC. 3532 SE Milwaukie Avenue, Portland, Oregon 97202-2751 Phone: (503) 230-2332 Fax: (503) 230-2820

CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (HATFIELD HALL)

DATE START: 05/24/21 FINISH: 07/21/21

SYSTEM: ASU-1, ASU-2 ASU-3

SECTION:

BY: DN / WN

PAGE: 1 OF 4

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	Size	Blow	DESIGN AK	Vel	CFM	TEST #1 FPM	TEST #1 CFM	TEST #2 FPM	TEST #2 CFM	TEST #3 FPM	TEST #3 CFM	FINAL FPM	FINAL CFM	Pct
										PRE-TEST		**PRE-TEST**		**POST-TEST**				
		HATFIELD HALL																
		ASU-4 (2 Speed)								**LOW SPEED**		**HIGH SPEED**		**HIGH SPEED**				
	DG	Fan Total @ filter -0% OSA			84x48		28.00			275	7700	555	15540	563	15764			
	DG	Fan Total @ Minimum			84x48		28.00							604	16912			
	DG	Fan Total @ filter -100% OSA			84x48		28.00					558	15624	600	16800			
3	DG	OSA @ 0% @ dampers			78x28		15.17			63	956	125	1896	91	1380			
	DG	OSA @ Low Min. @ damper																
	DG	OSA @ High Min. @ damper			78x28		15.17					754	11438	336	5097			
	DG	OSA @ 100% @ damper			78x28		15.17							1043	15822			
		ASU-5								**PRE-TEST**		**POST-TEST**						
	DG	Fan Total @ filter -0% OSA			72x57		28.50			381	10859	363	10346					
	DG	Fan Total @ Minimum			72x57		28.50			439	12512	427	12170					
	DG	Fan Total @ filter -100% OSA			72x57		28.50			397	11315	393	11201					
													0					
	DG	OSA @ 0% @ damper			78x24		13.00			152	1976	160	2080					
	DG	OSA @ Minimum @ damper			78x24		13.00			201	2613	181	2353					
	DG	OSA @ 100% @ damper			78x24		13.00			804	10452	848	11024					
		AHU-7																
	DA	Return - 100% RA			40x14		3.89			1438	5594	1378	5360					
	DA	Minimum OSA - 0% OSA			24x12		2.00			39	78	28	56					
		Fan Total									**5672**		**5416**					
	DA	Return - 100% RA			40x14		3.89			1348	5244	1343	5224					
	DA	Minimum OSA - Min OSA			24x12		2.00			261	522	257	514					
		Fan Total									**5766**		**5738**					
	DA	Return - 0% RA			40x14		3.89			198	770	197	766					
	DA	Minimum OSA -100% OSA			24x12		2.00			893	1786	896	1792					
		Fan Total									**2556**		**2558**					

Ref. Note: (3) Minor leakage of approx. a finger width on both Min. & Max. OSA damper when closed.

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CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (HATFIELD HALL)

DATE START: 05/24/21 FINISH: 07/21/21

SYSTEM: ASU-4, AHU-5 & AHU-7

SECTION:

BY: DN / WN

PAGE: 2 OF 4

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	Size	Blow	DESIGN AK	Vel	CFM	TEST #1 FPM	CFM	TEST #2 FPM	CFM	TEST #3 FPM	CFM	FINAL FPM	CFM	Pct
										PRE-TEST		**POST-TEST**						
		HATFIELD HALL																
		ASU-8																
	DG	Fan Total @ Disc. Trav.-0% OSA			36x28		5.05			1247	6297	363	1833					
	DG	Fan Total @ Disc. Trav. -Minimum			36x28		5.05			1245	6287	427	2156					
	DG	Fan Total @ Disc. Trav. -100% OSA			36x28		5.05			1278	6454	393	1985					
													0					
	DG	OSA @ 0% - OSA Trav.			60x20		8.61			0	0	160	1378					
	DG	OSA @ Minimum - OSA Trav.			60x20		8.61			563	4847	181	1558					
	DG	OSA @ 100% - OSA Trav.			60x20		8.61			1020	8782	848	7301					
		ASU-9																
	DA	Return @ 100%			36x12		3.00			908	2724	(4)						
	DA	OSA @ 0%			40x10		2.78			150	417	(4)						
		Fan Total									**3141**							
	DA	Return @ Minimum			36x12		3.00			633	1899	(4)						
	DA	OSA @ Minimum			40x10		2.78			480	1334	(4)						
		Fan Total									**3233**							
	DA	Return @ 0%			36x12		3.00			25	75	(4)						
	DA	OSA @ 100%			40x10		2.78			1016	2824	(4)						
		Fan Total									**2899**							

Ref. Note: (4) Unit was missing one or more merv 13 filters.

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CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (HATFIELD HALL)

DATE START: 05/24/21 FINISH: 07/21/21

SYSTEM: ASU-8 & ASU-9 SECTION: BY: DN / WN PAGE: 3 OF 4

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	Size	Blow	DESIGN AK	Vel	CFM	TEST #1 FPM	CFM	TEST #2 FPM	CFM	TEST #3 FPM	CFM	FINAL FPM	CFM	Pct
		HATFIELD HALL																
		EF-1 (By ASU-3)																
	DA				16x22		2.44		2730	927	2262							
		EF-2 (By ASU-4)																
	DA				26x14		2.53		3000	688	1741							
		EF-3 (Same level as ASU-5)																
	DG	Discharge Louver			36x17.5		2.63		1345	389	1023							
		EF-4 (Same level as ASU-5)																
	DG				18x8		1.00		1000	372	372							

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CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (HATFIELD HALL)

DATE START: 05/24/21 FINISH: 07/21/21

SYSTEM: EF-1, EF-2, EF-3 & EF-4

SECTION:

BY: DN / WN

PAGE: 4 OF 4

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	OUTLET Size	OUTLET Blow	DESIGN AK	DESIGN Vel	DESIGN CFM	TEST #1 FPM	TEST #1 CFM	TEST #2 FPM	TEST #2 CFM	TEST #3 FPM	TEST #3 CFM	FINAL FPM	FINAL CFM	Pct
										PRE-TEST								
		ARLENE SCHNITZER																
1		**ASU-1**								**HIGH SPEED**		(3)						
	DG	Fan Total @ filter -0% OSA			139.5x85		82.34			1096	90245	500	41170					
	DG	Fan Total @ filter -10% OSA			139.5x85		82.34			1093	89998	467	38453					
	DG	Fan Total @ filter -100% OSA			139.5x85		82.34			1082	89092	469	38617					
	DA	Minimum OSA - 0% OSA			108x24		18.00			36	648	19	342					
	DA	Minimum OSA - 10% OSA			108x24		18.00			488	8784	535	9630					
	DA	Minimum OSA -100% OSA			108x24		18.00			530	9540	576	10368					
1		**ASU-2**										(3)						
	DG	Fan Total @ filter -0% OSA			117x75		60.94			914	55699	493	30043					
	DG	Fan Total @ filter -10% OSA			117x75		60.94			933	56857	445	27118					
	DG	Fan Total @ filter -100% OSA			117x75		60.94			1061	64657	433	26387					
													0					
	DA	Minimum OSA - 0% OSA			72x36		18.00			35	630	7	126					
	DA	Minimum OSA - 10% OSA			72x36		18.00			256	4608	206	3708					
	DA	Minimum OSA -100% OSA			72x36		18.00			351	6318	423	7614					
		ASU-3																
	DG	Fan Total @ filter -0% OSA			58x41		16.51			285	4705	306	5052					
	DG	Fan Total @ filter -10% OSA			58x41		16.51			289	4771	350	5779					
	DG	Fan Total @ filter -100% OSA			58x41		16.51			268	4425	286	4722					
2	DG	Minimum OSA - 0% OSA			15x48	(2)	3.50			115	403	102	357					
2	DG	Minimum OSA - 10% OSA			15x48		3.50			121	424	123	431					
2	DG	Minimum OSA -100% OSA			15x48		3.50			1155	4043	1235	4323					

Ref. Note: (1) No motorized return damper. (2) Screen behind discharge louver is mostly plugged. (3) Fan is operating at a much higher suction pressure (@ filters) than during pre-testing.

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CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (ARLENE SCHNITZER)

DATE START: 05/24/21 FINISH: 07/20/21

SYSTEM: ASU-1, ASU-2 ASU-3

SECTION:

BY: DN / WN

PAGE: 1 OF 3

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	OUTLET Size	OUTLET Blow	DESIGN AK	DESIGN Vel	DESIGN CFM	TEST #1 FPM	TEST #1 CFM	TEST #2 FPM	TEST #2 CFM	TEST #3 FPM	TEST #3 CFM	FINAL FPM	FINAL CFM	Pct
										PRE-TEST								
		ARLENE SCHNITZER																
		AHU-4																
	DG	Fan Total @ filter -0% OSA			62x36		15.50			235	3643	239	3705					
	DG	Fan Total @ filter -10% OSA			62x36		15.50			277	4294	426	6603					
	DG	Fan Total @ filter -100% OSA			62x36		15.50			449	6960	455	7053					
	DG	Minimum OSA - 0% OSA			36x24		6.00			8	48	7	42					
	DG	Minimum OSA - 35% OSA			36x24		6.00			614	3684	606	3636					
	DG	Minimum OSA -100% OSA			36x24		6.00			1034	6204	1081	6486					
		AHU-5																
	DG	Return - 100% RA			24x16		2.67			935	2496	827	2208					
	DG	Minimum OSA - 0% OSA			27x11		2.06			41	84	31	64					
		Fan Total									**2580**		**2272**					
	DG	Return - 100% RA			24x16		2.67			614	1639	545	1455					
	DG	Minimum OSA - Min OSA			27x11		2.06			604	1244	576	1187					
		Fan Total									**2883**		**2642**					
	DG	Return - 0% RA			24x16		2.67			42	112	25	67					
	DG	Minimum OSA -100% OSA			27x11		2.06			1206	2484	1177	2425					
		Fan Total									**2596**		**2491**					
		AHU-6								**HIGH SPEED**								
	DG	Fan Total @ filter -0% OSA			62x36		15.50			453	7022	474	7347					
	DG	Fan Total @ filter -10% OSA			62x36		15.50			506	7843	529	8200					
	DG	Fan Total @ filter -100% OSA			62x36		15.50			679	10525	653	10122					
													0					
	DG	Minimum OSA - 0% OSA			25x45		7.81			70	547	70	547					
	DG	Minimum OSA - 10% OSA			25x45		7.81			244	1906	232	1812					
	DG	Minimum OSA -100% OSA			25x45		7.81			964	7529	941	7349					
		RTU-1																
	DG	@ OSA Intake - 0% OSA			32x11		2.44			86	210	76	185					
	DG	@ OSA Intake - 10% OSA			32x11		2.44			115	281	142	346					
	DG	@ OSA Intake - 100% OSA			32x11		2.44			76	185	723	1764					

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CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (ARLENE SCHNITZER)

DATE START: 05/24/21 FINISH: 07/20/21

SYSTEM: AHU-4. AHU-5, AHU-6 & RTU-1

SECTION:

BY: DN / WN

PAGE: 2 OF 3

Ref	Ins	AREA SERVED	Rm.#	OUTLET No.	OUTLET Size	OUTLET Blow	DESIGN AK	DESIGN Vel	DESIGN CFM	TEST #1 FPM	TEST #1 CFM	TEST #2 FPM	TEST #2 CFM	TEST #3 FPM	TEST #3 CFM	FINAL FPM	FINAL CFM	Pct
		ARLENE SCHNITZER																
		EF-1																
	DA	Main Traverse			44x8		2.44		2265	504	1230							
		EF-2																
	DA	Fan Intake Traverse			28"O		4.27		6045	1316	5619							
		(Fan Pressures)								((S) 1.25" (D) 0.19")								
		EF-3																
	DA	Toilet			6x6		0.19		700	460	87							
	DA	Control Rm			9"O		0.44			1000	440							
	DA	Control Rm			9"O		0.44			685	301							
		Total									**828**							
		EF-4							7000									
	DG	Discharge Backdraft			22x22		2.52			591	1489							
	DG	Discharge with hood			21x23		3.35			673	2255							
		Total									**3744**							
										Meas. RPM 356								
4		**EF-5**																
	DA	Fan Intake Traverse			33"O		5.93			67	397							
		(Fan Pressures)								((S) 0.003" (D) 0.24")								
		EF-7																
	DG	Discharge Backdraft			9x9		0.42			368	155							
	DG	Discharge Backdraft			9x9		0.42			485	204							
		Total									**359**							
										Meas. RPM 883								

Ref. Note: (4) Fan has no suction pressure. Discharge motorized damper was commanded open and closed with no change. Suspect damper is not operating or not tight to damper shaft.

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CONSTANT VOLUME - FPM

AIR BALANCE DATA SHEET

PROJECT NO.: 05/24/21

PROJECT: METRO PORTLAND - 5 THEATERS - PORTLAND, OREGON (ARLENE SCHNITZER)

DATE START: 05/24/21 FINISH: 07/20/21

SYSTEM: EF-1, EF-2, EF-3, EF-4, EF-5 & EF-7

SECTION:

BY: DN / WN

PAGE: 3 OF 3

Environmental Safety Technologies, Inc.
1815 Brownsboro Road., Suite 200
Louisville, Kentucky 40206
Phone: 502.893.6080
Fax: 502.893.6088
Email: est@estechlab.com
Web: www.estechlab.com

Report Date: 6/3/2021

Microbiological Analyses

Company Information
Watercare Industrial Services, Inc.
P.O. Box 464
Washougal, WA 98671

Job Site:
,

Batch Number: 210527019
Sampled By: Tom Carroll
P.O. Number:
Report Status: Original

Client Sample ID:
Location: SV9 MCH Sink 711
Lab Sample ID: 285032 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 504 Shower C
Lab Sample ID: 285033 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 504 Shower H
Lab Sample ID: 285034 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: Proj 803

Lab Sample ID: 285035 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: SB 721 C

Lab Sample ID: 285036 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: SB 721 H

Lab Sample ID: 285037 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: SB 704 C

Lab Sample ID: 285038 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: SB 704 H

Lab Sample ID: 285039 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: SB Sink 705

Lab Sample ID: 285040 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 609 Sink C

Lab Sample ID: 285041 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 624 Sink C

Lab Sample ID: 285042 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 624 Sink H

Lab Sample ID: 285043 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 609 Sink H

Lab Sample ID: 285044 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 543 Sink C

Lab Sample ID: 285045 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 543 Sink H

Lab Sample ID: 285046 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 421 Shower C

Lab Sample ID: 285047 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 421 Shower H

Lab Sample ID: 285048 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 23 Shower C

Lab Sample ID: 285049 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 23 Shower H

Lab Sample ID: 285050 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 708 Sink

Lab Sample ID: 285051 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 401 Sink C

Lab Sample ID: 285052 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 401 Sink H

Lab Sample ID: 285053 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 514 Sink C

Lab Sample ID: 285054 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 514 Sink H

Lab Sample ID: 285055 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 332 Shower C

Lab Sample ID: 285056 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Client Sample ID:
Location: 332 Shower H

Lab Sample ID: 285057 Collection Date: 5/26/2021 Receive Date: 5/27/2021

Analyte	Test Code	Media Type	Sample Result	Units	Detection Limit	Analysis Date	Priority
Legionella pneumophila SG1	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella pneumophila SG2-14	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard
Legionella non-pneumophila	L011 - Legionella Potable Water	BCYE & GVPC	None Detected	CFU/mL	0.10 CFU/mL	6/3/2021	Standard

Environmental Safety Technologies, Inc.

Richard D. Miller, Ph.D.
President, Chief Scientific Officer

Report Notes Applicable to All Analyses

- All samples were received in accordance with recommended transit times as detailed in Environmental Safety Technologies Sample Guidelines located online at www.estechlab.com. Samples received outside of the suggested sample transit times processed with the approval of the customer, with the understanding that transit delay may affect the viability of the sample results.
- Data are not corrected based on results for blank samples. Results relate only to items tested.
- Raw counts (available upon request) are used to calculate test results using all significant figures. Results found at or above the analytical sensitivity are reported to three significant figures; amounts below the analytical sensitivity are listed as None Detected.
- Analytical Sensitivity is defined as the lowest concentration that can be detected by a test method based on the amount or portion of sample analyzed and is reported without rounding. For qualitative samples, results found at or above this level are reported as "Present"; amounts below this limit are reported as "Absent". Scheduled analyses are performed during routine business hours. Otherwise, analyses are completed on the next business day.
- Results apply to samples as received.
- Samples collected by EST's Industrial Hygiene Department are indicated on reports by the suffix, /EST, appearing after the "Sampled By" field. EST is responsible for all the information provided on issued reports unless information is provided by the customer. Chain of Custody (COC) records accompanying samples submitted to laboratory are scanned and included with issued reports; see COC records for traceability of provided information including but not limited to sample collection time, sample rate, transport conditions, sampling media, and lot numbers. If pertinent information needed for sample processing or calculation of reported results is omitted from a COC record, customers are contacted for verification and information is recorded on the submitted COC record or a proxy COC record if one has not been provided.

Abbreviations

- Media Types : ACN = Acinetobacter CHROMagar™, BART = Biological Activity Reaction Test, BCSA = *Burkholderia cepacia* Selective Agar, BCYE = Buffered Charcoal Yeast Extract Agar, Cetrimide = *Pseudomonas aeruginosa* Selective Agar, GVPC = BCYE Selective Agar with antibiotics (Glycine, Vancomycin, Polymyxin, and Cycloheximide), Leeds = Leeds Acinetobacter Medium, ME* = Malt Extract with 0.01% Chloramphenicol, R2A = Reasoner's 2A Agar, SMA = Standard Methods Agar (a.k.a. Plate Count Agar), SSA = Stenotrophomonas Selective Agar, TSA = Tryptic Soy Agar, TSA* = Tryptic Soy Agar with 0.005% Cycloheximide, TSLT = Tryptic Soy Agar Contact Plate with Lecithin and Tween 80, 7H11S = Middlebrook 7H11 Selective Agar.
- Units: C= Celsius, CFU = Colony Forming Unit, F = Fahrenheit, g = gram, L = liter, m = meter, ml = milliliter, SG = serogroup, N/A = Not Applicable, N/R = Not Requested.
- Miscellaneous: AIHA-LAP, LLC = American Industrial Hygiene Association - Laboratory Accreditation Program, Limited Liability Company, EMLAP = Environmental Microbiology Laboratory Accreditation Program (ISO/IEC 17025:2017), ELITE = Environmental *Legionella* Isolation Techniques Evaluation Program, HPC = Heterotrophic Plate Count, N/A = Not Applicable, N/R = Not Requested.

Bacteria – Standard Heterotrophic Plate Counts for Water Samples

- Test Codes: B010 (Aerobic), B011 (Anaerobic)
- Total viable heterotrophic plate bacteria counts are obtained using the spread plate method.
- Samples are routinely processed on SMA under aerobic conditions at 35ºC for 2-4 days or anaerobically at 35ºC for 2-4 days using BD GasPak™ EZ Anaerobic Gas Generating Systems.

Bacteria – Plate Counts for Air, Swab, Bulk-Solid, and Contact Plates

- Test Codes: B002 (Air), B004 (Swab), B007 (Bulk-solid), B027 (Contact)
- Plate counts are routinely obtained utilizing SMA agar plates for air, swab, and bulk-solid samples as described above.
- Other agars may be utilized upon customer request (e.g. TSA plates incubated for 3-5 days at 35ºC or R2A plates incubated for 5-7 days at 30ºC).
- Bacteria plate counts are obtained for bulk-liquid and bulk-solid samples using the spread plate method.
- Surface contact plates (e.g. TSLT) are incubated directly at room temperature for 3-5 days unless otherwise requested and noted.
- Anaerobic plate counts are obtained using BD GasPak™ EZ Anaerobic Gas Generating Systems.

Legionella Culture Analysis

- Test Codes: Non-potable L001 (Bulk-Liquid/Water), L002 (Swab), L003 (Bulk-Solid), L099 (Air)
- Test Codes: Potable L011 (Bulk-Liquid/Water), L012 (Swab), L013 (Bulk-Solid)
- Total Viable *Legionella*: Viable *Legionella* counts (*Legionella pneumophila* SG1, *Legionella pneumophila* SG2-14, or *Legionella* non-*pneumophila* species) are obtained using an in-house modified method based on CDC and ISO 11731:2017(E) procedures for the recovery of *Legionella* from the environment. *Legionella* non-*pneumophila* species include *L. anisa, L. bozemanii 1 & 2, L. dumoffi, L. feelei, L. gormanii, L. jordanis, L. longbeachae 1 & 2,* and *L. micdadei.*

Microbial Corrosion Screen (Water, Solid/Sludge, or Swab)

- Test Codes and Organisms: Acid Producing Bacteria (M001, M011, M021), Denitrifying Bacteria (M002, M012, M022), Iron Related Bacteria (M003, M013, M023), Slime Forming Bacteria (M004, M014, M024), Sulfate Reducing Bacteria (M005, ,M015, M025), Fluorescent Pseudomonads (M006, M016, M026), Nitrifying Bacteria (M007, M017, M027) and Algae (M008, M018, M028).
- Daily monitoring of microbial reactions using organism specific BART™ testers (Dryocon Bioconcepts Inc.) enables the semi-quantitative projection of population sizes and associated activities (aggressiveness). Observation durations range from two to nine days at room temperature as specified by each BART™ tester.
- These listed microbial corrosion screen test methods are not covered under AIHA LAP, LLC's scope of accreditation.

Environmental Pathogen Monitoring - Listeria and Salmonella Immunoassay Tests

- Test Code B041: *Listeria.* Swabs are enriched in indicator broth for enhanced recovery and selection.
- Test Code B041: *Salmonella.* Swabs are enriched in indicator broth for enhanced recovery and selection.
- Test methods AOAC Research Institute approved for monitoring environmental surfaces.

Pathogen Screen Culture Analysis – Potable Water Samples

- Test Code: PS01/GC10 (Water)
- Pathogen Screen Analyses on selective agar: *Acinetobacter* species, *Burkholderia cepacia, Pseudomonas aeruginosa*, *Stenotrophomonas maltohilia,* Rapidly growing non-tuberculosis mycobacteria, Fungal Count (mold and yeast) and Mold Identification (Genus level; common *Aspergillus* species).

Pseudomonas aeruginosa and other *Pseudomonas* species Culture Analysis

- Test Codes: B018 (Water), B019 (Swab); *Pseudomonas aeruginosa* isolation and identification on Cetrimide selective agar incubated for 2-4 days at 41°C.
- Test Codes: B062 (Water), B063 (Swab); *Pseudomonas* species screen on Cetrimide selective agar incubated for 5-7 days at 30°C.

Pseudomonas aeruginosa Screen; Presence/Absence

- Test Codes: B052 (Water), B053 (Swab)
- Presence/Absence using IDEXX™ test reagents for the detection *P. aeruginosa* (Pseudalert®)

Sewage Contamination Screens

- Tests are applicable for the detection of environmental fecal contamination, not for potable drinking water certification.

Total Coliform & *E. coli*; Presence/Absence

- Test Codes: B022 (Water), B023 (Swab)
- Presence/Absence using IDEXX™ test reagents for the detection of Total Coliforms and *E. coli* (Colisure®

Sewage Screen – *E. coli* & Enterococci; Presence/Absence

- Test Codes: B012 (Water), B013 (Swab)
- Presence/Absence using IDEXX™ test reagents for the detection of *E. coli* (Colisure®)
- Presence/Absence using IDEXX™ test reagents for the detection of Enterococci (Enterolert®).

Sewage Screen – Enterococci; Presence/Absence

- Test Codes: B024 (Water), B025 (Swab)
- Presence/Absence using IDEXX™ test reagents for the detection of Enterococci (Enterolert®).

Microbiological Analyses Endnotes Revision 1-1

Columbia LABORATORIES
A Tentamus Company

12423 NE Whitaker Way
Portland, OR 97230
503-254-1794

Report Number: 21-005780/D002.R00
Report Date: 05/28/2021
ORELAP#: OR100028
Purchase Order:
Project Name:
Project No:

Cover Letter

Watercare Industries
P.O. Box 464
Washougal, WA 98671
United States of America (USA)

Dear Cathy Elie,

Enclosed please find Columbia Laboratories analytical report for samples received as order number 21-005780 on 05/26/2021 at 14:04. Should you have any questions about this report or any other matter, please do not hesitate to contact us. We are here to help you.

Thank you for allowing Columbia Laboratories to be of service to you, we appreciate your business.

Sincerely,

Derrick Tanner
General Manager

Columbia LABORATORIES
A Tentamus Company

12423 NE Whitaker Way
Portland, OR 97230
503-254-1794

Report Number: 21-005780/D002.R00
Report Date: 05/28/2021
ORELAP#: OR100028
Purchase Order:
Project Name:
Project No:

Sample Results

Sample: 708 SInk | Collected: 5/26/21 12:16 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0001 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 401 Sink C | Collected: 5/26/21 12:25 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0002 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 401 Sink H | Collected: 5/26/21 12:27 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0003 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 518 Sink C | Collected: 5/26/21 12:35 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0004 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Columbia LABORATORIES
A Tentamus Company

12423 NE Whitaker Way
Portland, OR 97230
503-254-1794

Report Number: 21-005780/D002.R00
Report Date: 05/28/2021
ORELAP#: OR100028
Purchase Order:
Project Name:
Project No:

Sample Results

Sample: 514 Sink H | Collected: 5/26/21 12:37 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0005 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 332 Shower C | Collected: 5/26/21 12:41 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0006 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 332 Shower H | Collected: 5/26/21 12:43 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0007 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: SU9 MCH Sink 711 | Collected: 5/26/21 10:42 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0008 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

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503-254-1794

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Sample Results

Sample: 504 Shower C | Collected: 5/26/21 10:47 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0009 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 504 Shower H | Collected: 5/26/21 10:47 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0010 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: PROJ 803 | Collected: 5/26/21 11:02 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0011 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: SB 721 C | Collected: 5/26/21 11:06 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0012 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

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Project No:

Sample Results

Sample: SB 721 H | Collected: 5/26/21 11:08 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0013 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: SB 704 C | Collected: 5/26/21 11:12 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0014 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: SB 704 H | Collected: 5/26/21 11:14 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0015 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: SB Sink 705 | Collected: 5/26/21 11:16 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0016 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

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Purchase Order:
Project Name:
Project No:

Sample Results

Sample: 609 Sink C | Collected: 5/26/21 11:39 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0017 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 624 Sink C | Collected: 5/26/21 11:42 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0018 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 624 Sink H | Collected: 5/26/21 11:45 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0019 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 609 Sink H | Collected: 5/26/21 11:47 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0020 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

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Sample Results

Sample: 543 Sink C | Collected: 5/26/21 11:52 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0021 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 543 Sink H | Collected: 5/26/21 11:55 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0022 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 421 Shower C | Collected: 5/26/21 11:59 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0023 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

Sample: 23 Shower C | Collected: 5/26/21 12:04 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0024 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

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Sample Results

Sample: 23 Shower H | Collected: 5/26/21 12:05 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0025 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Sample Results

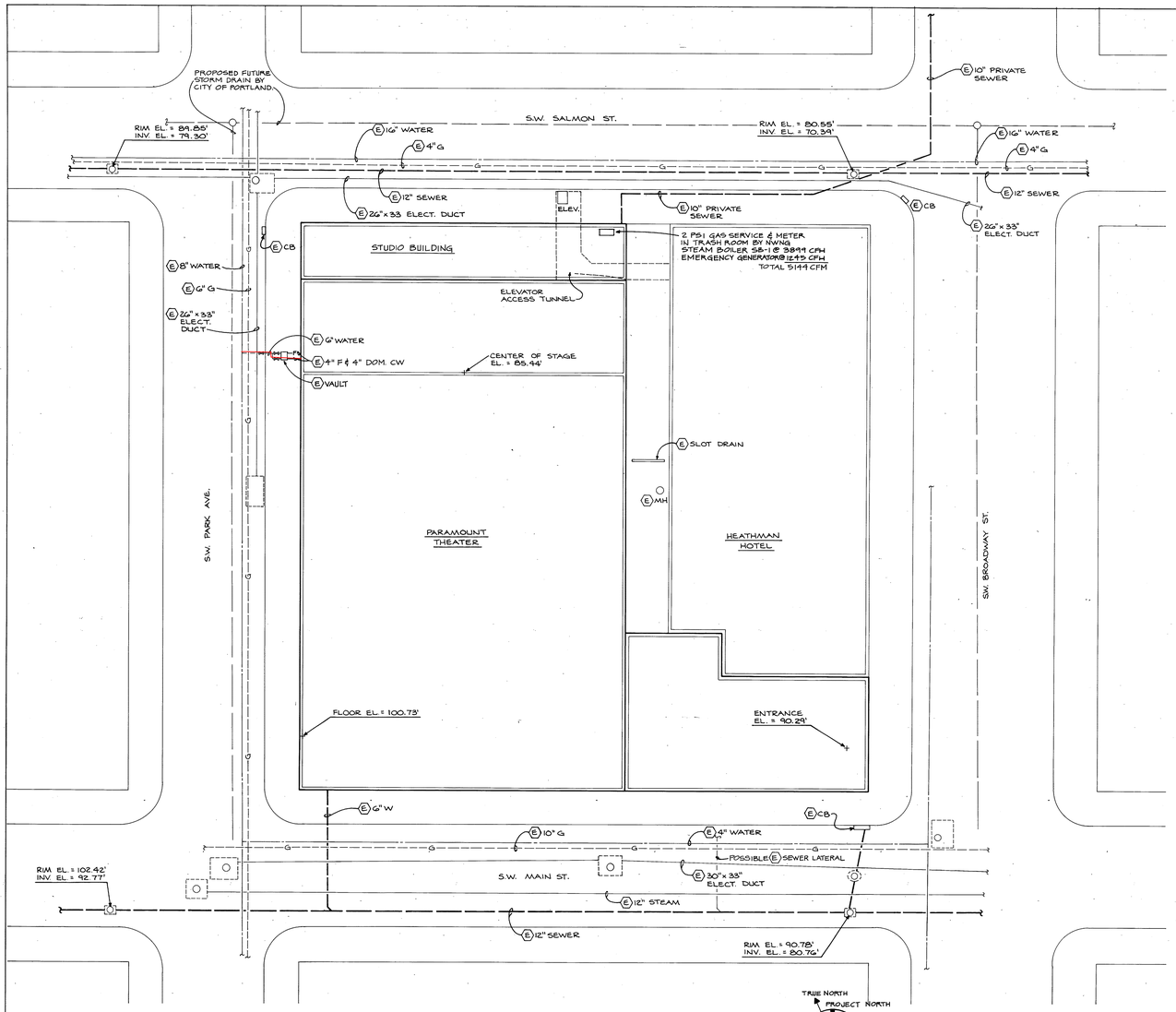
Sample: 421 Shower H | Collected: 5/26/21 12:02 | Temp: 15 °C | Matrix: Drinking Water
Lab ID: 21-005780-0026 | Received: 5/26/21 14:04 | Evidence of Cooling: Y

Method: SM9223BColilert

Analyte	Result	Limit	Units	LOQ	Dil.	Batch	Start/Extract	Analyzed	Notes
E. coli	Absent	Absent	/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	
Total Coliform	Absent		/100 mL		1.00	2104706	05/26/21 16:13	05/27/21 16:30	

Units of Measure
/100 mL = per 100 milliliter

Abbreviations
LOQ Limit of quantification



MECHANICAL SITE PLAN

1"=20'-0"

GENERAL NOTES

1. INFORMATION PERTAINING TO EXISTING HVAC EQUIPMENT, FIRE PROTECTION, AND PLUMBING PIPING, FIXTURES, ITEMS, ETC., SHOWN ON THESE DRAWINGS HAS BEEN TAKEN FROM C.W. & GEO. L. RAPP DRAWINGS DATED JAN. 29, 1927, AND SEVERAL SUPPLEMENT DRAWINGS, ALSO SOME FIELD INVESTIGATION.
2. THESE DRAWINGS DO NOT INDICATE ACCURATE PIPE ROUTING IN ALL AREAS. SOME CONCEALED DUCT AND PIPING RUNS & OTHER NON-VISIBLE ITEMS HAVE BEEN SHOWN IN AN ASSUMED LOCATION BUT NOT VERIFIED. THE CONTRACTOR WILL BE RESPONSIBLE FOR FIELD LOCATING ALL POINTS OF CONNECTION.
3. PRIOR TO INSTALLATION OF ANY NEW PIPING, CONTRACTOR SHALL EXPOSE ALL POINTS OF CONNECTION AND VERIFY EXACT SIZE, LOCATION, CONDITION, ELEVATION, & TYPE OF MATERIAL. HE SHALL DETERMINE THAT THE EXISTING PIPE IS THE CORRECT SIZE & THAT THE ELEVATION IS LOW ENOUGH TO ACHIEVE THE REQUIRED SLOPE BEFORE NEW PIPING IS CONNECTED; IF NOT, HE SHALL NOTIFY ARCHITECT AND NOT PROCEED WITH INSTALLATION UNTIL INSTRUCTED TO DO SO. SEE SPECIFICATIONS FOR PIPE TESTS AND CLEANING.
4. ALL EXISTING DUCTS AND PIPING WHICH ARE NO LONGER REQUIRED AND WHICH INTERFERE WITH CONSTRUCTION OR WILL BE EXPOSED SHALL BE REMOVED AND BE DISPOSED OF AS DIRECTED BY THE OWNER. IF IT IS CONCEALED AND/OR DOES NOT INTERFERE WITH CONSTRUCTION, IT MAY BE CAPPED AND ABANDONED IN PLACE. SEE SPECIFICATIONS. CAP ALL PIPING AS CLOSE TO MAIN AS POSSIBLE TO ELIMINATE DEAD END RUNS. LIMIT ALL NEW & EXISTING CAPPED DEAD END RUNS TO 2'-0" MAXIMUM FOR ALL SERVICES EXCEPT INACCESSIBLE BELOW GRADE WASTE PIPING.
5. ALL EXISTING MECHANICAL EQUIPMENT, FIRE PROTECTION ITEMS, PLUMBING FIXTURES, & APPURTENANCES WHICH ARE REMOVED AND NOT RELOCATED SHALL BE TURNED OVER TO THE OWNER. SEE SPECIFICATIONS & NOTE 9.
6. ALL EXISTING MECHANICAL EQUIPMENT, PLUMBING, AND FIRE PROTECTION ITEMS & APPURTENANCES WHICH ARE TO BE RELOCATED UNDER THIS CONTRACT SHALL BE COMPLETELY CLEANED AND INSPECTED. IF REPAIR IS REQUIRED TO PUT THEM IN A SATISFACTORY WORKING CONDITION, NOTIFY OWNER BEFORE REINSTALLING.
7. ALL INVERT ELEVATIONS, PIPE SIZES, LOCATIONS, AND DEVIATIONS FROM CONTRACT DRAWINGS, INCLUDING EXISTING, SHALL BE RECORDED ON AS-BUILT DRAWINGS.
8. ALL END OF PIPING RUN LAVATORIES, SINKS, AND DRINKING FOUNTAINS SHALL HAVE A WALL CLEANOUT BELOW FIXTURE.
9. REMOVE EXISTING FIXTURES, EQUIPMENT, AND ALL LOCAL RELATED PIPING, FITTINGS, AND APPURTENANCES WHERE INDICATED AND AS REQUIRED. CAP ALL SERVICE PIPING IN A CONCEALED LOCATION. SEE NOTE 4.
10. REFER TO ARCHITECTURAL DOCUMENTS FOR EXACT LOCATION AND HEIGHT OF ALL PLUMBING FIXTURES. COORDINATE WITH ALL OTHER TRADES.
11. PRIOR TO DISCONNECTING, REMOVING, OR CAPPING ANY EXISTING SERVICES, VERIFY THAT THEY DO NOT SERVE ANY EXISTING FIXTURES OR EQUIPMENT TO REMAIN AND THAT THEY ARE NOT REQUIRED FOR NEW FIXTURES OR EQUIPMENT. IF THEY DO, LEAVE SYSTEM INTACT OR WHERE POSSIBLE AND/OR TO SIMPLIFY OR CLEAN UP SYSTEM, CONNECT TO CLOSEST NEW SERVICES. RECORD ON AS-BUILT DRAWINGS.
12. PROVIDE & INSTALL SHUTOFF VALVES ON ALL BRANCH WATER PIPING SERVING FIXTURES AND/OR GROUPS OF FIXTURES OR EQUIPMENT. INSTALL IN LIFTOUT CEILING WHERE POSSIBLE, BEHIND CEILING OR WALL ACCESS PANELS WHERE LIFTOUT CEILING IS NOT AVAILABLE OR AS INDICATED ON THE DRAWINGS. COORDINATE WITH ARCHITECTURAL AND ALL OTHER TRADES.
13. BECAUSE OF THE SMALL SCALE OF THE DRAWINGS, IT IS NOT POSSIBLE TO INDICATE ALL OFFSETS, FITTINGS, VALVES, AND ACCESSORIES WHICH MAY BE REQUIRED. THE CONTRACTOR SHALL CAREFULLY INVESTIGATE THE CONDITIONS SURROUNDING THE INSTALLATION OF HIS WORK AND SHALL FURNISH THE NECESSARY FITTINGS, VALVES, TRAPS, ETC., WHICH MAY BE REQUIRED TO COMPLETE THE INSTALLATION IN A SATISFACTORY AND CODE APPROVED MANNER.
14. WHERE BRANCH PIPE SIZE IS NOT SHOWN ON DRAWINGS, REFER TO FIXTURE ROUGH-IN SCHEDULE FOR REQUIRED PIPE SIZE.
15. IF ANY EXISTING RISERS OR SERVICE PIPING STILL REQUIRED TO REMAIN IN SERVICE AND WHICH INTERFERES WITH NEW CONSTRUCTION IS ENCOUNTERED DURING REMODEL WORK, THE CONTRACTOR SHALL RELOCATE TO THE NEAREST ACCEPTABLE LOCATION AND RECONNECT.
16. ALL ORIGINAL INSULATION IS ASSUMED TO BE ASBESTOS TYPE. SEE SPECIFICATIONS FOR SPECIAL CONDITIONS SURROUNDING ITS HANDLING.
17. THE RECORD DRAWINGS DO NOT INDICATE THE RAIN DRAIN/STORM DRAIN ROUTING FROM BASEMENT RISER LOCATIONS TO OUTSIDE OF BUILDING. THE CONTRACTOR SHALL FIELD INVESTIGATE AND WHERE POSSIBLE, DETERMINE WHERE RAIN DRAINS EXIT BUILDING AND RECORD ON AS-BUILT DRAWINGS. IF IT IS FOUND THAT ANY RAIN DRAINS CONNECT TO SANITARY SEWER EITHER WITHIN OR OUTSIDE BUILDING, HE SHALL REPORT THIS INFORMATION TO THE ARCHITECT AND ENGINEER.
18. A NEW CODE APPROVED VALVE, RACK, HOSE, NOZZLE, AND APPURTENANCES SHALL BE INSTALLED IN ALL EXISTING FIRE HOSE CABINETS TO BE RELOCATED OR TO REMAIN.
19. ALL FIRE SPRINKLER HEADS HAVE NOT BEEN SHOWN OR SCHEDULED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE AND INSTALL A COMPLETE FIRE SPRINKLER SYSTEM IN ALL PORTIONS OF THE BUILDING EXCEPT AUDITORIUM AND OTHER AREAS THE FIRE MARSHAL HAS EXEMPTED.
20. ALL FIRE PROTECTION WITHIN THE BUILDING WHICH IS SERVED BY THE DOMESTIC WATER SERVICE INCLUDING REWORKING EXISTING FIRE HOSE CABINETS SHALL BE THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR.
21. WHERE NEW OR RELOCATED DIFFUSERS OR GRILLES ARE SHOWN, REFER TO ARCHITECTURAL CEILING PLANS & ELEVATIONS FOR THEIR EXACT LOCATION.
22. ALL ELEVATIONS SHOWN ON THESE DRAWINGS MAY BE APPROXIMATE, SEE ARCHITECTURAL DRAWING FOR ACTUAL ELEVATIONS.

LEGEND

LPS	LPS	LOW PRESSURE STEAM SUPPLY
LPR	LPR	LOW PRESSURE CONDENSATE RETURN
HWS	HWS	HEATING WATER SUPPLY
HWR	HWR	HEATING WATER RETURN
CWS	CWS	CHILLED WATER SUPPLY
CWR	CWR	CHILLED WATER RETURN
CLW	CLW	CONDENSER LEAVING WATER
CRW	CRW	CONDENSER RETURN WATER
RRV	RRV	REFRIGERANT RELIEF VENT
RL	RL	REFRIGERANT LIQUID
RS	RS	REFRIGERANT SUCTION
CD	CD	CONDENSATE DRAIN
W	W	SANITARY SOIL OR WASTE ABOVE FLOOR
W	W	SANITARY SOIL OR WASTE BELOW FLOOR OR GRADE
SD	SD	STORM DRAIN ABOVE FLOOR
SD	SD	STORM DRAIN BELOW FLOOR OR GRADE
OSD	OSD	OVERFLOW STORM DRAIN ABOVE FLOOR
V	V	VENT
CW	CW	COLD WATER
PCW	PCW	PROCESS COLD WATER
HW	HW	HOT WATER
RHW	RECIRCULATED HOT WATER	
F	F	FIRE PROTECTION (WET)
FS	FS	FIRE PROTECTION (SPRINKLER FROM FCS)
DP	DP	FIRE PROTECTION (DRY)
WSP	WSP	WET STANDPIPE (CLASS II FROM DOMESTIC WATER)
CSP	CSP	COMBINATION STANDPIPE
MG	MG	NATURAL GAS (MEDIUM PRESSURE - 2 PSI)
G	G	NATURAL GAS (LOW PRESSURE - 11" W.C.)
V(G)	V(G)	VENT (GAS)
		REMOVE EXISTING PIPING OR ABANDON IN PLACE.
OS&Y	OS&Y	OUTSIDE SCREW AND YOKE VALVE
OS&Y/TS	OS&Y VALVE WITH TAMPER SWITCH	
GV	GV	GATE VALVE
GLV	GLV	GLOBE VALVE
BV	BV	BALL VALVE
GC	GC	GAS COCK
CKV	CKV	CHECK VALVE
BFV	BFV	BUTTERFLY VALVE
BAL	BAL	BALANCING FITTING
FCV	FCV	FLOW CONTROL VALVE
MV	MV	TWO-WAY MOTORIZED VALVE
MV	MV	THREE-WAY MOTORIZED VALVE
MV	MV	MOTORIZED BUTTERFLY VALVE
PRV	PRV	PRESSURE REDUCING VALVE
RV	RV	PRESSURE RELIEF VALVE
WH	WH	WALL HYDRANT
DV	DV	HOSE END DRAIN VALVE
HB	HB	HOSE BIBB
AV	AV	AIR VENT
VB	VB	VACUUM BREAKER
WHA	WHA	WATER HAMMER ARRESTOR (SIZE C)
STR	STR	STRAINER WITH HOSE END DRAIN VALVE
		PIPE ANCHOR
		FLEXIBLE CONNECTOR
		UNION, FLANGE
		PIPE REDUCER
		SPRINKLER HEAD - UPRIGHT, PENDENT, RECESSED & FLUSH
		SPRINKLER HEAD - SIDEWALL & PENDENT SIDEWALL
		PRESSURE GAGE WITH GAGE COCK
		GAGE COCK
		THERMOMETER
FS	FS	FLOW SWITCH
		IMMERSION THERMOSTAT
		PITCHED DOWN
PTT	PRESSURE TEMPERATURE TAP	
		DIRECTION OF FLOW
		VALVE IN RISER
		CAP OR PLUG
CTG	CTG	CLEANOUT TO GRADE
FCO	FCO	FLOOR CLEANOUT
WCO	WCO	WALL CLEANOUT
CO	CO	CLEANOUT
TPV	TPV	TRAP PRIMER VALVE
GPR	GPR	GAS PRESSURE
		AIR FLOW DIRECTION
		SUPPLY OR OSA DUCT SECTION ROUND, RECTANGULAR
		RETURN OR EXHAUST DUCT SECTION ROUND, RECTANGULAR
		INTERNALLY INSULATED DUCT DOUBLE LINE, SINGLE LINE
		FLEXIBLE EQUIPMENT CONNECTION
FLD	FLD	FUSIBLE LINK DAMPER DOUBLE LINE, SINGLE LINE
B	B	BUTTERFLY VOLUME DAMPER DOUBLE LINE, SINGLE LINE
		DUCT LAGGING DOUBLE LINE

HX	HEAT EXCHANGER
SHB	STEAM HEATING BOILER
ET	EXPANSION TANK
WCU	WATER CHILLER UNIT
HWP	HEATING WATER PUMP
CWP	CHILLED WATER PUMP
CDP	CONDENSER WATER PUMP
CCC	CLOSED CIRCUIT COOLER
ACCU	AIR COOLED CONDENSING UNIT
ASU	AIR SUPPLY UNIT
ACU	AIR CONDITIONING UNIT
SF	SUPPLY FAN
RF	RETURN FAN
EF	EXHAUST FAN
REF	ROOF EXHAUST FAN
RC	RELIEF CAP
RDR	STEAM RADIATOR
CV	CONVECTOR
CUH	CABINET UNIT HEATER
UH	UNIT HEATER
BHC	BOOSTER HEATING COIL
HC	HEATING COIL
CC	COOLING COIL
OSA	OUTSIDE AIR
AUD	AUTOMATIC DAMPER
OAD	OUTSIDE AIR DAMPER
RAD	RETURN AIR DAMPER
EAD	EXHAUST AIR DAMPER
SMD	SMOKE DAMPER
6Φ	ROUND DUCT DIAMETER, INCHES
32x14	RECTANGULAR DUCT SIZE, INCHES
CS	CEILING SUPPLY DIFFUSER
CR	CEILING RETURN GRILLE
CE	CEILING EXHAUST GRILLE
HS	HIGH SUPPLY GRILLE
HR	HIGH RETURN GRILLE
HE	HIGH EXHAUST GRILLE
LS	LOW SUPPLY GRILLE
LR	LOW RETURN GRILLE
LCS	LINEAR CEILING SUPPLY DIFFUSER
WG	WALL GRILLE
SMB	STARTER MOUNTING BOARD (SEE ELECT.)
DDCU	DIRECT DIGITAL CONTROL UNIT
MCC	MOTOR CONTROL CENTER (SEE ELECT.)
T	ROOM THERMOSTAT OR SENSOR
302	ZONE AIR DUCT
N.O.	NORMALLY OPEN
N.C.	NORMALLY CLOSED
D.A.	DIRECT ACTING
R.A.	REVERSE ACTING
P.E.	PNEUMATIC - ELECTRIC
SAV	SOLENOID AIR VALVE
NLL	NIGHT LOW LIMIT
WC	WATER CLOSET
U	URINAL
L	LAVATORY
S	SINK
SS	SERVICE SINK
MS	MOP SINK
SHR	SHOWER
DF	DRINKING FOUNTAIN
EWH	ELECTRIC WATER HEATER
RHWP	RECIRCULATING HOT WATER PUMP
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
DCA	DOUBLE CHECK VALVE ASSEMBLY
DDCA	DOUBLE DETECTOR CHECK VALVE ASSEMBLY
FCS	FLOOR CONTROL STATION (FIRE SPRINKLER)
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE REEL
FHV	FIRE HOSE VALVE
FDC	FIRE DEPARTMENT CONNECTION
FD	FLOOR DRAIN
SHD	SHOWER DRAIN
DS	DOWNSPOUT
RD	ROOF DRAIN
ORD	OVERFLOW ROOF DRAIN
VTR	VENT THROUGH ROOF
CIP	CAST IRON PIPE
I.E.	INVERT ELEVATION
EL	ELEVATION
FF	FINISHED FLOOR
NIM	NOT IN MECHANICAL - SPECIFIED UNDER ANOTHER DIVISION
A	ACCESS DOOR
C	CONNECT TO EXISTING
E	EXISTING TO REMAIN
K	CAP OR PLUG
N	NEW
R	RELOCATE EXISTING
T	THROUGH TRUSS WEB
W	LOCATE IN WALL SPACE
X	REMOVE EXISTING
	NEW PLUMBING FIXTURE
	REMOVE EXISTING FIXTURE, EQUIPMENT OR ITEM.

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REGISTERED PROFESSIONAL ENGINEER OREGON JULY 9, 1987 ROBERT G. MANFULL

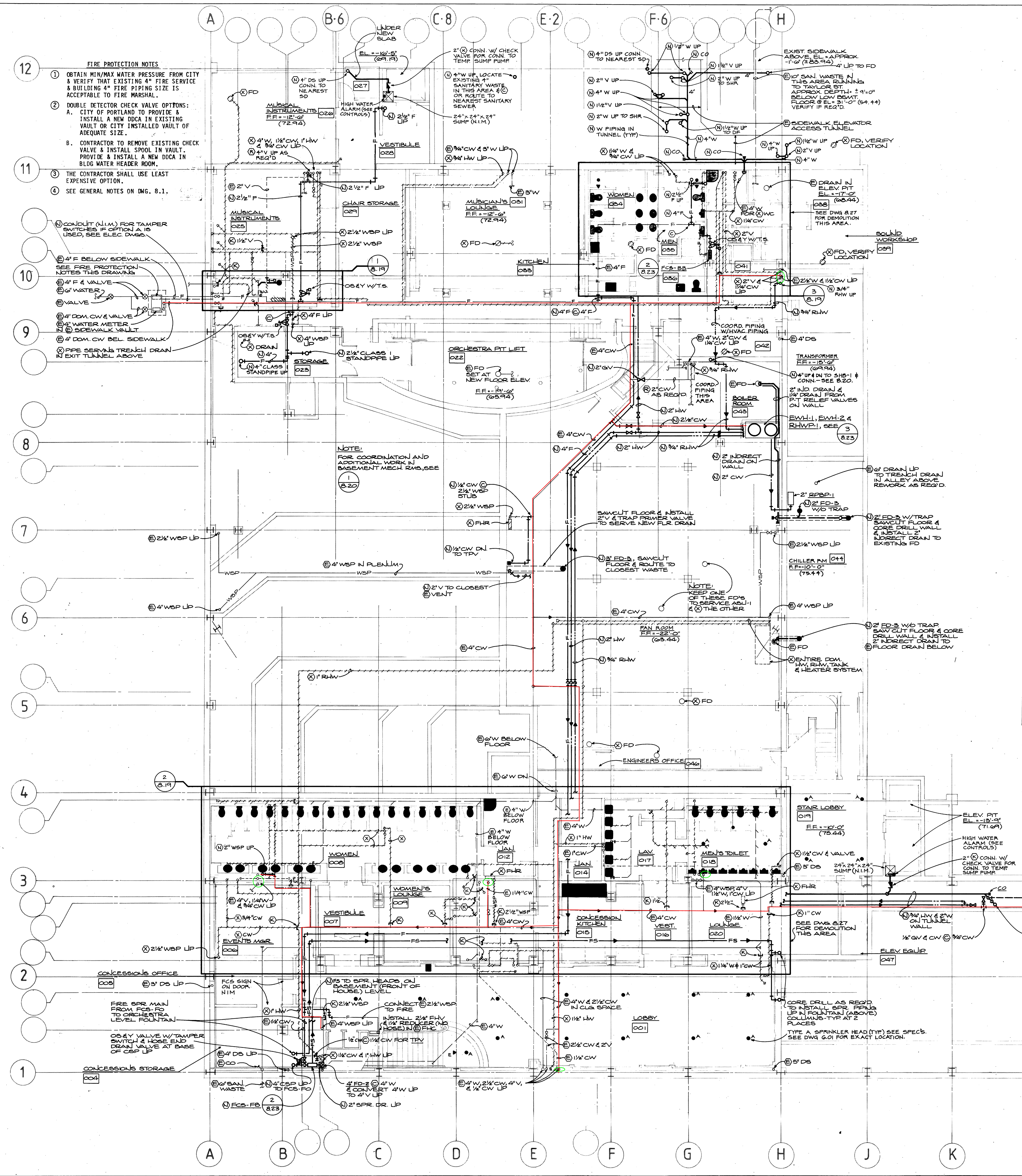
1993-20

SITE PLAN AND LEGEND

Job No.	Date JULY 15, 1993
Set No.	Sheet No. 8.1

FIRE PROTECTION NOTES

1. OBTAIN MIN/MAX WATER PRESSURE FROM CITY & VERIFY THAT EXISTING 4" FIRE SERVICE & BUILDING 4" FIRE PIPING SIZE IS ACCEPTABLE TO FIRE MARSHAL.
2. DOUBLE DETECTOR CHECK VALVE OPTIONS:
   A. CITY OF PORTLAND TO PROVIDE & INSTALL A NEW DDCA IN EXISTING VAULT OR CITY INSTALLED VAULT OF ADEQUATE SIZE.
   B. CONTRACTOR TO REMOVE EXISTING CHECK VALVE & INSTALL SPOOL IN VAULT. PROVIDE & INSTALL A NEW DDCA IN BLDG WATER HEADER ROOM.
3. THE CONTRACTOR SHALL USE LEAST EXPENSIVE OPTION.
4. SEE GENERAL NOTES ON DWG. 8.1.



PLUMBING FIXTURE SCHEDULE

SYM.	FIXTURE	MIN. ROUGH-IN SIZES (INCHES) W	V	TRAP	CW	HW	REMARKS/DESCRIPTION
WC-1	WATER CLOSET	4	2	INT	1-1/4	-	WALL HUNG, FLUSH VALVE, STD. HT.
WC-2	WATER CLOSET	4	2	INT	1-1/4	-	WALL HUNG, FLUSH VALVE, HANDICAP HT.
WC-3	WATER CLOSET	4	2	INT	3/4	-	FLOOR STANDING, FLUSH TANK, STD. HT.
WC-4	WATER CLOSET	4	2	INT	3/4	-	FLOOR STANDING, FLUSH TANK, HANDICAP HT.
U-1	URINAL	2	1-1/2	INT	1	-	WALL HUNG, STALL TYPE, FLUSH VALVE, SIPHON JET, STD. HT.
U-2	URINAL	2	1-1/2	INT	1-1/4	-	WALL HUNG, FLUSH VALVE, SIPHON JET, HANDICAP HT.
U-3	URINAL	2	1-1/2	INT	1	-	WALL HUNG, STALL TYPE, FLUSH VALVE, WASHOUT, STD. HT.
L-1	LAVATORY	1-1/2	1-1/4	1-1/4	1/2	1/2	WALL HUNG, METERING FAUCET
L-2	LAVATORY	1-1/2	1-1/4	1-1/4	1/2	1/2	WALL HUNG, SINGLE LEVER, * HDCP W/INSULATED TRAP & HW
L-3	LAVATORY	1-1/2	1-1/4	1-1/4	1/2	1/2	UNDER CNTR MTD, OVAL, METERING FAUCET
L-4	LAVATORY	1-1/2	1-1/4	1-1/4	1/2	1/2	UNDER CNTR. SINGLE LEVER, INSULATE TRAP & HW, HANDICAP
L-5	LAVATORY	1-1/2	1-1/4	1-1/4	1/2	1/2	CNTR TOP, OVAL, RIM MTD, SINGLE LEVER, * HDCP W/INSULATED TRAP & HW
L-6	LAVATORY	1-1/2	1-1/4	1-1/4	1/2	SEE REMKS	WALL HUNG W/INST. H.W. & INTEGRAL MIXING FAUCET.
S-1	SINK	2	1-1/2	1-1/2	1/2	1/2	COUNTER TOP, ST. STL, SINGLE COMP, SINGLE LEVER, SWING SPOUT
S-2	SINK	2	1-1/2	1-1/2	1/2	1/2.	SCULLERY TYPE ST. STL, 3-COMP, 2 SWING SPOUT FAUCETS
SS-1	SERVICE SINK	3	2	3	1/2	1/2	WALL HUNG, TRAP STD MTD, ENAMEL CAST IRON
MS-1	MOP SINK	3	2	3	1/2	1/2	FLOOR SET, ENAMEL CAST IRON
SHR-1	SHOWER	2	1-1/2	2	1/2	1/2	THERMOSTATIC/PRESS. BAL. VALVE, ARM, HEAD
SHR-2	SHOWER	2	1-1/2	2	1/2	1/2	THERMOSTATIC/PRESS. BAL. VALVE, SLIDE ROD, HAND HELD SPRAY, HDCP.
DF-1	DRINKING FOUNTAIN	1-1/2	1-1/4	1-1/4	1/2	-	NON-REFRIGERATED, WALL MTD, HANDICAP
DF-2	DRINKING FOUNTAIN	1-1/2	1-1/4	1-1/4	1/2	-	NON-REFRIGERATED, WALL MTD, HANDICAP
EXDF-1	EXISTING DRINKING FOUNTAIN	1-1/2	1-1/4	AS REQD.	1/2	-	MODIFY EXISTING TERRA COTTA FOUNTAIN. DETAILS TO FOLLOW.
FD-1	FLOOR DRAIN	SEE	DWGS		-	-	6" ROUND NICKEL BRONZE GRATE
FD-2	FLOOR DRAIN	SEE	DWGS		-	-	ROUND HINGED GRATE
FD-3	FLOOR DRAIN	SEE	DWGS		-	-	8" ROUND CAST IRON GRATE
SHD-1	SHOWER DRAIN	2	1-1/2	2	-	-	5" ROUND NICKEL BRONZE GRATE

NOTE:
MIN. ROUGH-IN SIZE REFERS TO SUPPLY OR WASTE PIPE TO ROUGH-IN POINT.
FIXTURE CONNECTION SIZE AS REQUIRED BY CODE OR MANUFACTURER.

MISC. EQUIPMENT SCHEDULE

ITEM	DESCRIPTION
EWH-1 & EWH-2	119 GAL. STORAGE TANK, 18 KW, 105 GPH REC @ 70 DEG TEMP RISE SET @ 110 DEG F MAX OUTLET WATER. BASIS OF DESIGN: A.O. SMITH DSE-120.
RHWP-1	INLINE TYPE, 1", 10 GPM @ 15 FT. HD., 1/6 HP, 120V, 1 PHASE. BASIS OF DESIGN: BELL & GOSSETT SERIES PR.
RPBP-1	REDUCED PRESSURE TYPE, 2", MAX PRESS LOSS 10 PSI @ 120 GPM. BASIS OF DESIGN: FEBCO 2" 825Y W/AGD.
DCA-1	DOUBLE CHECK TYPE, 4", MAX PRESS LOSS 4 PSI @ 180 GPM. BASIS OF DESIGN: FEBCO 4" 805.
GPR-1	3899 CFH, 2 PSI INLET, 5" TO 9" W.C. OUT, 2" SIZE. BASIS OF DESIGN: FISHER SERIES S200.
GPR-2	1245 CFH, 2 PSI INLET, 5" TO 9" W.C. OUT, 1-1/2" SIZE. BASIS OF DESIGN: FISHER SERIES S200.

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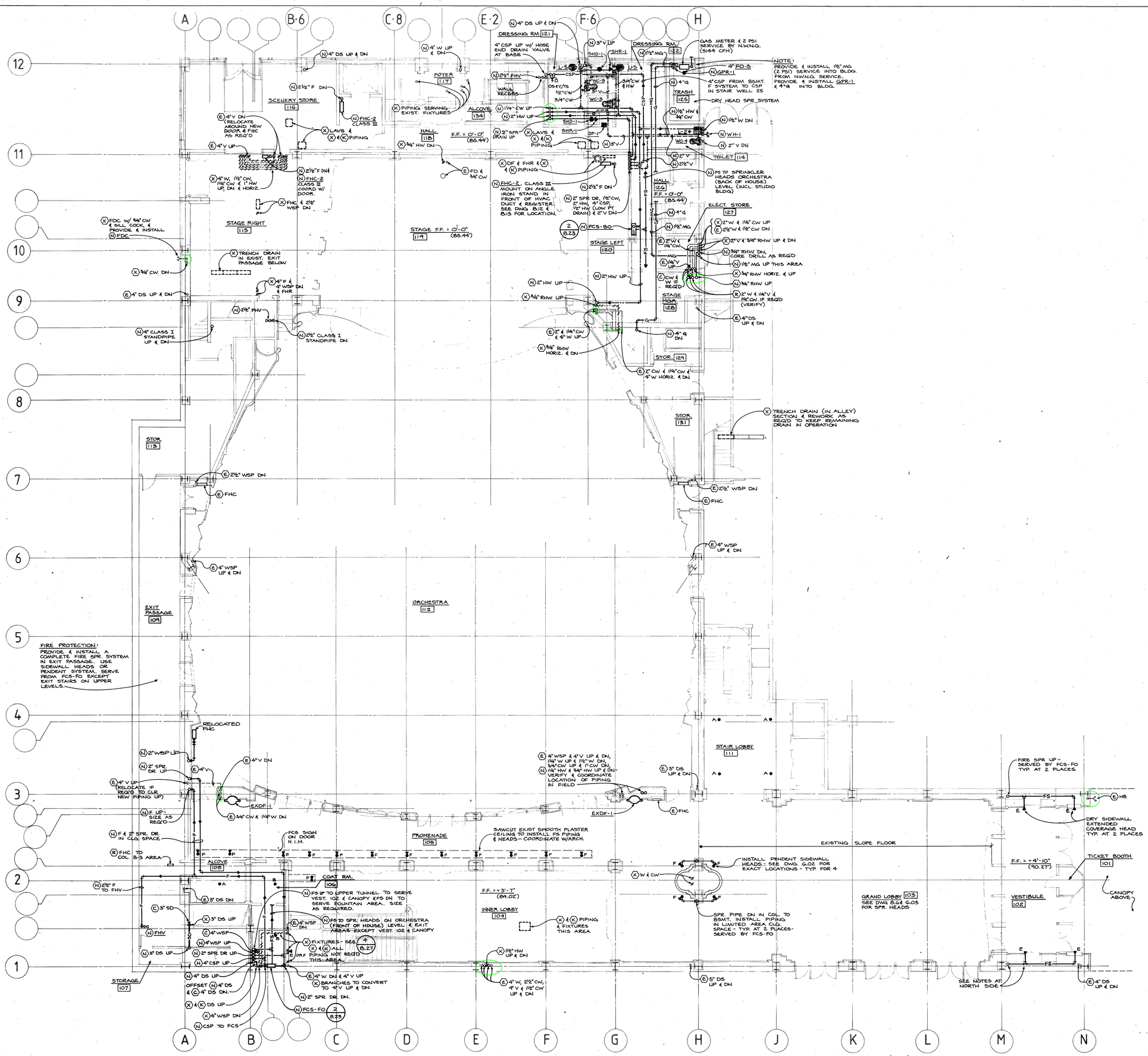
REGISTERED PROFESSIONAL ENGINEER 4916 OREGON JULY 9, 1962 ROBERT G. MANFULL
1693-20

BASEMENT PLAN PLBG. & F.P.

Job No.	Date JULY 18, 1983
Set No.	Sheet No. 8.2

4.01
5-16-83



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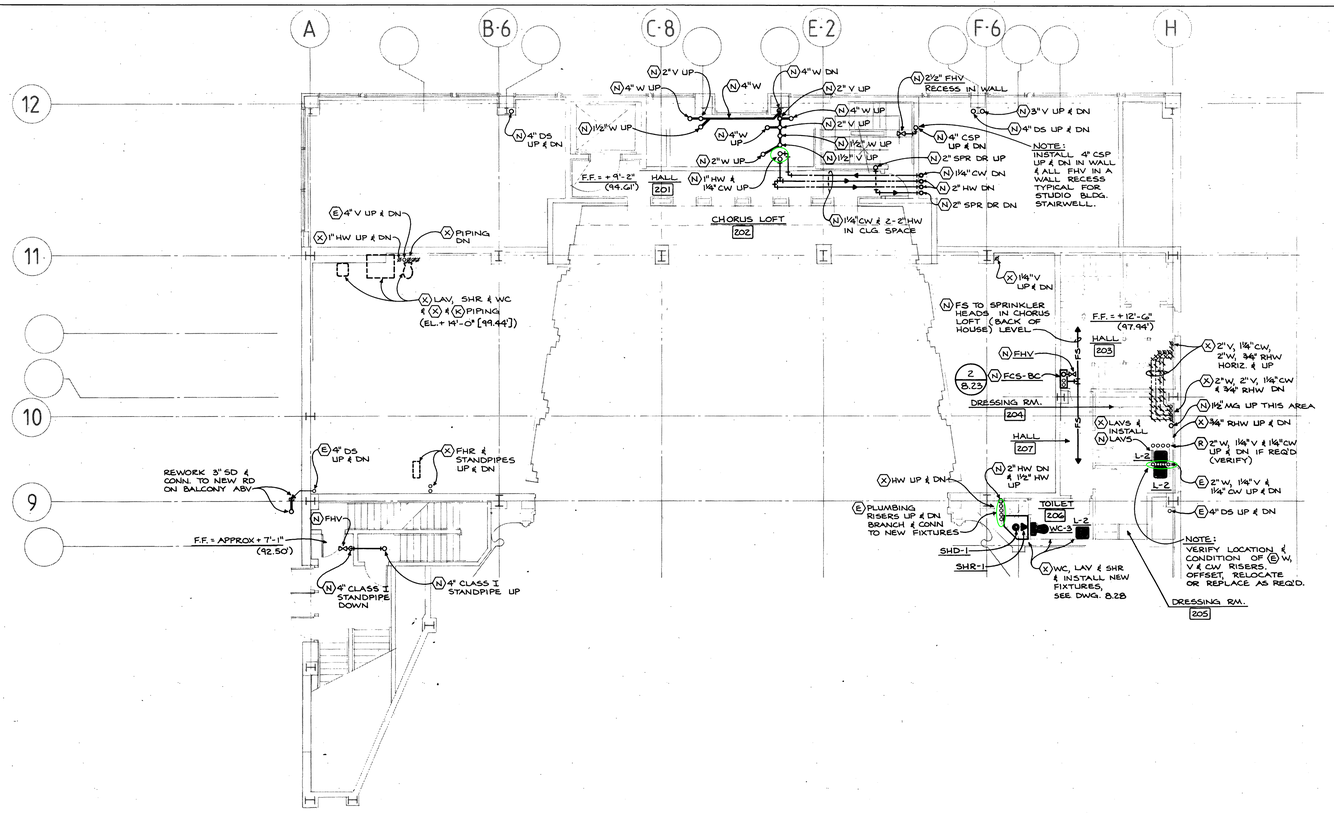
REGISTERED PROFESSIONAL ENGINEER 4010 OREGON JULY 9, 1948 ROBERT G. MANFULL

1693-20

ORCHESTRA PLAN PLBG. & F.P.

Job No.	Date
	JULY 18, 1985
Set No.	Sheet No.
	8.3

4.02.
11.85



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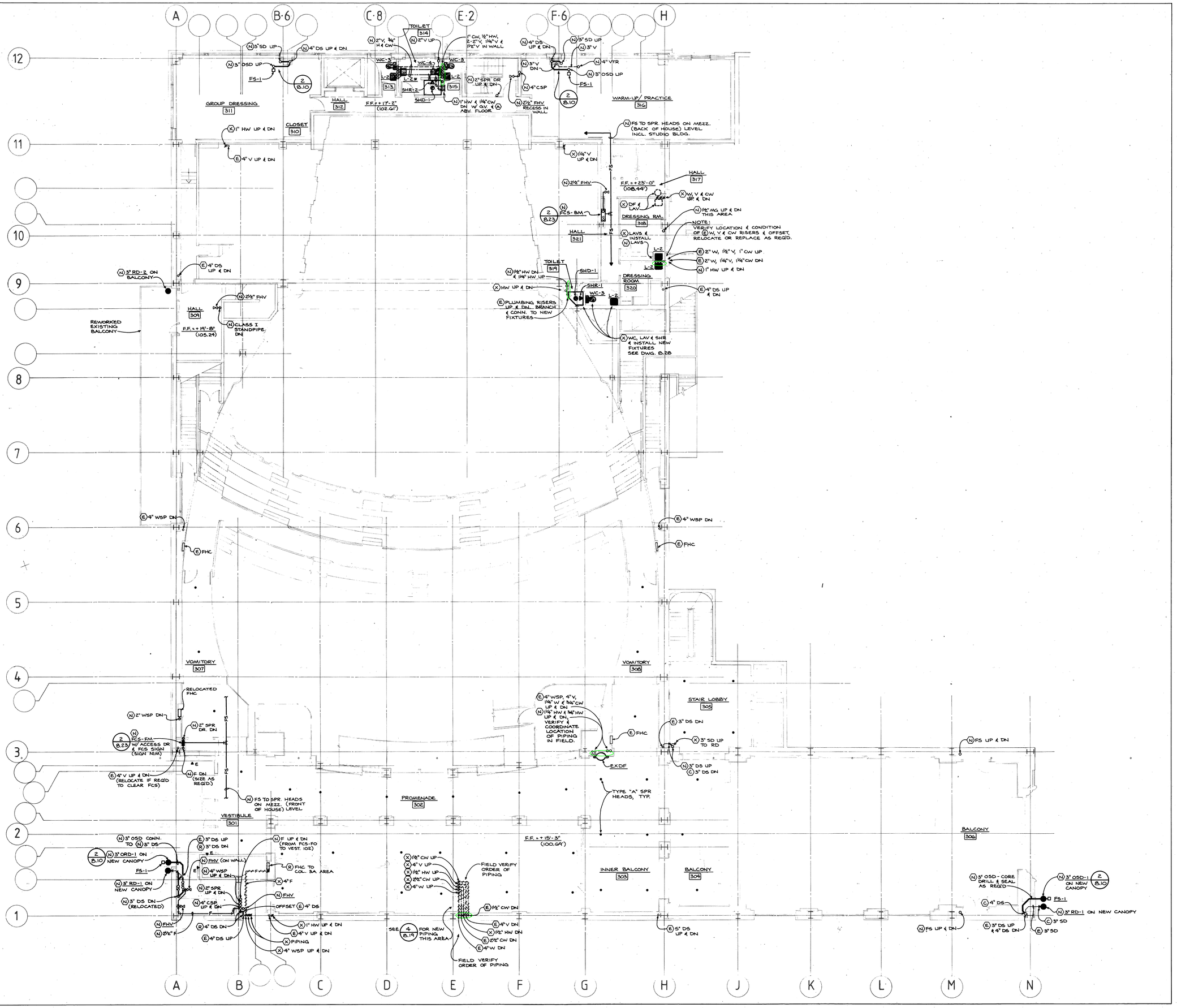
REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1957 ROBERT G. MANFULL

1693-20

CHORUS LOFT PLAN PLBG. & F.P.

Job No.	Date JULY 15, 1983
Set No.	Sheet No. 8.4



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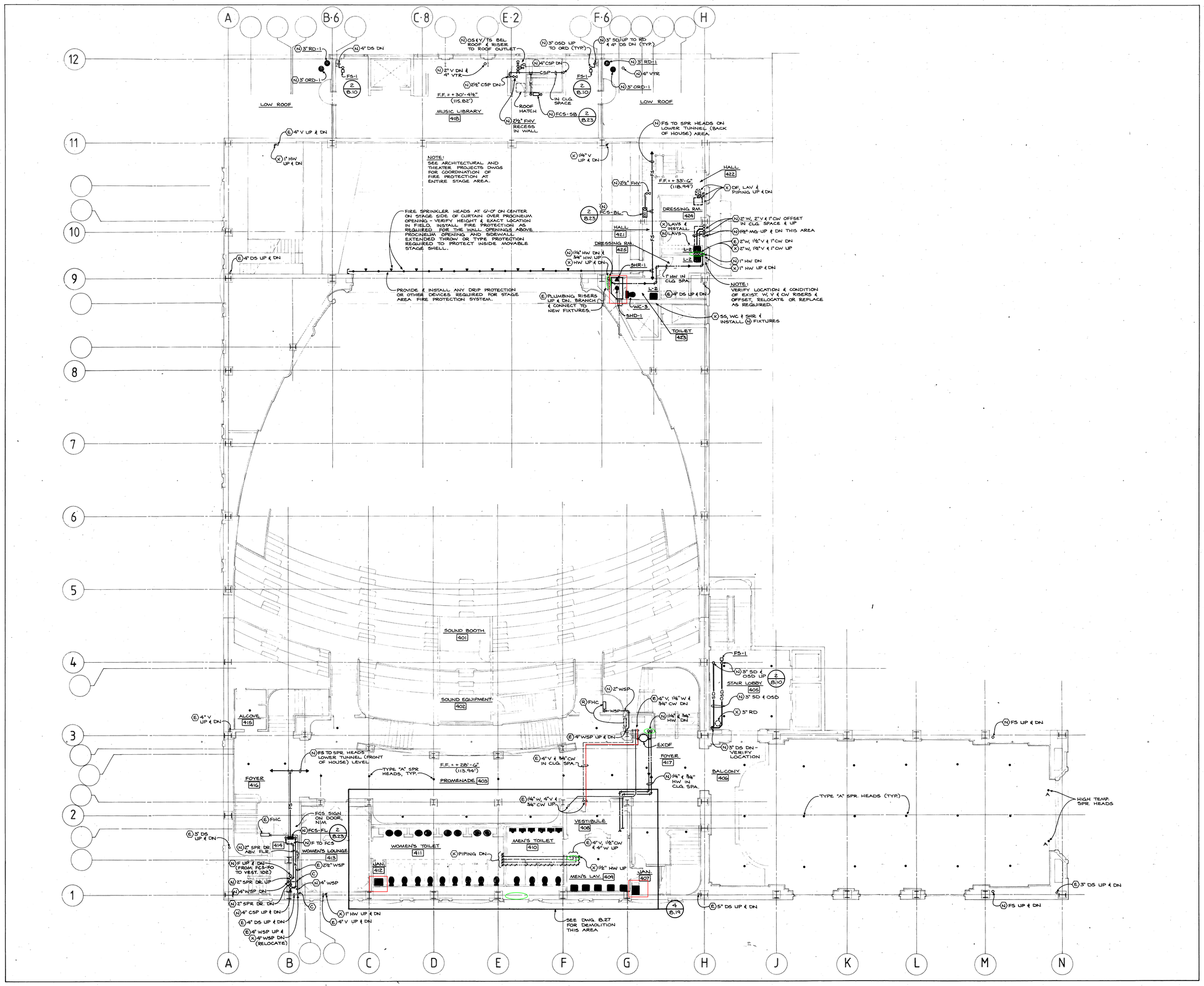
REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 9, 1969
ROBERT G. MAHRLL
1093-20

MEZZANINE PLAN PLBG. & F.P.

Job No.	Date JULY 18, 1985
Set No.	Sheet No. 8.5



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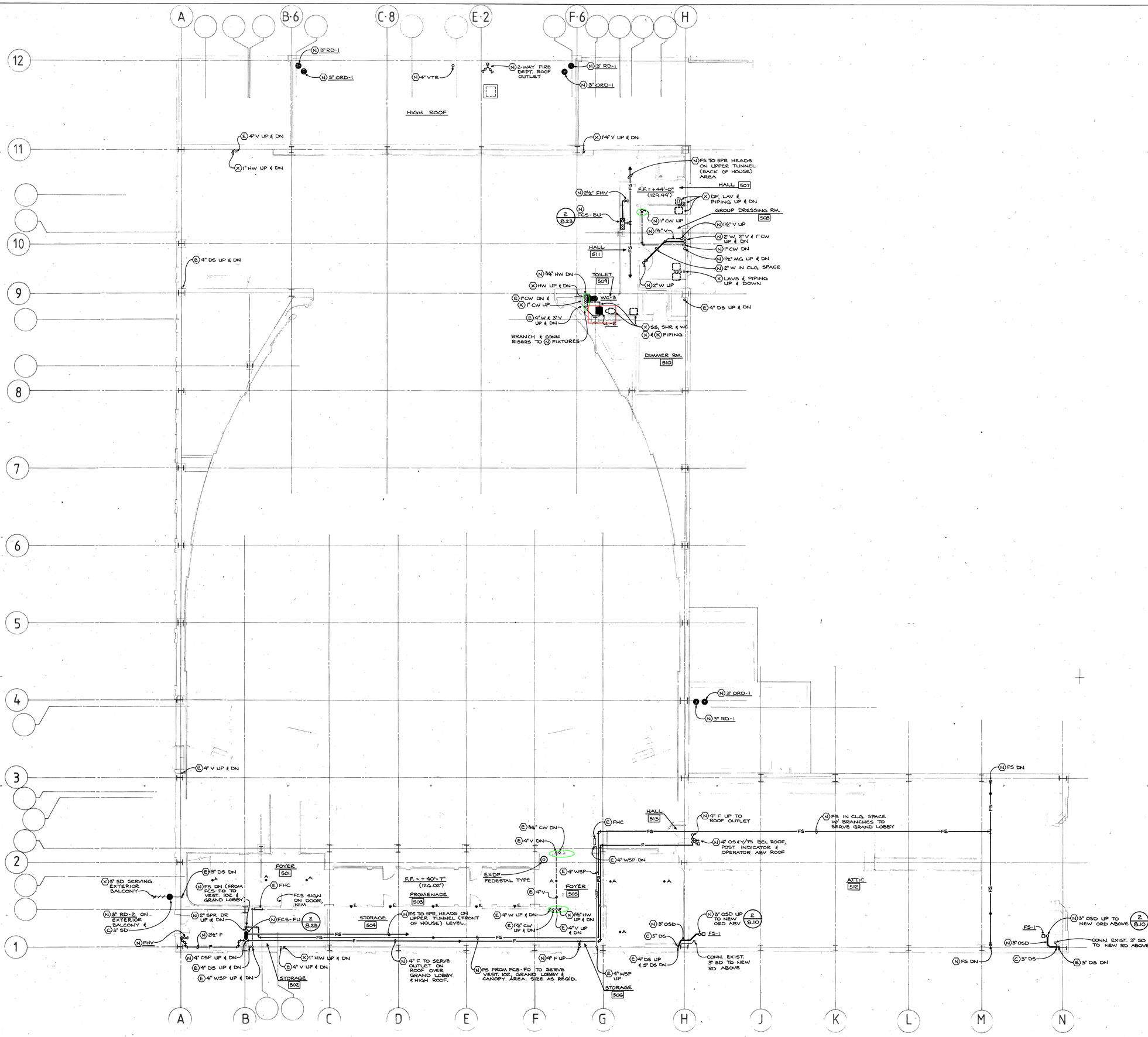
REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1985 ROBERT G. MANFULL

1693-20

LOWER TUNNEL PLAN PLBG. & F.P.

Job No.	Date
	JULY 18, 1985
Set No.	Sheet No.
	8.6

4.05



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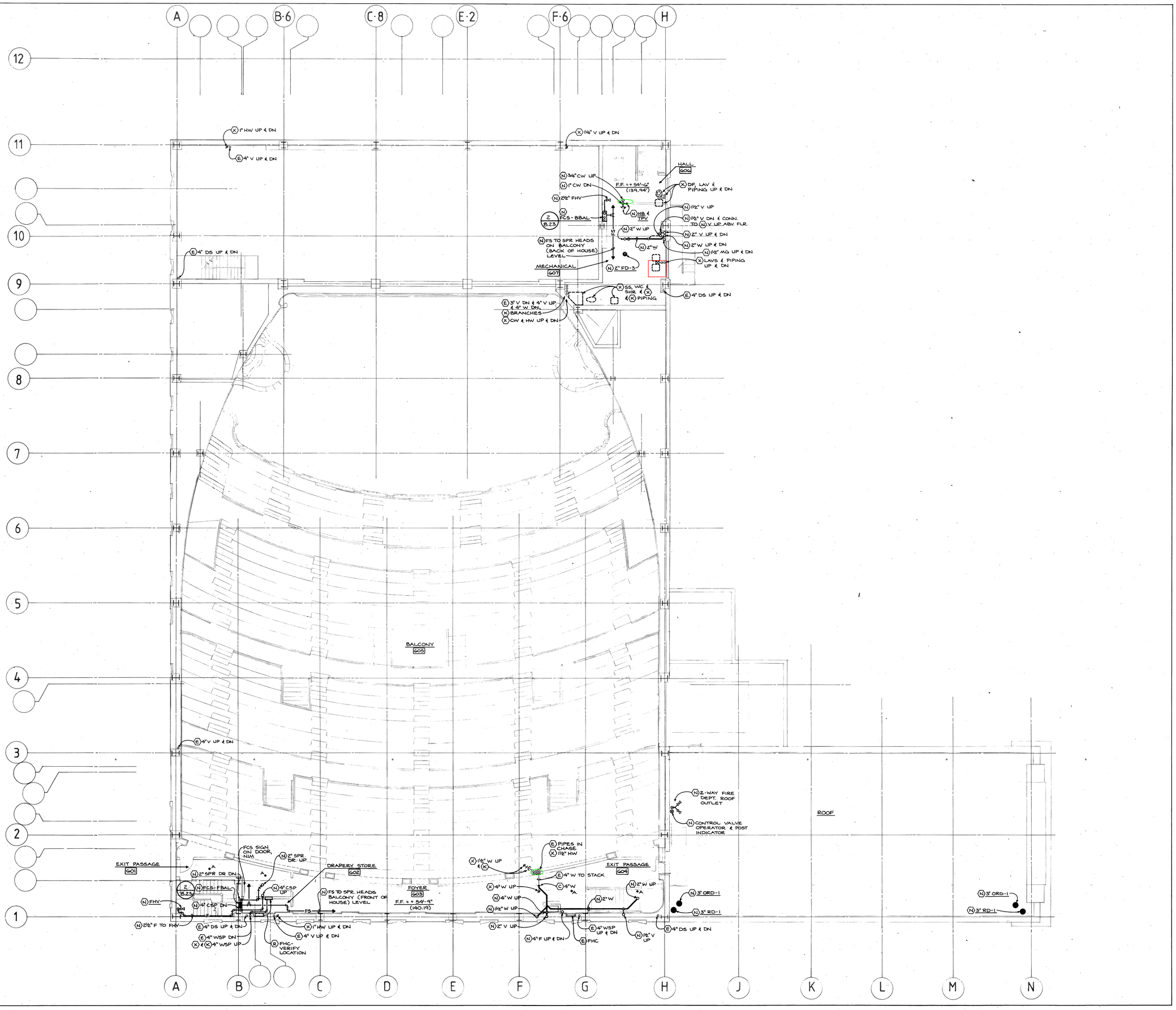
REGISTERED PROFESSIONAL ENGINEER OREGON JULY 9, 1948 ROBERT G. MANFULL

1693-20

UPPER TUNNEL PLAN PLBG. & F.P.

Job No.	Date
	July 15, 1983
Set No.	Sheet No.
	8.7



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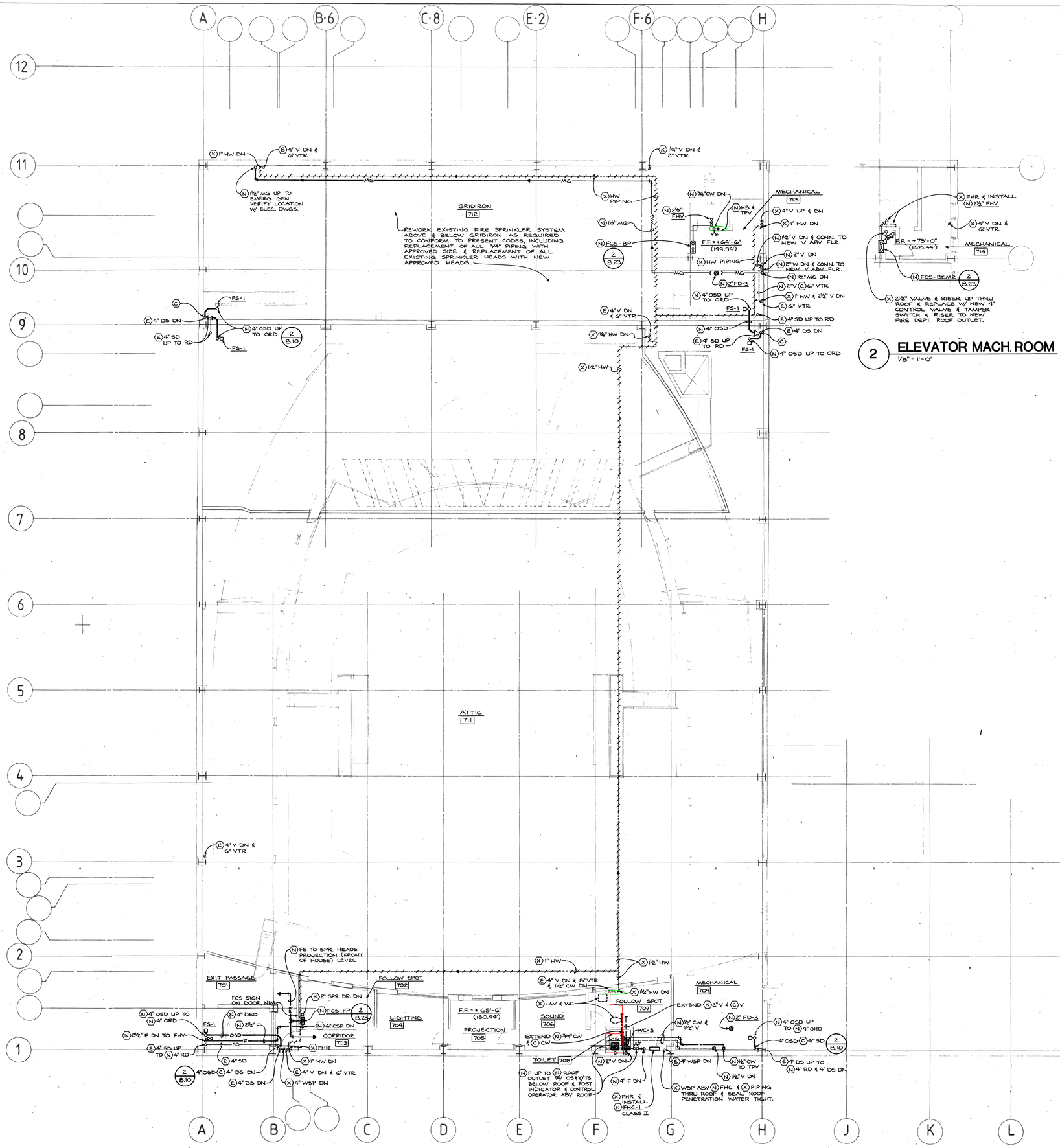
REGISTERED PROFESSIONAL ENGINEER OREGON JULY 9, 1969 ROBERT G. MANFULL

1693-20

BALCONY PLAN PLBG. & F.P.

Job No.	Date
	JULY 18, 1983
Set No.	Sheet No.
	8.8

4.07
E-6-83



2 ELEVATOR MACH. ROOM
1/8" = 1'-0"

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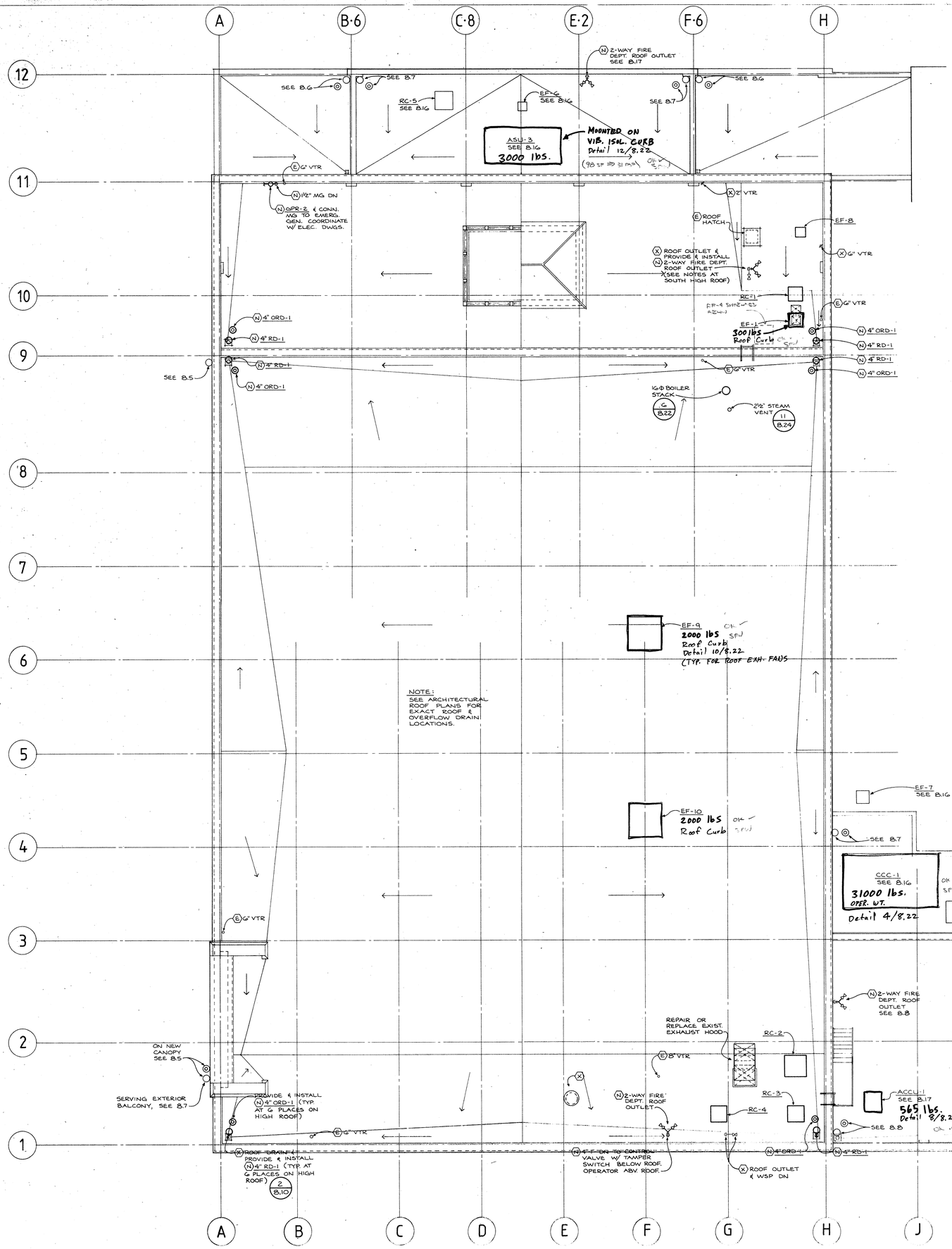
REGISTERED PROFESSIONAL ENGINEER 4916 OREGON JULY 9, 1988 ROBERT E. MANFULL

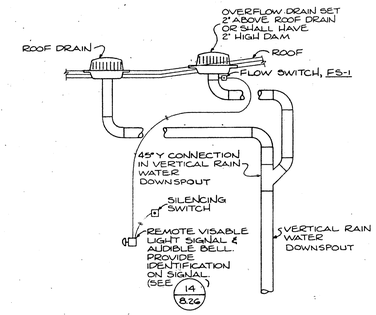
1695-20

PROJECTION LEVEL PLAN PLBG. & F.P.

Job No.	Date JULY 18, 1988
Set No.	Sheet No. 8.9

4.08
5-1-89





2 DETAIL – OVERFLOW DRAIN
NO SCALE

REVIEWED FOR CONFORMANCE WITH ORIGINAL PERFORMANCE BASIS SEE NEW STRUCTURAL CALCULATIONS
SPW = LJE 1-26-84
CH2M Hill Inc

REGISTERED PROFESSIONAL ENGINEER 2016 OREGON JULY 9, 1982 ROBERT G. MANFULL

1693-20

Portland Performing Arts Center

ROOF PLAN MECHANICAL

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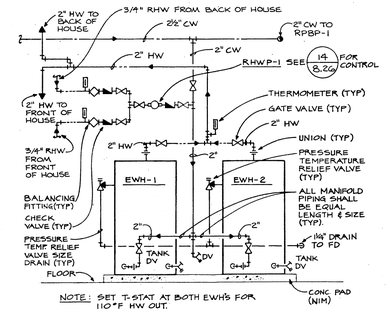
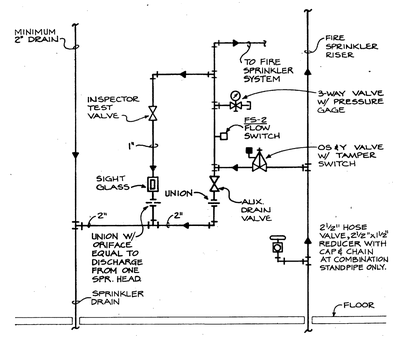
Barton Myers
Theatre Projects Inc
R. Lawrence Kirkegaard & Associates
Interface Engineering Inc
C.W. Emmer & Associates
CH2M Hill

8.10

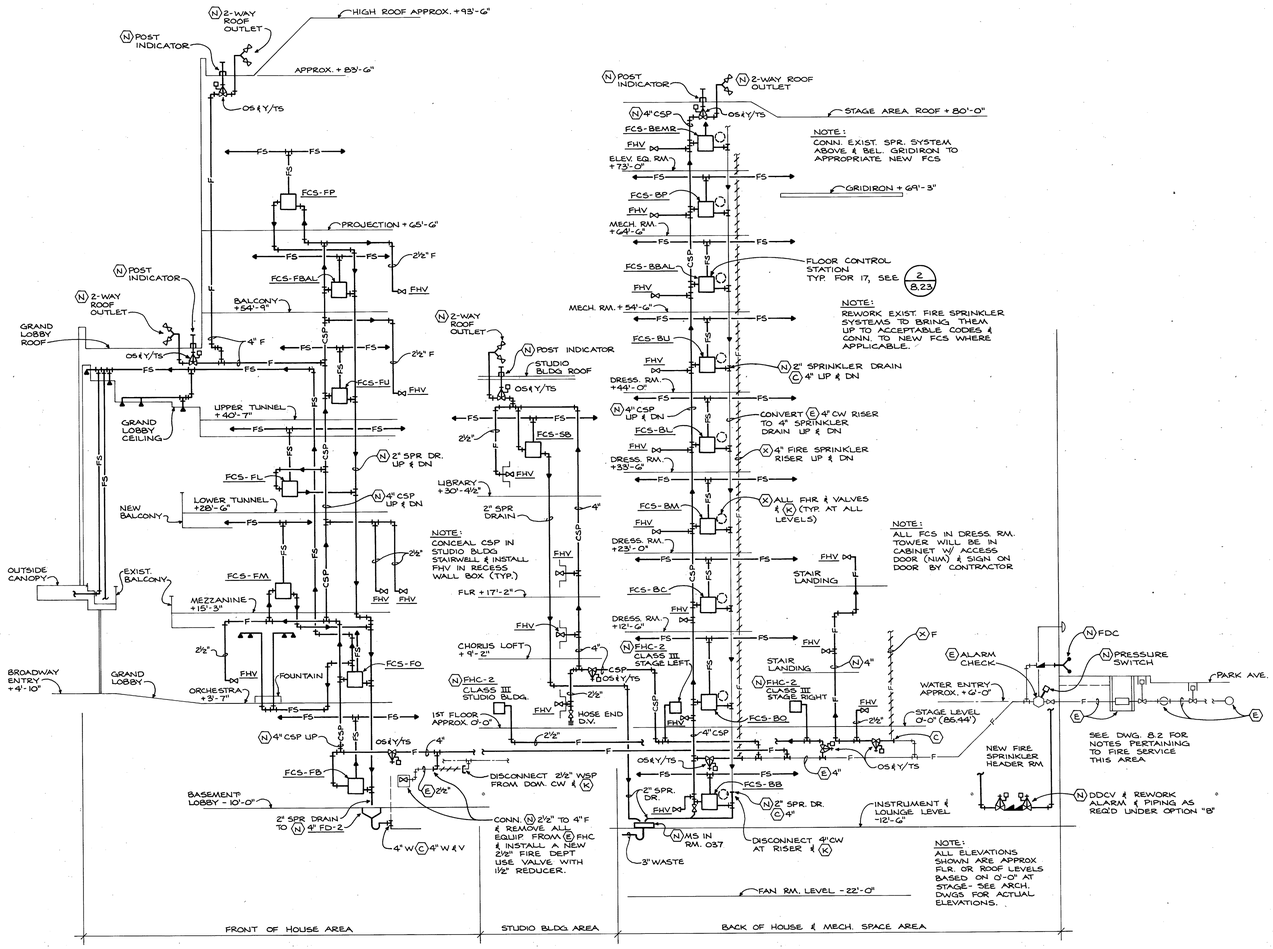
ROOF PLAN



3 DETAIL - MANIFOLDED ELECTRIC WATER HEATER - EWH-1 & EWH-2
NO SCALE



2 DETAIL - FLOOR CONTROL STATION
NO SCALE



1 FIRE PROTECTION PIPING DIAGRAM
NO SCALE

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REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1965 ROBERT G. MANFIELD

1693-20

DIAGRAMS & DETAILS PLBG. & F.P.

Job No.	Date JULY 18, 1983
Set No.	Sheet No. 8.23

LEGEND

Symbol	Abbr.	Description
—HWS—	HWS	HEATING WATER SUPPLY
—HWR—	HWR	HEATING WATER RETURN
—CWS—	CWS	CHILLED WATER SUPPLY
—CWR—	CWR	CHILLED WATER RETURN
—CLW—	CLW	CONDENSER LEAVING WATER
—CRW—	CRW	CONDENSER RETURN WATER
—RRY—	RRV	REFRIGERANT RELIEF VENT
—RL—	RL	REFRIGERANT LIQUID
—RS—	RS	REFRIGERANT SUCTION
—RHG—	RHG	REFRIGERANT HOT GAS
—DOS—	DOS	DIESEL OIL SUPPLY
—DOR—	DOR	DIESEL OIL RETURN
—CD—	CD	CONDENSATE DRAIN
	W	SANITARY SOIL OR WASTE ABOVE FLOOR
	W	SANITARY SOIL OR WASTE BELOW GRADE OR FLOOR
—D—	D	INDIRECT WASTE OR DRAIN ABOVE FLOOR
—SD—	SD	STORM DRAIN ABOVE FLOOR
—SD—	SD	STORM DRAIN BELOW GRADE OR FLOOR
	V	VENT
	CW	COLD WATER
	PCW	PROCESS COLD WATER
	HW	HOT WATER
	HWTM	HOT WATER TEMPERATURE MAINTAINED
—F—	F	FIRE PROTECTION (WET)
—FS—	FSP	FIRE SPRINKLER PIPE (FROM. FCS)
—CSP—	CSP	COMBINATION STANDPIPE
—WSP—	WSP	WET STANDPIPE
—MG—	MG	NATURAL GAS (MEDIUM PRESSURE - 2 PSI)
—G—	G	NATURAL GAS (LOW PRESSURE - 11" W.C.)
—V(G)—	V(G)	VENT (GAS)
—A—	A	COMPRESSED AIR
		HEAT TAPE
—TPL—	TPL	TRAP PRIMER LINE
—ARW—	ARW	ACID RESISTING WASTE
—ARV—	ARV	ACID RESISTING VENT
—IRW—	IRW	IRRIGATION WATER
	OS&Y	OUTSIDE SCREW AND YOKE VALVE
	GV	GATE VALVE
	GLV	GLOBE VALVE
	BV	BALL VALVE
	GC	GAS COCK
	CKV	CHECK VALVE
	BWV	BACKWATER VALVE
	BFV	BUTTERFLY VALVE
	BAL	BALANCING FITTING
	FCV	FLOW CONTROL VALVE
	MV	TWO-WAY MOTORIZED VALVE
	MV	THREE-WAY MOTORIZED VALVE
	MV	MOTORIZED BUTTERFLY VALVE
	PRV	PRESSURE REDUCING VALVE
	RV	PRESSURE RELIEF VALVE
	PTRV	PRESSURE TEMPERATURE RELIEF VALVE
		COMPRESSED AIR OUTLET
WH	WH	WALL HYDRANT
DV	DV	HOSE END DRAIN VALVE
HB	HB	HOSE BIBB
AV	AV	AIR VENT
	WHA	WATER HAMMER ARRESTOR
	TPV	TRAP PRIMER VALVE
	STR	STRAINER WITH HOSE END DRAIN VALVE
		UNION, FLANGE
		PIPE REDUCER
		SPRINKLER HEAD - UPRIGHT/ PENDENT & SIDEWALL
		SPRINKLER HEAD - DRY PENDENT, 45° DRY PENDENT
		PRESSURE GAGE WITH GAGE COCK
		GAGE COCK
		THERMOMETER
FS	FS	FLOW SWITCH
		IMMERSION THERMOSTAT
		PITCHED DOWN
	PTT	PRESSURE TEMPERATURE TAP
		DIRECTION OF FLOW
		VALVE IN RISER
		CAP OR PLUG
	CTG	CLEANOUT TO GRADE
	FCO	FLOOR CLEANOUT
	WCO	WALL CLEANOUT
	CO	CLEANOUT PLUG
TS	TS	TAMPER SWITCH
		SQUARE FEET

Symbol	Description
	AIR FLOW DIRECTION
	SUPPLY OR OSA DUCT SECTION ROUND, RECTANGULAR
	RETURN OR EXHAUST DUCT SECTION ROUND, RECTANGULAR
	INTERNALLY INSULATED DUCT DOUBLE LINE, SINGLE LINE
	FLEXIBLE EQUIPMENT CONNECTION
FLD	FUSIBLE LINK DAMPER DOUBLE LINE, SINGLE LINE
B	BUTTERFLY VOLUME DAMPER DOUBLE LINE, SINGLE LINE
	FLEXIBLE DUCT CONNECTOR DOUBLE LINE, SINGLE LINE
	ACOUSTICAL ENCLOSURE OVER DUCT (ENCLOSURE N.I.M.) SEE 33/G.9

Abbr.	Description
N.O.	NORMALLY OPEN
N.C.	NORMALLY CLOSED
D.A.	DIRECT ACTING
R.A.	REVERSE ACTING
P.E.	PNEUMATIC - ELECTRIC
SAV	SOLENOID AIR VALVE
NLL	NIGHT LOW LIMIT
(701)	MZU ZONE NUMBER
(A)	ACCESS DOOR
(C)	CONNECT
(E)	EXISTING
(F)	LOCATE BELOW FLOOR
(K)	CAP OR PLUG
(X)	REMOVE EXISTING
(T)	THROUGH TRUSS WEB

Abbr.	Description
HWB	HEATING WATER BOILER
WCU	WATER CHILLER UNIT
HWP	HEATING WATER PUMP
CWP	CHILLED WATER PUMP
CDP	CONDENSER WATER PUMP
CT	COOLING TOWER
ACCU	AIR COOLED CONDENSING UNIT
ASU	AIR SUPPLY UNIT
MZU	MULTIZONE UNIT
SF	SUPPLY FAN
RF	RETURN FAN
EF	EXHAUST FAN
REF	ROOF EXHAUST FAN
CUH	CABINET UNIT HEATER
UH	UNIT HEATER
TU	TERMINAL UNIT
BHC	BOOSTER HEATING COIL
EHC	ELECTRIC HEATING COIL
HC	HEATING COIL
CC	COOLING COIL
OSA	OUTSIDE AIR
AUD	AUTOMATIC DAMPER
OAD	OUTSIDE AIR DAMPER
RAD	RETURN AIR DAMPER
EAD	EXHAUST AIR DAMPER
SMD	SMOKE DAMPER
SPS	STATIC PRESSURE SENSOR
6Φ	ROUND DUCT DIAMETER, INCHES
32x14	RECTANGULAR DUCT SIZE, INCHES
CS	CEILING SUPPLY DIFFUSER
CR	CEILING RETURN GRILLE
CE	CEILING EXHAUST GRILLE
HS	HIGH SUPPLY GRILLE
HR	HIGH RETURN GRILLE
HE	HIGH EXHAUST GRILLE
LR	LOW RETURN GRILLE
LDS	LINEAR DUCT SUPPLY
LDR	LINEAR DUCT RETURN
DDCU	DIRECT DIGITAL CONTROL UNIT
FCP	FAN CONTROL PANEL
MCC	MOTOR CONTROL CENTER (SEE ELECT.)
(T)	ROOM THERMOSTAT
TP	TRANSFER PUMP (DIESEL OIL)

Abbr.	Description
WC	WATER CLOSET
U	URINAL
L	LAVATORY
S	SINK
SS	SERVICE SINK
MS	MOP SINK
SHR	SHOWER
DF	DRINKING FOUNTAIN
EWH	ELECTRIC WATER HEATER
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
DCA	DOUBLE CHECK VALVE ASSEMBLY
DDCVA	DOUBLE DETECTOR CHECK VALVE ASSEMBLY
FHC	FIRE HOSE CABINET
FCS	FLOOR CONTROL STATION
FDC	FIRE DEPARTMENT CONNECTION
FH	FIRE HYDRANT
FHV	FIRE HOSE VALVE
HDR	HEADER
CB	CATCH BASIN
AD	AREA DRAIN
FS	FLOOR SINK
FD	FLOOR DRAIN
SHD	SHOWER DRAIN
DS	DOWNSPOUT
RD	ROOF DRAIN
ORD	OVERFLOW ROOF DRAIN
VTR	VENT THROUGH ROOF
MH	MANHOLE
CIP	CAST IRON PIPE
CSP	CONCRETE SEWER PIPE
CONC	CONCRETE
TC	TOP OF CURB
I.E.	INVERT ELEVATION
EL	ELEVATION
RI&C	ROUGH-IN AND CONNECT
NIM.	NOT IN MECHANICAL - SPECIFIED UNDER ANOTHER DIVISION
S.O.V.	SHUT-OFF VALVE (GATE UNLESS OTHERWISE NOTED)
ASR	AUTOMATIC SPRINKLER RISER
ASD	AUTOMATIC SPRINKLER DRAIN
AGD	AIR GAP DRAIN

GENERAL NOTES

1. THE CONTRACTOR SHALL RECORD ALL INVERT ELEVATIONS, PIPE SIZES, LOCATIONS, AND ANY OTHER DEVIATIONS FROM CONTRACT DRAWINGS, ON AS-BUILT DRAWINGS.
2. ALL END OF WASTE PIPING RUN LAVATORIES, SINKS, AND DRINKING FOUNTAINS SHALL HAVE A WALL CLEANOUT BELOW FIXTURE.
3. REFER TO ARCHITECTURAL DOCUMENTS FOR EXACT LOCATION AND HEIGHT OF ALL PLUMBING FIXTURES. COORDINATE WITH ALL OTHER TRADES.
4. PROVIDE & INSTALL SHUTOFF VALVES ON ALL BRANCH WATER PIPING SERVING FIXTURES AND/OR GROUPS OF FIXTURES OR EQUIPMENT. INSTALL IN LIFTOUT CEILING WHERE POSSIBLE, BEHIND CEILING OR WALL ACCESS PANELS WHERE LIFTOUT CEILING IS NOT AVAILABLE OR AS INDICATED ON THE DRAWINGS. COORDINATE WITH ARCHITECTURAL AND ALL OTHER TRADES.
5. BECAUSE OF THE SMALL SCALE OF THE DRAWINGS, IT IS NOT POSSIBLE TO INDICATE ALL OFFSETS, FITTINGS, VALVES, AND ACCESSORIES WHICH MAY BE REQUIRED. THE CONTRACTOR SHALL CAREFULLY INVESTIGATE THE CONDITIONS SURROUNDING THE INSTALLATION OF HIS WORK AND SHALL FURNISH THE NECESSARY FITTINGS, VALVES, TRAPS, ETC., WHICH MAY BE REQUIRED TO COMPLETE THE INSTALLATION IN A SATISFACTORY AND CODE APPROVED MANNER.
6. WHERE BRANCH PIPE SIZE IS NOT SHOWN ON DRAWINGS, REFER TO PLUMBING FIXTURE ROUGH-IN SCHEDULE FOR REQUIRED PIPE SIZE.
7. ALL FIRE SPRINKLER HEADS HAVE NOT BEEN SHOWN OR SCHEDULED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE AND INSTALL A COMPLETE FIRE SPRINKLER SYSTEM IN ALL PORTIONS OF THE BUILDING EXCEPT AS SPECIFICALLY NOTED.
8. SEE ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF PIPE AND DUCTS IN EXPOSED AREAS WITHOUT CEILINGS; ALSO FOR EXACT LOCATIONS OF SPRINKLER HEADS.
9. FOR LOCATIONS OF EXPANSION JOINTS IN GENERAL CONSTRUCTION WORK, SEE ARCHITECTURAL DRAWINGS.
10. THE LOCATIONS OF THE PLUMBING, MECHANICAL, AND FIRE PROTECTION PIPING, EQUIPMENT, DUCTS, AND FIRE SPRINKLER HEADS IS TO BE STRICTLY CONTROLLED IN MANY AREAS. THE ARCHITECTURAL REFLECTED CEILING PLANS AND THE MECHANICAL DRAWINGS INDICATE THE LOCATION OF MANY OF THESE ITEMS AND ANY DEVIATION FROM THESE DRAWINGS MUST BE APPROVED BY THE ARCHITECT PRIOR TO INSTALLATION.

Portland Center for the Performing Arts

The City of Portland

Honorable Mildred A. Schwab
Commissioner in Charge
Ronald K. Ragen
Chairman
Performing Arts Center Committee

Architects
Broome, Oringdulph, O'Toole, Rudolf & Associates pc
ELS Design Group
Barton Myers

Project Address
733 N.W. 20th Avenue
Portland, Oregon 97209
(503) 226-1575

Consultants
Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4916 OREGON JULY 9, 1981 ROBERT G. MANFULL

Target	Revision Item	Revision Date
△	Addendum #1	10/29/84
△	Addendum #2	11/06/84
△	Addendum #4	11/13/84
△	Addendum #5	11/21/84
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△	Proposal Request #13	03/01/85
△	Proposal Request #14	03/01/85
△	Clarification Items	03/01/85
△	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

LEGEND & NOTES MECHANICAL

Date OCT. 12, 1984
Scale NONE
Drawing No. **8.0**

C.W. Timmer Associates Inc.
Consulting Engineers
1644-20

CASCADE A. & E. SUPPLIES CO.

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REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1948 ROBERT G. MANFULL

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17	-	Proposal Request #13	03/01/85
18	-	Proposal Request #14	03/01/85
19	-	Clarification Items	03/01/85
20	-	Miscellaneous Items	03/01/85
21	-	CLARIFICATION PP & L VAULT	10/01/85 10/01/85
22	-	MISC. ITEMS	10/17/85

Revisions

New Theatre Building

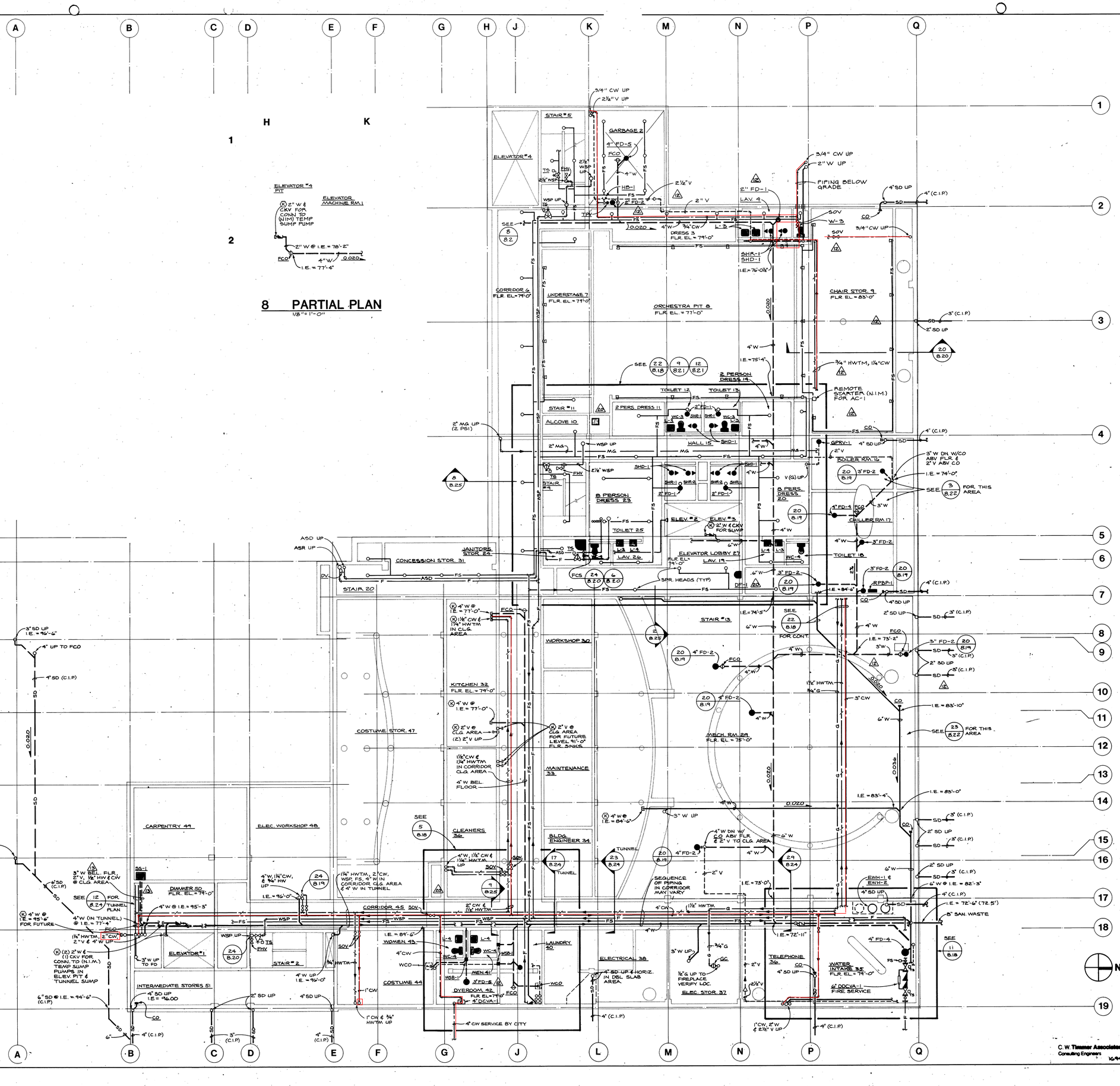
SITE PLAN MECHANICAL

Date OCT. 12, 1984
Scale 1" = 10'-0"
Drawing No. **8.1**

C. W. Timmer Associates Inc
Consulting Engineers
1644-20

SCREEN VALUE
COMPOSITE INSTRUCTIONS 127 801
BASE/OVERLAY NO. 801

CASCADE A. & E. SUPPLIES CO.



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REGISTERED PROFESSIONAL ENGINEER 4916 OREGON JULY 9, 1969 ROBERT G. MANRAL

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
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CA	Clarification Items	03/01/85
MA	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

PLAN LEVEL 79'-0" PLUMBING & FIRE PROTECTION

Date OCT. 12, 1984
Scale 1/8" - 1'-0"
Drawing No. 8.2

CASCADE A. & E. SUPPLIES CO.

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REGISTERED PROFESSIONAL ENGINEER 4915 OREGON JULY 9, 1980 ROBERT G. MANRAL

Target	Revision Item	Revision Date
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14	Proposal Request #14	03/01/85
A	Clarification Items	03/01/85
M	Miscellaneous Items	03/01/85

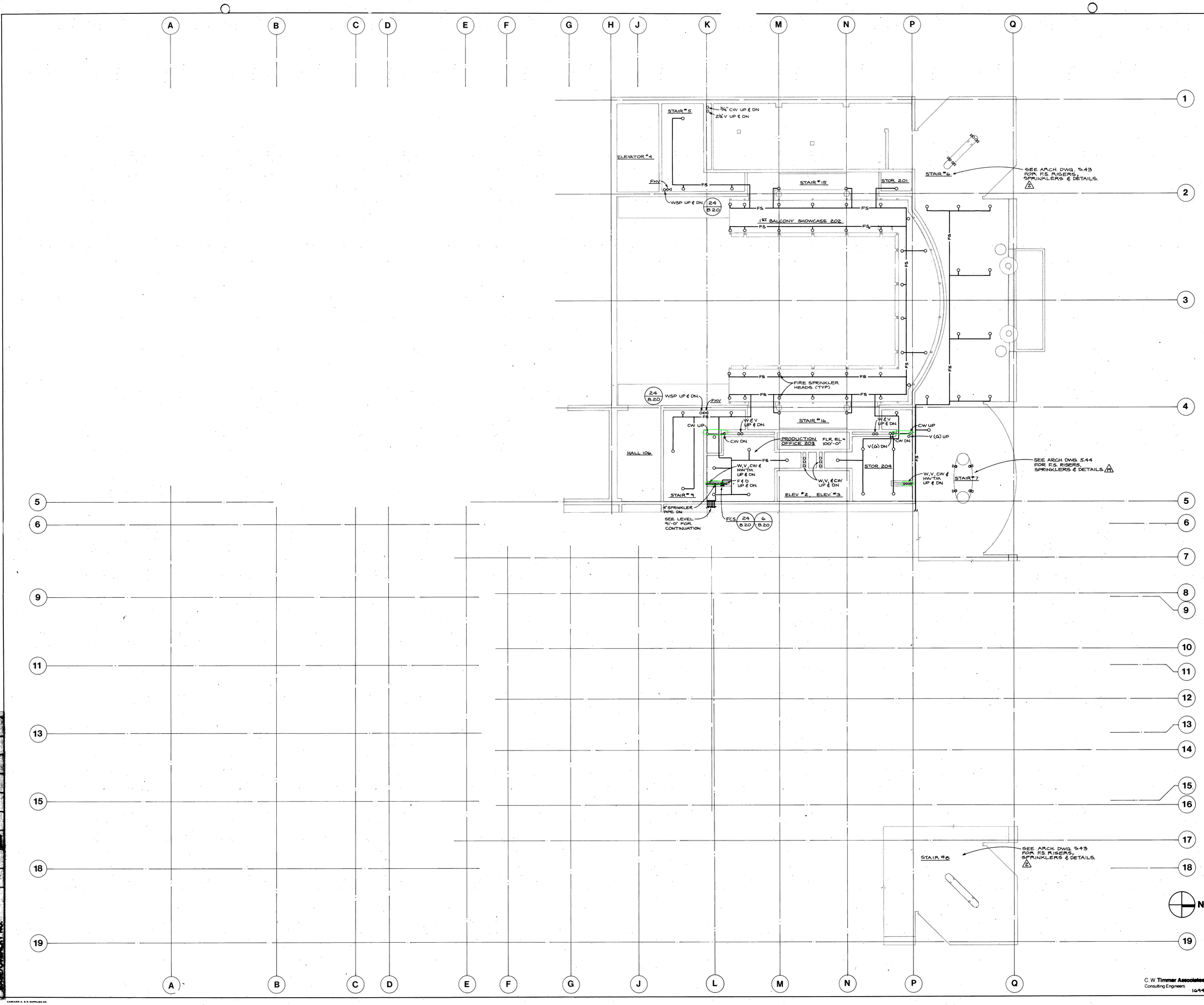
Revisions

New Theatre Building

PLAN LEVEL 91'-0"/97'-6"
PLUMBING &
FIRE PROTECTION

Date OCT. 12, 1984
Scale 1/8" = 1'-0"
Drawing No. **8.3**

C.W. Timmer Associates Inc.
Consulting Engineers
1644-80



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REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1974 ROBERT G. MANFULL

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14	Proposal Request #14	03/01/85
15	Clarification Items	03/01/85
16	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

PLAN LEVEL 99'-0"
PLUMBING &
FIRE PROTECTION

Date OCT 12, 1984
Scale 1/8"=1'-0"
Drawing No. 6.8.4

C. W. **Timmer Associates** Inc
Consulting Engineers
1699-20

SCREEN VALUE 133 / COMPOSITE INSTRUCTIONS 34 / BASE/OVERLAY NO. 74

CANCARD A. B. S. SUPPLIES CO.

PROVIDE & INSTALL FIRE PROTECTION AS REQ'D. SEE ARCH. DETAILS FOR THIS AREA.

WH-1

STAIR #5 FLR EL. = 105'-6½"

¾" CW DN
2½" V UP & DN

STAIR #22

FLR EL= 107'-0"

LOBBY 301
FLR EL= 103'-8½"

STAIR #23

FLR EL= 108'-0"

GALLERY 302

ELEVATOR #4

24 8.20 WSP UP & DN

STAIR #15

VESTIBULE 305

STAIR #6

SEE ARCH DWG S.43 FOR FS. RISERS, SPRINKLERS & DETAILS 2

2ND BALCONY SHOWCASE 304

LOBBY 306

24 8.20

24 8.18 | 9 8.21 | 12 8.21

HALL 311
FLR EL= 104'-9"

WSP UP & DN

CW UP & DN

STAIR #16

W & V UP & DN

VESTIBULE 307

V (G) UP & DN

CW UP & DN

DRY SIDEWALL

STAIR #9
FLR EL= 107'-0"

FLR EL= 104'-9"

VESTIBULE 312

F & D UP & DN

WOMEN 309

MEN 308

SEE ARCH. DWGS. S.44 FOR FS RISERS, SPRINKLERS & DETAILS 19

W, V, CW & HWTM UP & DN

STAIR #7

W, V & CW UP & DN

ELEV #2

ELEV #3

INSTALL FIRE PROTECTION IN (2) KITCHEN EXH. DUCTS AS REQ'D - SEE HVAC DWGS.

ASR & ASD DN, FS UP

STOR 313

STAIR #4

FCS 24 8.20 | 6 8.20

STAIR #1

2½" WSP

FHC

24 8.20 FCS

STAIR #20

VESTIBULE 314

FIRE SPRINKLER HEADS (TYP)

4" W UP & DN

LATE COMERS 315

WH-1

¾" CW DN

BROADCAST 317

SOUND CONTROL 318

ORCHESTRA 319

LIGHTING CONTROL 303

BACKSTAGE 333

INTERMEDIATE STAGE 334

FIRE PROTECTION NOTE:
PROVIDE & INSTALL AN APPROVED WATER CURTAIN TYPE SPRINKLER SYSTEM @ THE PROCENIUM OPENING USING FAST RESPONSE HEADS W/WATERSHIELDS (IF REQ'D) @ 6'-0" ON CENTER.

3" W UP & DN

DIRECTOR 320

SEE 4 8.20 TYP

LATE COMERS 321

NOTE: SERVE FHC W/ NEAREST 2½" FIRE SERVICE PIPE

FHC ON NORTH WALL

4" W, 1" CW & ¾" HWTM UP

2" W & 3" V & 1" CW & HWTM UP & DN

KIT UNIT (N.I.M.) R1&C

4" W DN
2" V UP & DN

VESTIBULE 322

INSTALL ALL PLUMBING FOR BAR - SEE 12 8.19

STAIR #8

SEE ARCH. DWG. S.43 FOR FS. RISERS, SPRINKLERS & DETAILS 2

BAR 323

TOILET 331

SHR-1 SHD-1

2" FD-1

TPV & A

WC-3

WC-2

2" FD-1

TOILET 330

SHR-1 SHD-1

1" HWTM, 1½" CW, 4" W, 2" W, & 1½" V DN, 1" HWTM, 1¼" CW, 4" W, 2" W, (2) 1½" V & 2" V UP

2 PERSON DRESS 332

L-3

L-3

8 PERSON DRESS 329

CANTEEN 336

ELEVATOR #1

HALL 328

ACTOR ASSEMBLY 327

STAIR #2

FHV

WSP UP & DN

HALL 326

STAIR #3

STAIR #21

2" W UP & DN (3) 1½" V UP 1" CW & 1¼" HWTM DN ¾" CW & 1" HWTM UP

SHR-2 SHD-1

4" W & 1¼" CW UP & DN & 2" V UP

3" W UP & DN 2" V, ¾" HWTM & CW UP

SHR-1 SHD-1

WC-4

2" FD-1

TPV & A

L-3 L-4

TOILET 324

8 PERSON DRESS 325

DF-1

2" W, 2½" V UP & DN, ¾" CW UP, 1" CW DN IN FURRED WALL SPACE

1" CW & ¾" HWTM DN

2" W & 3" V UP & DN ¾" CW & HWTM UP & DN

N

C.W. Timmer Associates Inc.
Consulting Engineers
1644-20

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Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4216 OREGON JULY 9, 1948 ROBERT G. MARVIN

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
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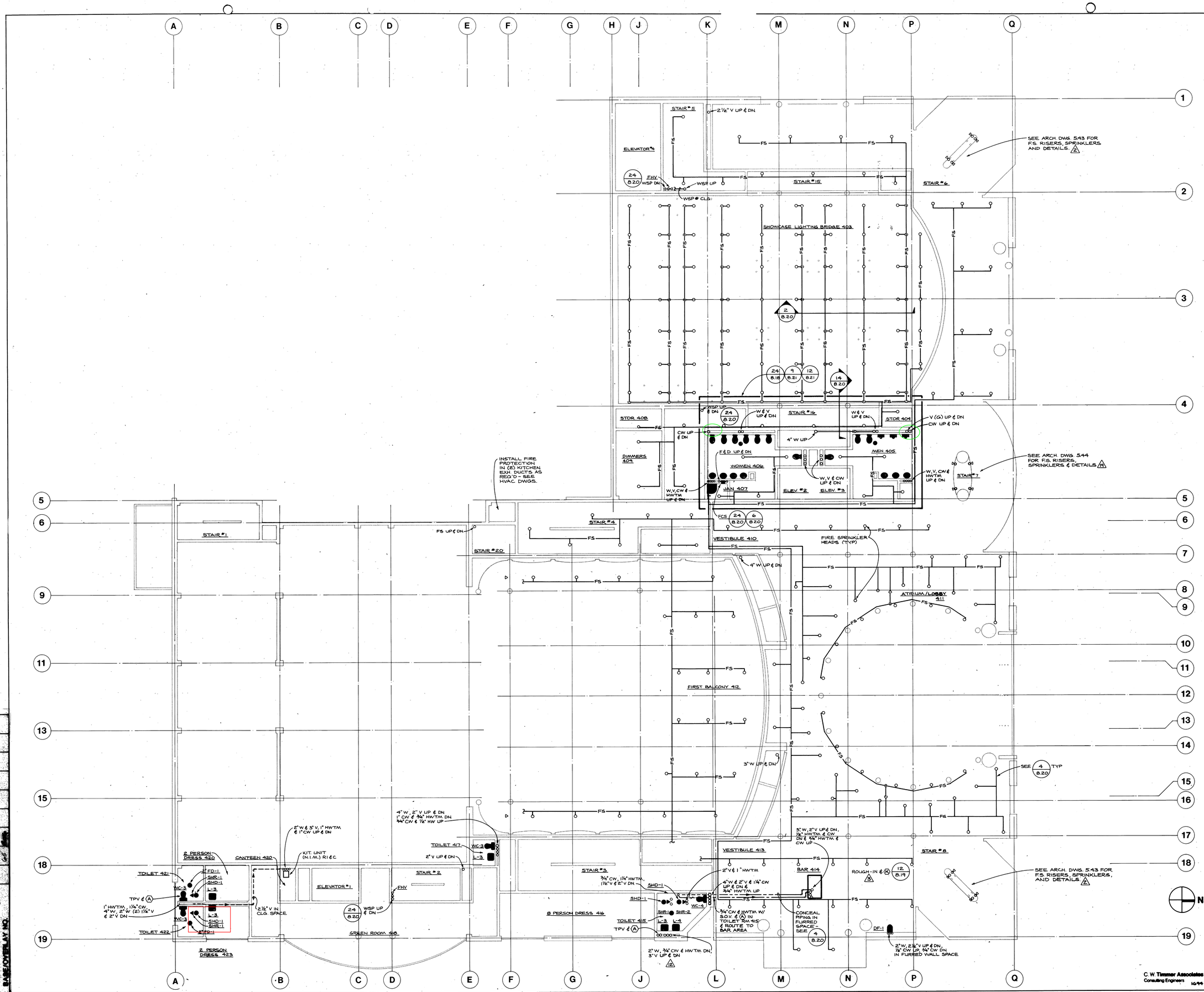
14	Proposal Request #14	03/01/85
19	Clarification Items	03/01/85
20	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

PLAN LEVEL 107'-0"/108'-0"
PLUMBING &
FIRE PROTECTION

Date OCT 12, 1984
Scale 1/8"-1'-0"
Drawing No. **8.5**



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REGISTERED PROFESSIONAL ENGINEER OREGON JULY 9, 1940 ROBERT G. MANFULL

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CA	Clarification Items	03/01/85
MI	Miscellaneous Items	03/01/85

Revisions

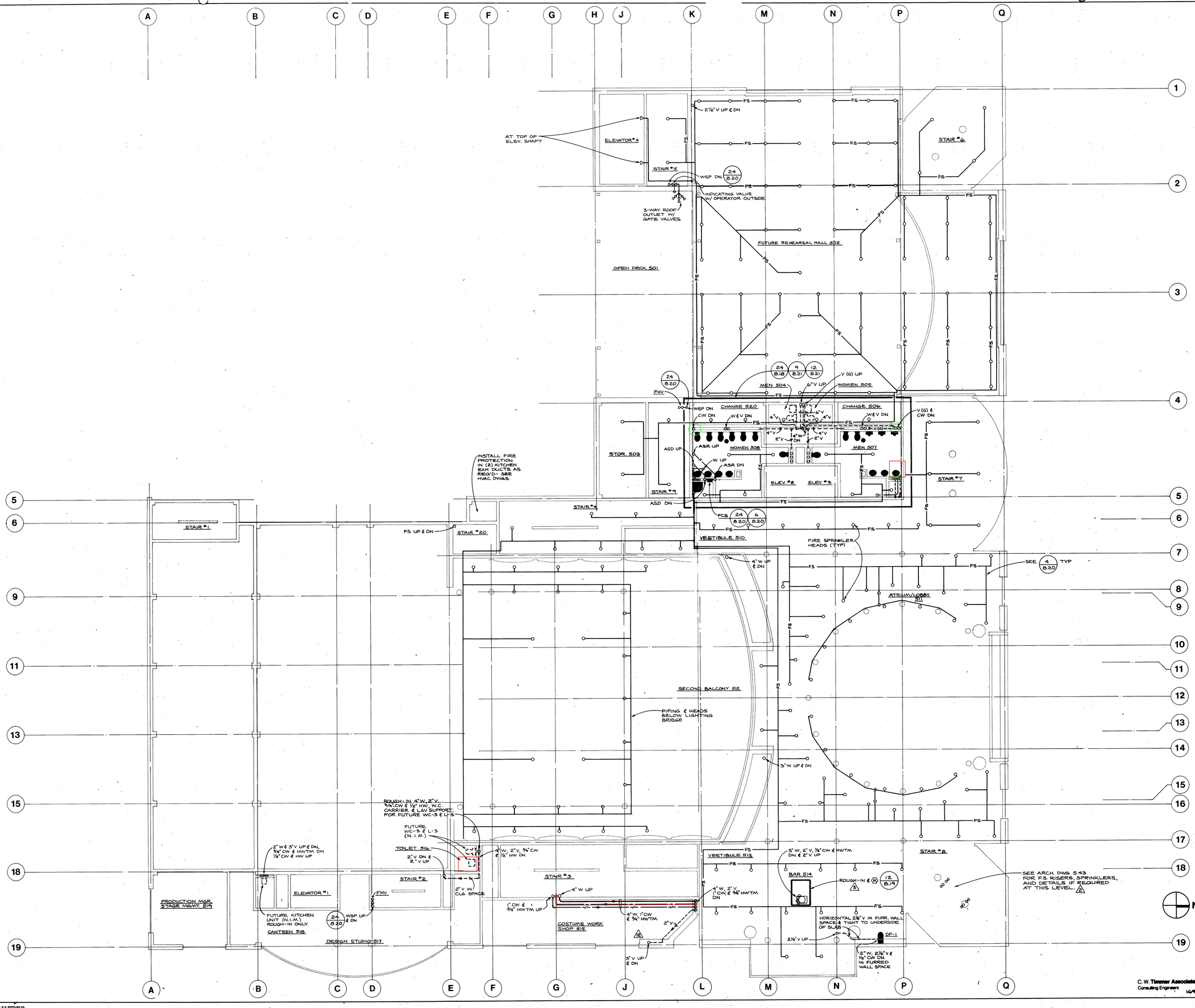
New Theatre Building

PLAN LEVEL 115'-0"/118'-6"
PLUMBING &
FIRE PROTECTION

Date OCT 12, 1984
Scale 1/8" = 1'-0"
Drawing No. **8.6**

SCREEN VALUE
COMPOSITE INSTRUCTIONS
BASEPOINT PLAY NO.

CARGAGE A. G. E. SUPPLIES CO.



SCREEN VALUE 10 125 267
COMPOSITE INSTRUCTIONS 67 80?
MAKE OVERLAY NO.

CADCAM A. B. E. SUPPLIES CO.

C. W. Timmer Associates Inc.
Consulting Engineers
1644 - 20

Portland Center for the Performing Arts

The City of Portland

Honorable Mildred A. Schwab
Commissioner in Charge

Ronald K. Ragen
Chairman
Performing Arts Center Committee

Architects

Broome, Oringdulph, O'Toole, Rudolf & Associates pc
ELS Design Group
Barton Myers

Project Address
733 N.W. 20th Avenue
Portland, Oregon 97209
(503) 226-1575

Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4010 OREGON JULY 2, 1947 ROBERT G. MANFULL

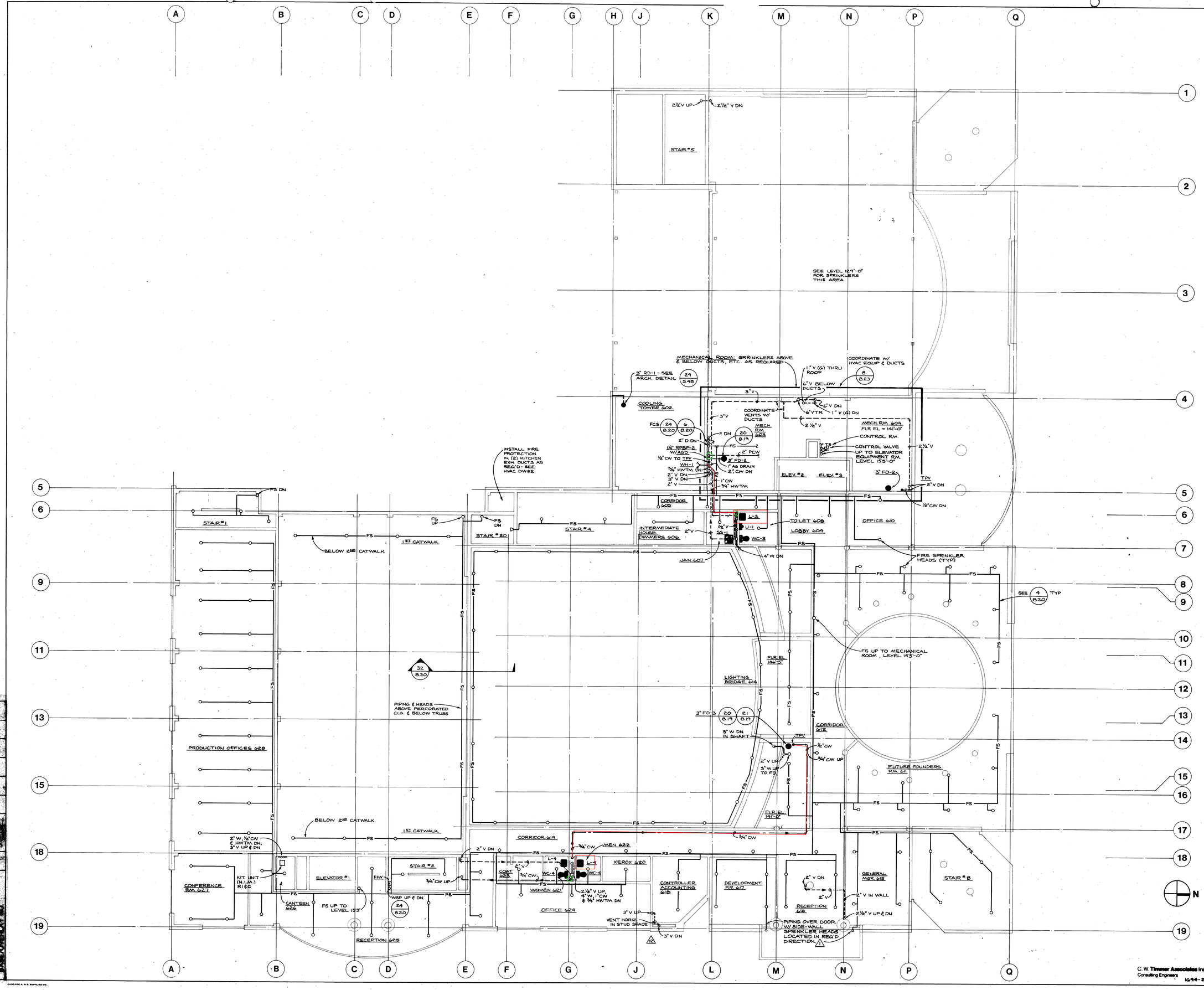
Target		Revision Item	Revision Date
1	-	Addendum #1	10/29/84
2	-	Addendum #2	11/06/84
3	-	Addendum #4	11/13/84
4	-	Addendum #5	11/21/84
1		Proposal Request #1	03/01/85
2		Proposal Request #2	03/01/85
3		Proposal Request #3	03/01/85
4		Proposal Request #4	
5		Proposal Request #5	03/08/85
6		Proposal Request #6	03/01/85
7		Proposal Request #7	03/01/85
8		Proposal Request #8	03/01/85
9		Proposal Request #9	03/01/85
10		Proposal Request #10	03/01/85
11		Proposal Request #11	03/01/85
12		Proposal Request #12	03/01/85
13		Proposal Request #13	03/01/85
14		Proposal Request #14	03/01/85
A		Clarification Items	03/01/85
20		Miscellaneous Items	03/01/85

Revisions

New Theatre Building

PLAN LEVEL 129'-0"
PLUMBING & FIRE PROTECTION

Date OCT 12, 1984
Scale 1/8"-1'-0"
Drawing No. **8.7**



Portland Center for the Performing Arts

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Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER — OREGON — JULY 9, 1974 — ROBERT G. MANUELL

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
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4	Addendum #4	11/13/84
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7	Proposal Request #7	03/01/85
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10	Proposal Request #10	03/01/85
11	Proposal Request #11	03/01/85
12	Proposal Request #12	03/01/85
13	Proposal Request #13	03/01/85
14	Proposal Request #14	03/01/85
15	Clarification Items	03/01/85
16	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

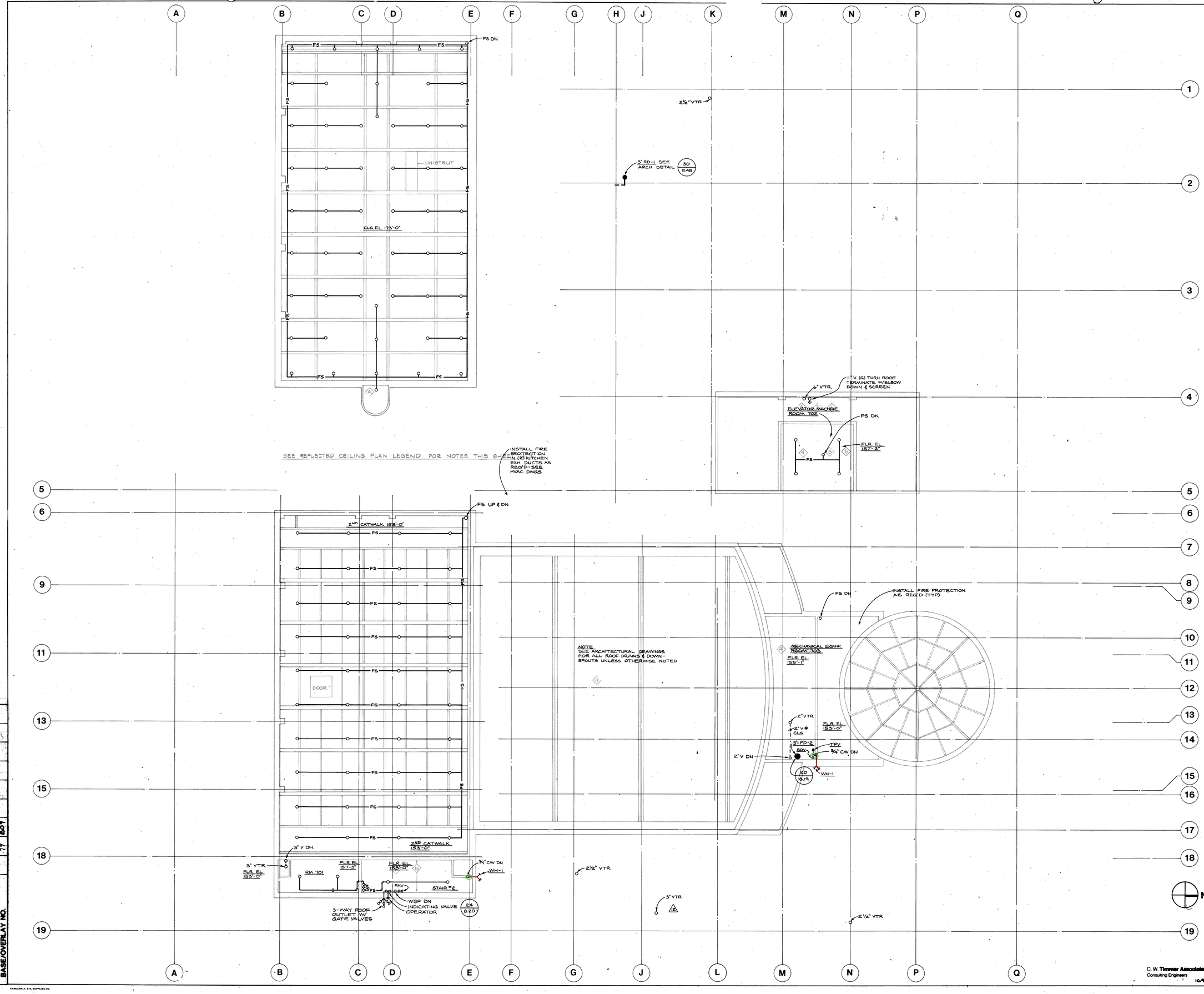
PLAN LEVEL 141'-0"
PLUMBING & FIRE PROTECTION

Date OCT 12, 1984
Scale 1/8" = 1'-0"
Drawing No. **8.8**

C. W. Timmer Associates Inc.
Consulting Engineers
1644-20

COMPOSITE INSTRUCTIONS
BASE/OVERLAY NO.

CASCADE A. & E. SUPPLIES CO.



SCREEN VALUE
COMPOSITE INSTRUCTIONS 10 127 809
BASE/OVERLAY NO. 79 809

CASCADE A. & E. SUPPLIES CO.

Portland Center for the Performing Arts

The City of Portland

Honorable Mildred A. Schwab
Commissioner in Charge

Ronald K. Ragen
Chairman
Performing Arts Center Committee

Architects

Broome, Oringdulph, O'Toole, Rudolf & Associates pc
ELS Design Group
Barton Myers

Project Address
733 N.W. 20th Avenue
Portland, Oregon 97209
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Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 9, 1976
ROBERT G. MANFIELD

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
3	Addendum #4	11/13/84
4	Addendum #5	11/21/84
5	Proposal Request #1	03/01/85
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14	Proposal Request #10	03/01/85
15	Proposal Request #11	03/01/85
16	Proposal Request #12	03/01/85
17	Proposal Request #13	03/01/85
18	Proposal Request #14	03/01/85
19	Clarification Items	03/01/85
20	Miscellaneous Items	03/01/85

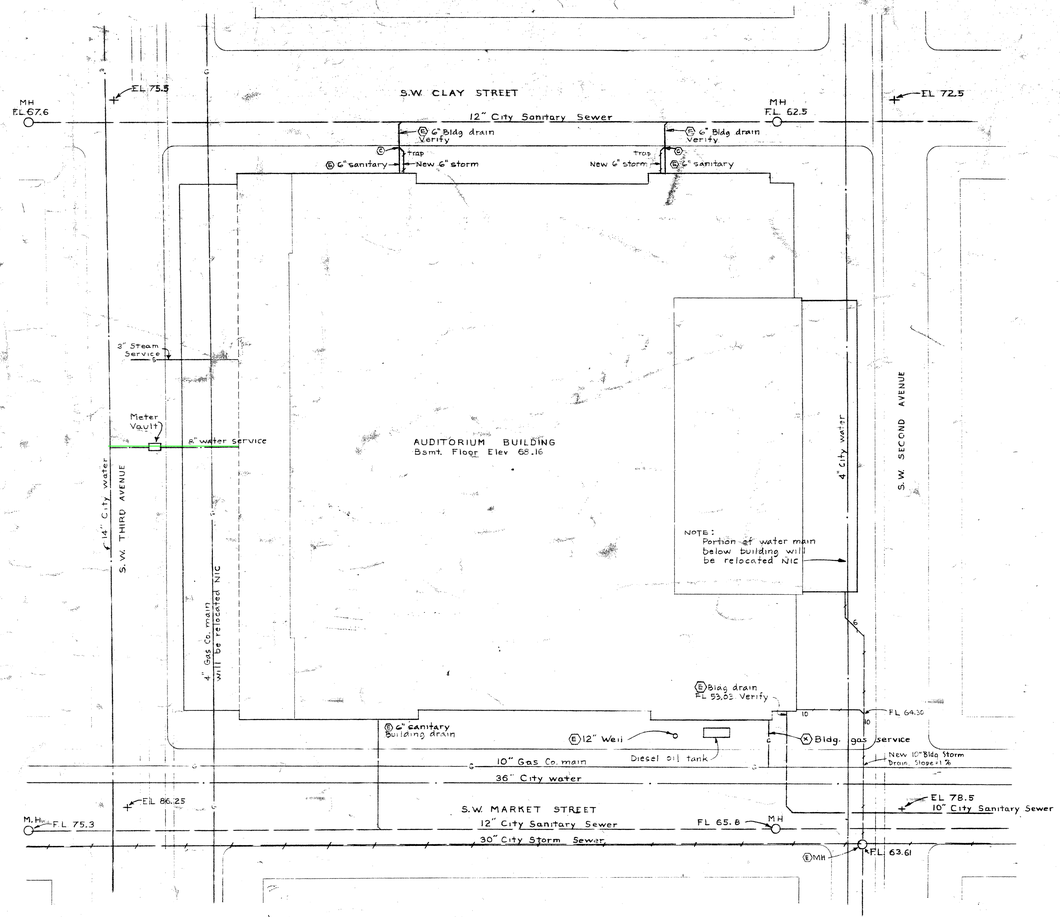
Revisions

New Theatre Building

PLAN LEVEL 153'-0"/173'-0" PLUMBING & FIRE PROTECTION

Date OCT 12, 1984
Scale 1/8" = 1'-0"
Drawing No. **8.9**

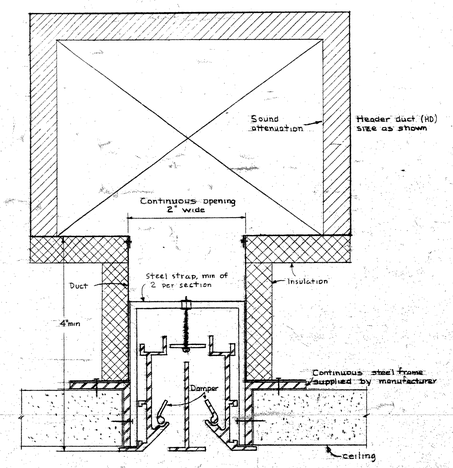
C. W. Timmer Associates Inc.
Consulting Engineers
1644-20



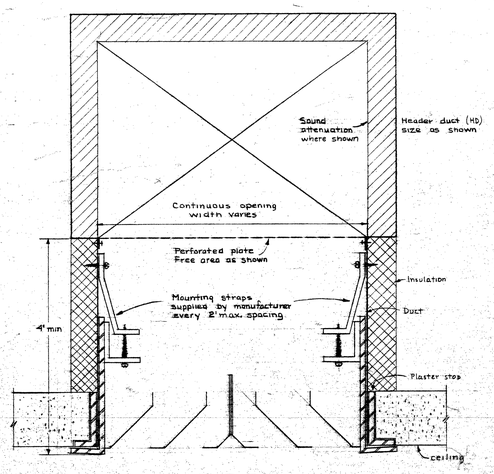
PLOT PLAN

1" = 20' Approx.

Note: All elevations are approximate. Verify



LD-1



LD-2, 3, 4

TYPICAL LINEAR DIFFUSER MOUNTING DETAILS

No Scale

MECHANICAL DRAWING SYMBOLS

S	Steam	200	Air volume, cfm
R	Condensate return	LD-2	Linear diffuser
C — CS	Cooling supply	14%FP	Perforated plate, 14% free area
C — CR	Cooling return	S	Splitter damper
H — HS	Heating supply	B	Butterfly damper
H — HR	Heating return	OAD	Outside air automatic damper
W — WS	Well water supply	EAD	Exhaust air automatic damper
W — WR	Well water return	RAD	Return air automatic damper
CW	Cold water	IVD	Inlet vane damper
HWR	Hot water recirculated	MD	Mixing damper
HW	Hot water	SPD	Static pressure damper
SPR	Sprinkler supply	(2)	Riser number - heating & cooling pipes
WSP	Wet standpipe	(X)	Existing removed or abandoned, as applicable
W	Waste, soil, drainage	(B)	Below floor
RD	Roof drain	(E)	Existing to remain
V	Plumbing vent	(J)	Between joists
G	Gas	(R)	Rough-in
	Gate valve	(2)	Air supply zone number
	Check valve	402	Room number
	Adjusting valve	(2)	Column line number
AV	Automatic valve	AAV	Automatic air vent valve
	Strainer	SAV	Semi-automatic air vent valve
	Union	SU	Supply air unit
	Globe valve	EF	Exhaust fan
CO	Cleanout	FC-2	Fan-coil unit
	Pitch down	EH	Entry heater
FS	Flow measuring station	HP	Heating pump
D	Drain pan piping	BO	Blank-off top of diffuser
	Relief valve	FD	Floor drain
	Drain valve	WH	Wall hydrant
	Sprinkler heads; pendant, upright	HC	Heating coil
TSS	Tube service space	CC	Cooling coil
	Thermometer	ASV	Automatic sequencing valve
	Pipe capped	PRV	Pressure reducing valve
	Offset in duct; see details Drwg M-13	BT	Bucket trap
	Supply or intake duct	FT	Float and thermostatic trap
	Return or exhaust duct	CP	Ceiling plenum supply
	Sound attenuated duct	MH	Manhole
	Wall supply grille	EL	Elevation
F	Wall return grille at floor	FL	Flow-line elevation
	Wall return grille at ceiling	VTR	Vent through roof
FC	Wall return grille at floor and ceiling	DD	Deflection damper
R40	Ceiling diffuser, Agitair pattern no.	MCC	Motor control center NIM
	Ceiling return grille	NIM	Not in mechanical work
FLD	Fire damper	FHC	Fire hose cabinet
FSD	Fire sub duct	HD	Header duct
DSP	Dry standpipe	IM	Ice machine (NIM)
CD	Canopy drain	CM	Coffee machine (NIM)
	Access door	ST	Sound trap
T	Thermostat	DEC	Duct encased in concrete; see detail Drwg M-6
P	Pressure gage	BB	Special baseboard return grille; see specifications

REGISTERED ARCHITECT KEITH MAGUIRE PORTLAND, OREGON STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER 3124 STATE OF OREGON

J. DONALD KROEKER AND ASSOCIATES

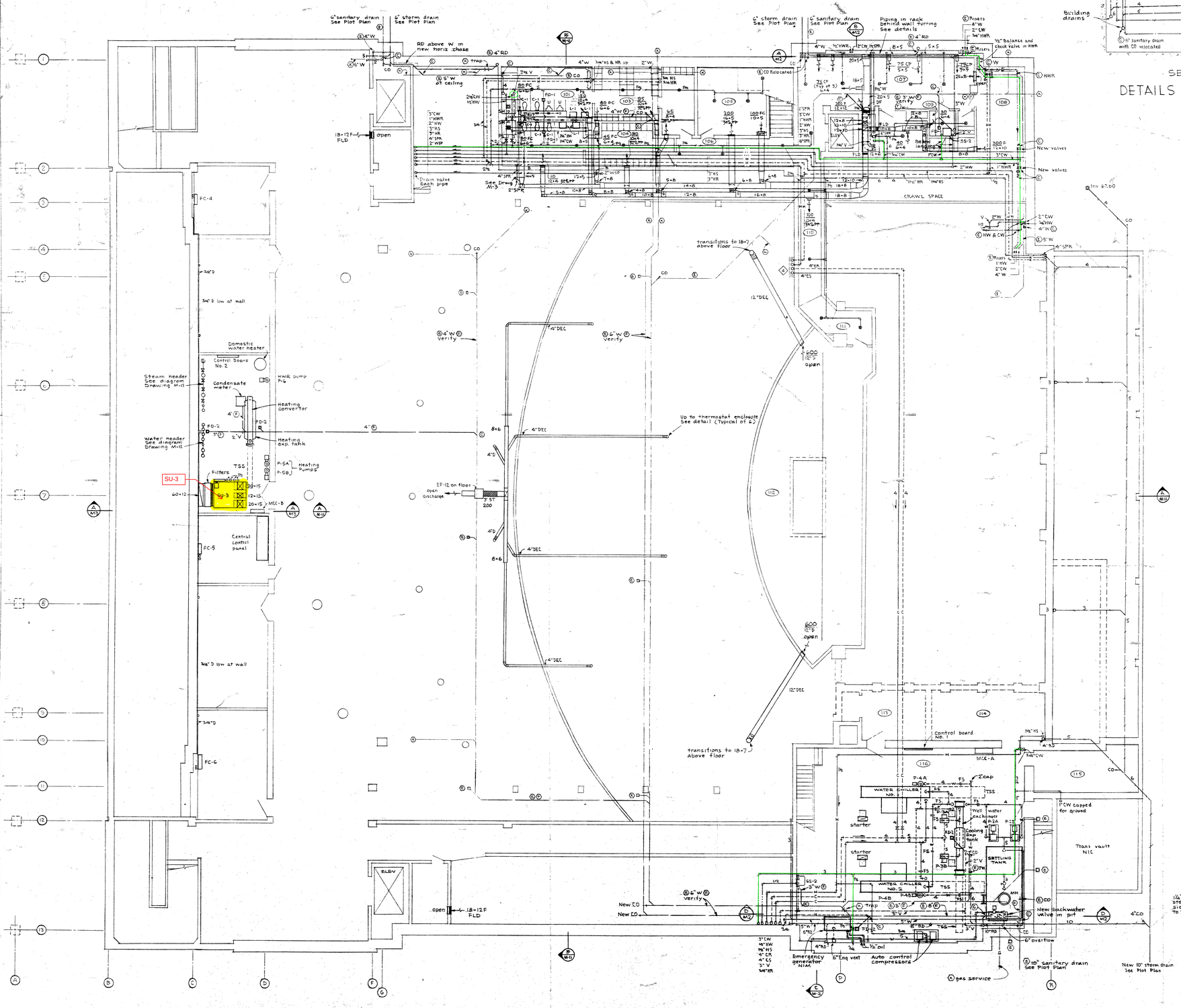
MECHANICAL
PLOT PLAN AND DETAILS

B. MARCUS SPRITECA ARCHITECT THEATER CONSULTANT
PAUL VENKLASEN & ASSOCIATES ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES ELECTRICAL ENGINEERS
LILA COLWELL A.I.D. INTERIOR DECORATION CONSULTANT

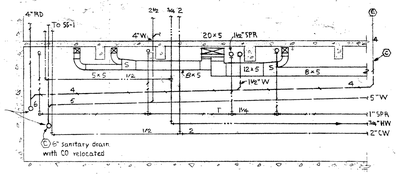
REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S.W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND, OREGON

DRAWING M-1

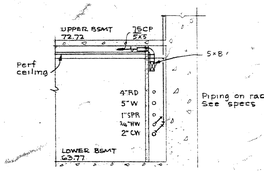
STANTON BOLES, MAGUIRE & CHURCH ARCHITECTS
208 S.W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 5323 DRAWN
DATE NOV 2 & 1955 CHECKED



FLOOR PLAN - LOWER BASEMENT LEVEL
1/8" = 1'-0"

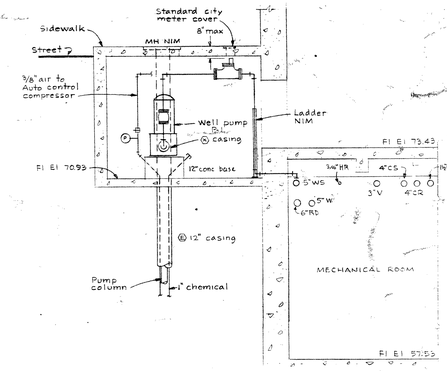


SECTION A M2

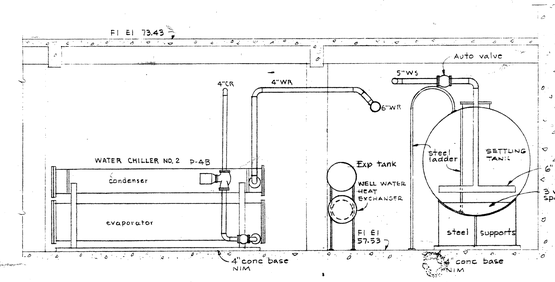


SECTION B M2

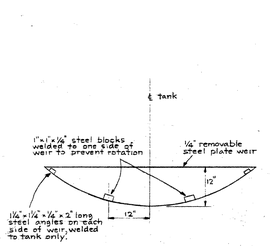
DETAILS OF PIPING AT WALL IN ROOM 107
1/4"=1'-0"



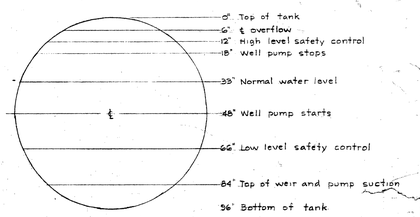
SECTION C M2
1/4"=1'-0"



SECTION D M2
1/4"=1'-0"



TYPICAL WEIR



WATER LEVELS

SETTLING TANK DETAILS
No scale

REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND, OREGON
STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER
3124
OREGON

MECHANICAL
LOWER BASEMENT FLOOR PLAN AND DETAILS

B. MARCUS PRITECA
ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSÉ & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL A.I.D.
INTERIOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING M-2

STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE: MAY 24 1966
DRAWN
CHECKED

DRESSING ROOM AREA
See ¼"=1'-0" Plan at right

NOTE
See Drwg M-4 for location of thermostats in this area

NOTE:
Coordinate location of sprinklers in this area with light fixtures

REHEARSAL ROOM NO.1

STAIR 1 · STAIR 2 · STAIR 3 · STAIR 4 · ELEV · SOUND EQUIPMENT · WELL ROOM · Stair 2 · chase

FLOOR PLAN - UPPER BASEMENT LEVEL
⅛" = 1'-0"

FLOOR PLAN - DRESSING ROOM AREA
UPPER BASEMENT LEVEL
¼" = 1'-0"

SECTION A/M3
¼" = 1'-0"

SECTION B/M3
⅛" = 1'-0"

REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND, OREGON
STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER
3124
OREGON
ROBERT E. SCHICK

MECHANICAL
UPPER BASEMENT FLOOR PLAN AND DETAILS

B. MARCUS PRITECA ARCHITECT THEATER CONSULTANT PAUL VENEKLASEN & ASSOCIATES ACOUSTICAL CONSULTANTS COOPER & ROSE & ASSOCIATES STRUCTURAL ENGINEERS J. DONALD KROEKER & ASSOCIATES MECHANICAL ENGINEERS GRANT KELLEY & ASSOCIATES ELECTRICAL ENGINEERS LILA COLWELL A.I.D. INTERIOR CONSULTANT	REBUILDING OF PORTLAND CIVIC AUDITORIUM S.W. THIRD AVENUE & CLAY STREET FOR CITY OF PORTLAND OREGON DRAWING M-3 STANTON, BOLES, MAGUIRE & CHURCH ARCHITECTS 208 S.W. STARK ST., PORTLAND 4, OREGON COMM. NO. 6823 DRAWN DATE MAY 24 1966 CHECKED

FLOOR PLAN - ORCHESTRA LEVEL

1/8"=1-0"

FLOOR PLAN - DRESSING ROOM AREA ORCHESTRA LEVEL

1/4"=1-0"

WET STANDPIPE DIAGRAM

No scale

SECTION

1/8"=1-0"

MECHANICAL
ORCHESTRA LEVEL FLOOR PLAN AND DETAILS

B. MARCUS PRITECA
ARCHITECT
THEATER CONSULTANT
PAUL VENECLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COPPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LISA COLWELL A.I.D.
COLOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING M-4

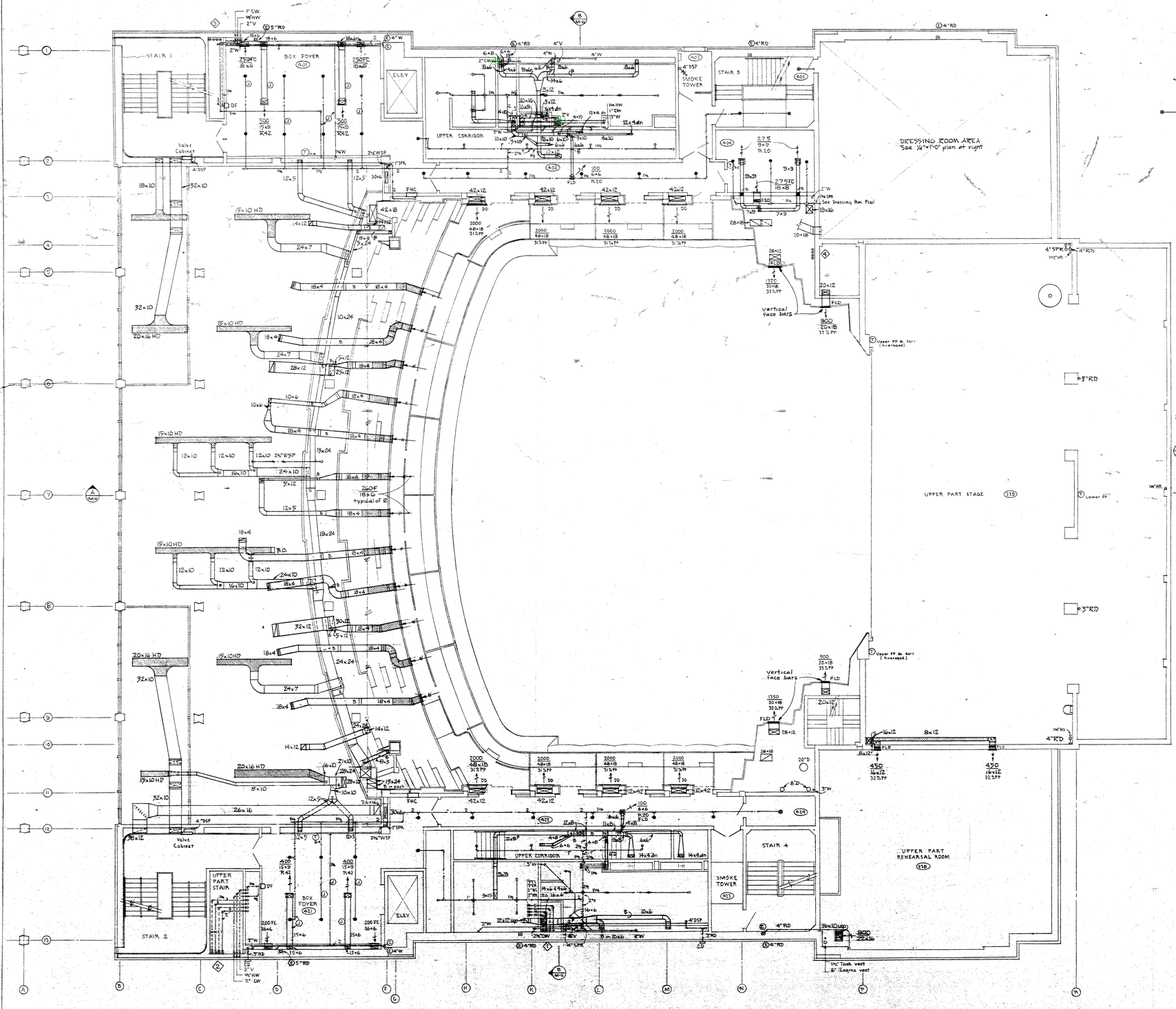
STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON

COMM. NO. 6323
DATE: MAY 24 1966
DRAWN
CHECKED

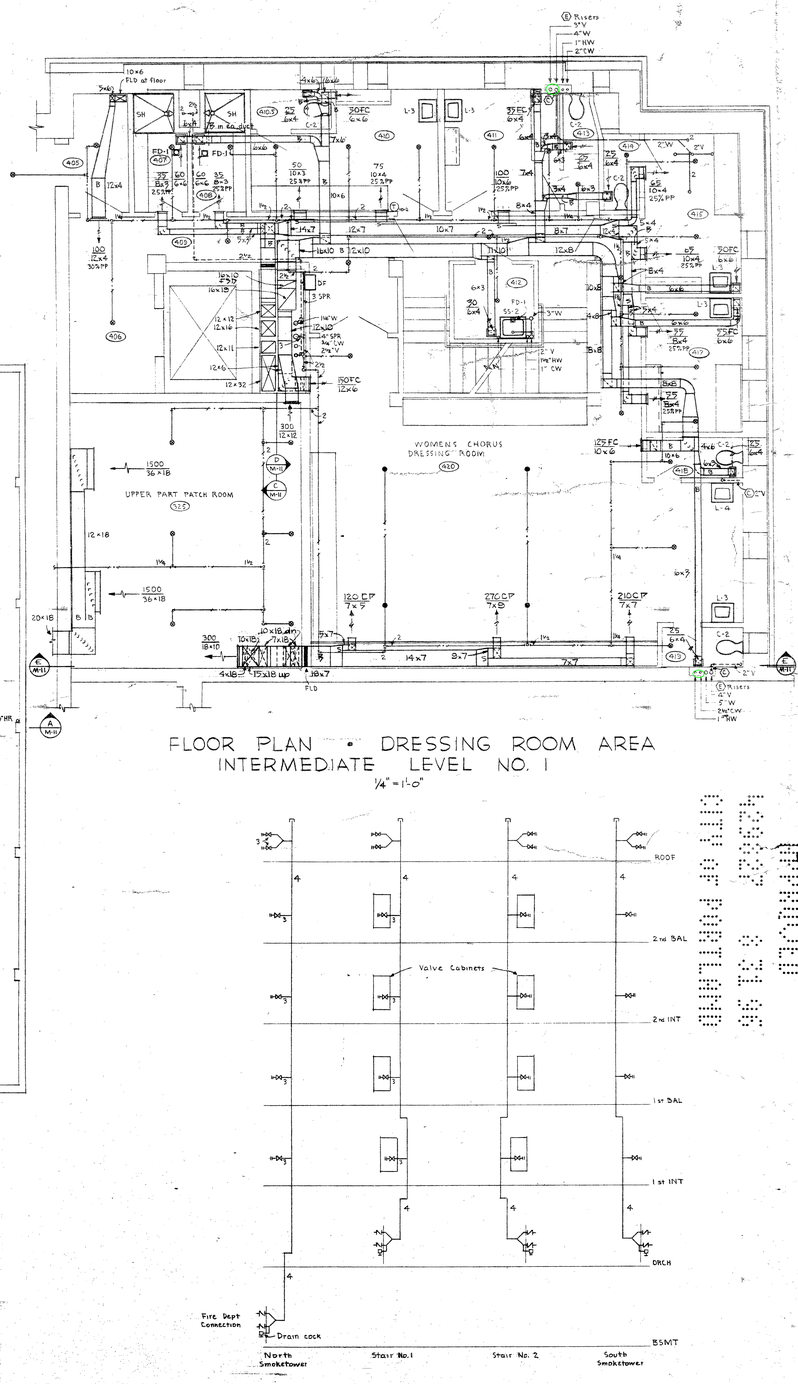
REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND
OREGON
STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER
21124
STATE OF OREGON

PORTLAND CIVIC AUDITORIUM
S.W. 3RD AVE. & CLAY ST.
PORTLAND, OREGON



FLOOR PLAN - INTERMEDIATE LEVEL NO. 1
1/8"=1'-0"



FLOOR PLAN - DRESSING ROOM AREA
INTERMEDIATE LEVEL NO. 1
1/4"=1'-0"

DRY STANDPIPE DIAGRAM
No scale

KEITH MAGUIRE
PORTLAND, OREGON
REGISTERED ARCHITECT
STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER
3124
Robert E. Kelley
PRINCIPAL DESIGNER

MECHANICAL
INTERMEDIATE LEVEL NO. 1 PLAN AND DETAILS

B. MARCUS PRITECA ARCHITECT THEATER CONSULTANT PAUL VENECLASEN & ASSOCIATES ACOUSTICAL CONSULTANTS COOPER & ROSE & ASSOCIATES STRUCTURAL ENGINEERS J. DONALD KROEGER & ASSOCIATES MECHANICAL ENGINEERS GRANT KELLEY & ASSOCIATES ELECTRICAL ENGINEERS LILA COLWELL A.I.D. INTERIOR CONSULTANT	REBUILDING OF PORTLAND CIVIC AUDITORIUM S. W. THIRD AVENUE & CLAY STREET FOR CITY OF PORTLAND, OREGON DRAWING M-5 STANTON, BOLES, MAGUIRE & CHURCH ARCHITECTS 208 S. W. STARK ST., PORTLAND 4, OREGON COMM. NO. 6323 DATE: MAY 24 1966 DRAWN CHECKED

FLOOR PLAN - FIRST BALCONY LEVEL

1/8"=1'-0"

FLOOR PLAN - DRESSING ROOM AREA FIRST BALCONY LEVEL

1/4"=1'-0"

TYPICAL DEC DETAIL

No scale

SECTION (A/MG) TYPICAL PIPE RACK

1/2"=1'-0"

THERMOSTAT ENCLOSURES FOR ZONES 9-5 AND 9-8

1½"=1'-0"

DETAIL OF TYPICAL DSP VALVE CABINET

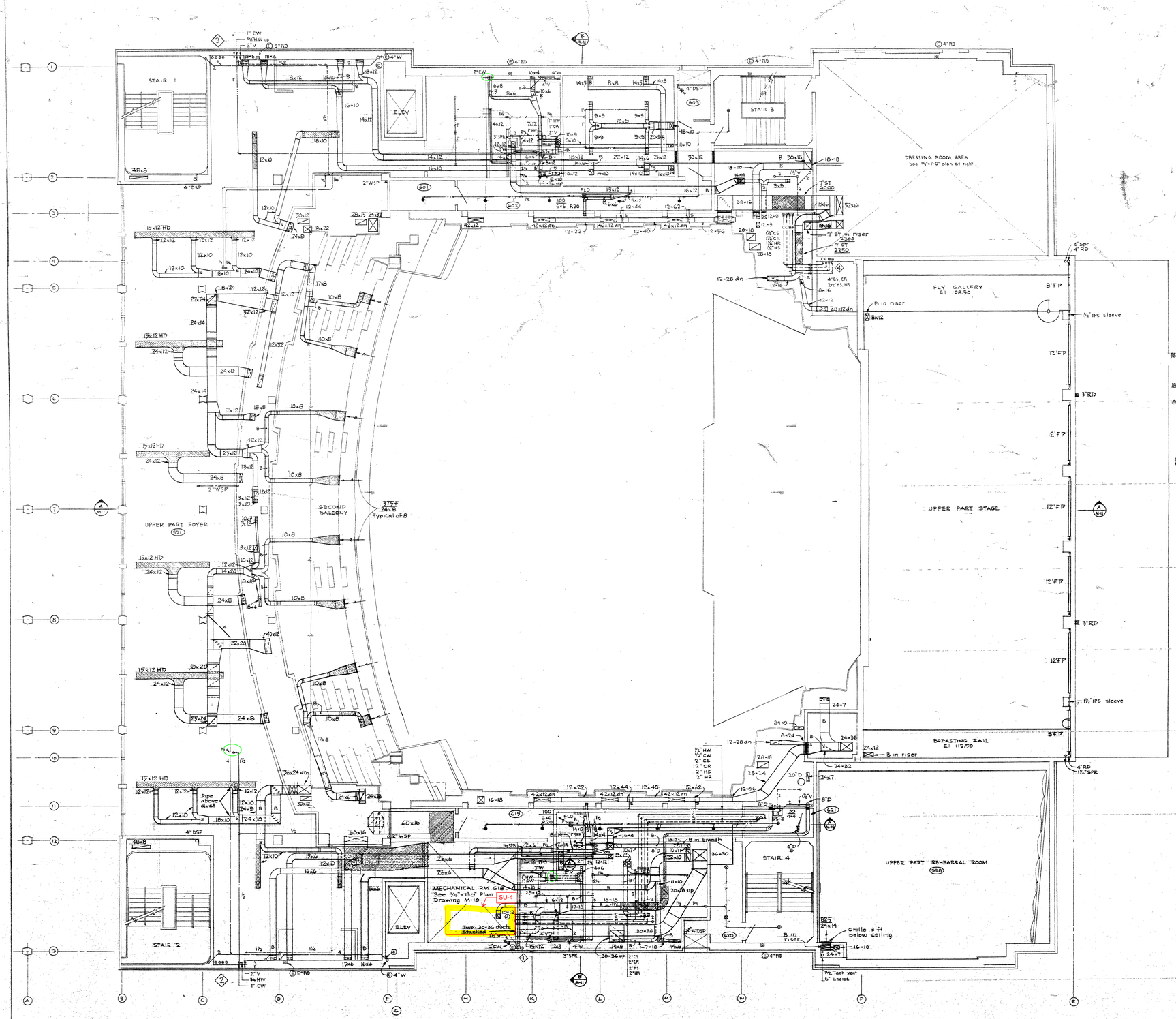
1½"=1'-0"

MECHANICAL
FIRST BALCONY FLOOR PLAN AND DETAILS

B. MARCUS PRITECA, ARCHITECT, THEATER CONSULTANT PAUL VENECLASEN & ASSOCIATES, ACOUSTICAL CONSULTANTS COOPER & ROSÉ & ASSOCIATES, STRUCTURAL ENGINEERS J. DONALD KROEKER & ASSOCIATES, MECHANICAL ENGINEERS GRANT KELLEY & ASSOCIATES, ELECTRICAL ENGINEERS LILA COLWELL A.I.D., INTERIOR CONSULTANT	REBUILDING OF PORTLAND CIVIC AUDITORIUM S. W. THIRD AVENUE & CLAY STREET FOR CITY OF PORTLAND OREGON
DRAWING M-6	STANTON, BOLES, MAGUIRE & CHURCH ARCHITECTS 208 S. W. STARK ST., PORTLAND 4, OREGON COMM. NO. 6323 DATE: MAY 24 1966 DRAWN CHECKED

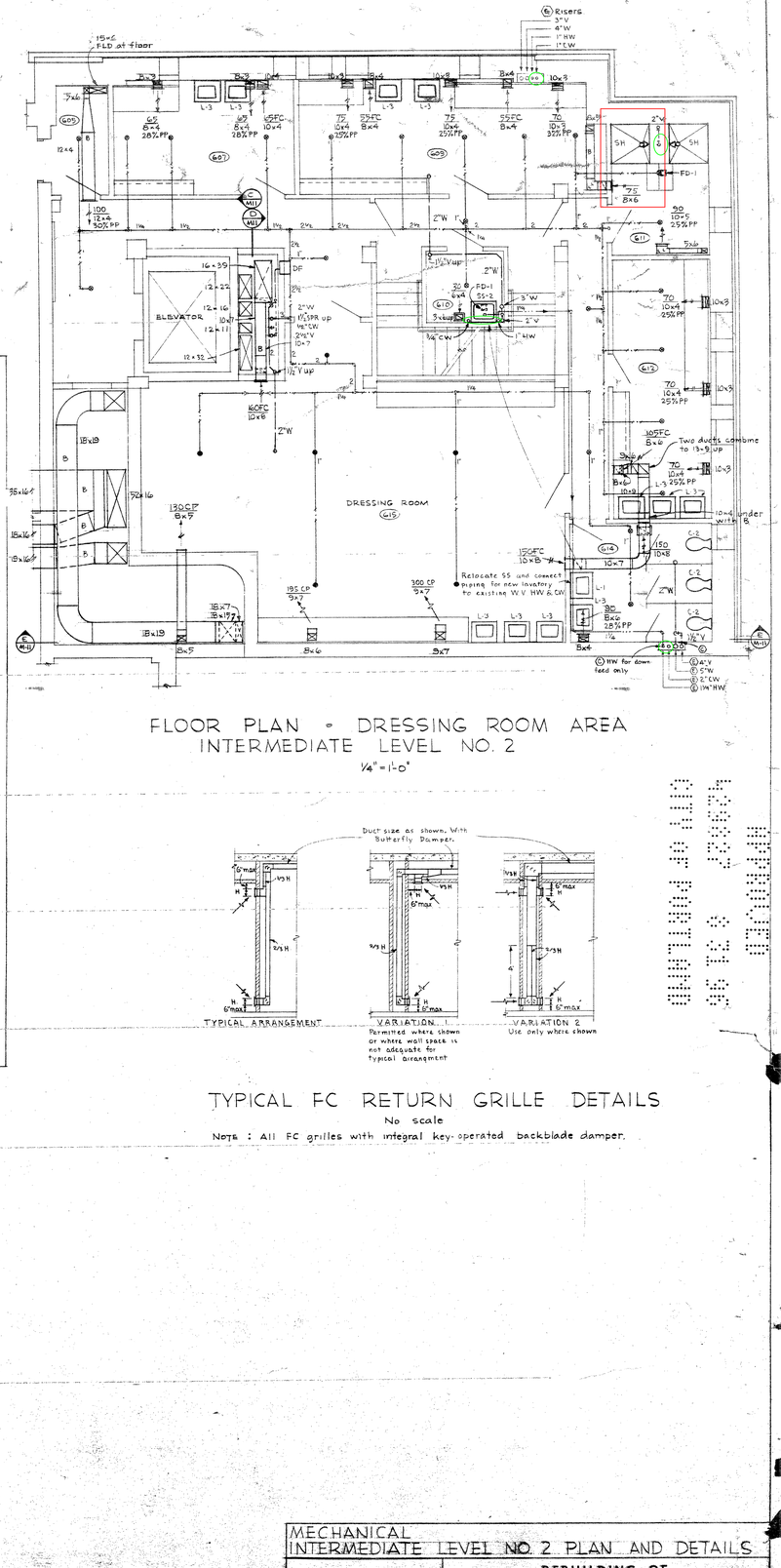
REGISTERED ARCHITECT KEITH MAGUIRE PORTLAND, OREGON STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER 3124 ROBERT L. SELLING



FLOOR PLAN - INTERMEDIATE LEVEL NO. 2

1/8"=1'-0"



FLOOR PLAN - DRESSING ROOM AREA
INTERMEDIATE LEVEL NO. 2

1/4"=1'-0"

TYPICAL FC RETURN GRILLE DETAILS

No scale

NOTE : All FC grilles with integral key-operated backblade damper.

CITY OF PORTLAND
APR 12 1966
APPROVED

MECHANICAL
INTERMEDIATE LEVEL NO. 2 PLAN AND DETAILS

B. MARCUS PRITEKA
ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL A.I.D.
INTERIOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING M-7

STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE: MAY 24 1966
DRAWN
CHECKED

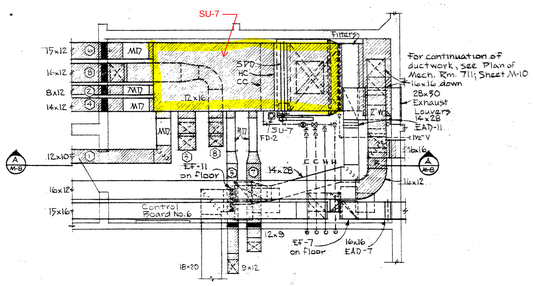
REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND, OREGON
STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER
3124
JOHN L. BOLES
STATE OF OREGON

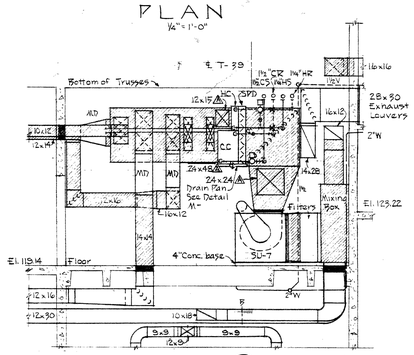
SU-10
SU-7
SU-9
See Plan Mechanical Room 711 Sheet M-10
See Plan Mechanical Room 709 This Sheet
Sound attenuate to Mech. Room
Note: First 5'-ft of all ductwork from return grilles in Auditorium sound attenuated
Sound attenuate up to Mech Room
SU-1
SU-2
SU-8
See Plan Mechanical Room 727 This Sheet

FLOOR PLAN - SECOND BALCONY LEVEL
1/8"=1'-0"

SU-7

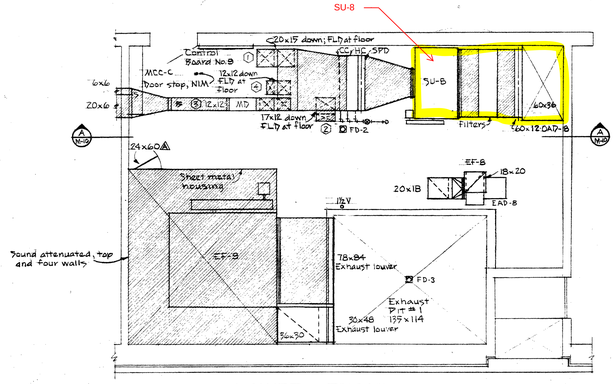


PLAN
1/4"=1'-0"



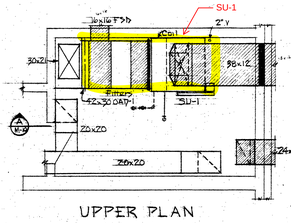
SECTION A M-8
MECHANICAL ROOM 709

SU-8



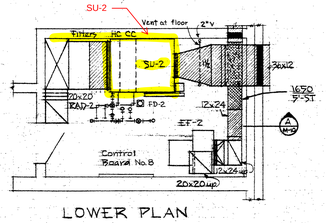
LOWER PLAN
MECHANICAL ROOM 725

SU-1



UPPER PLAN

SU-2



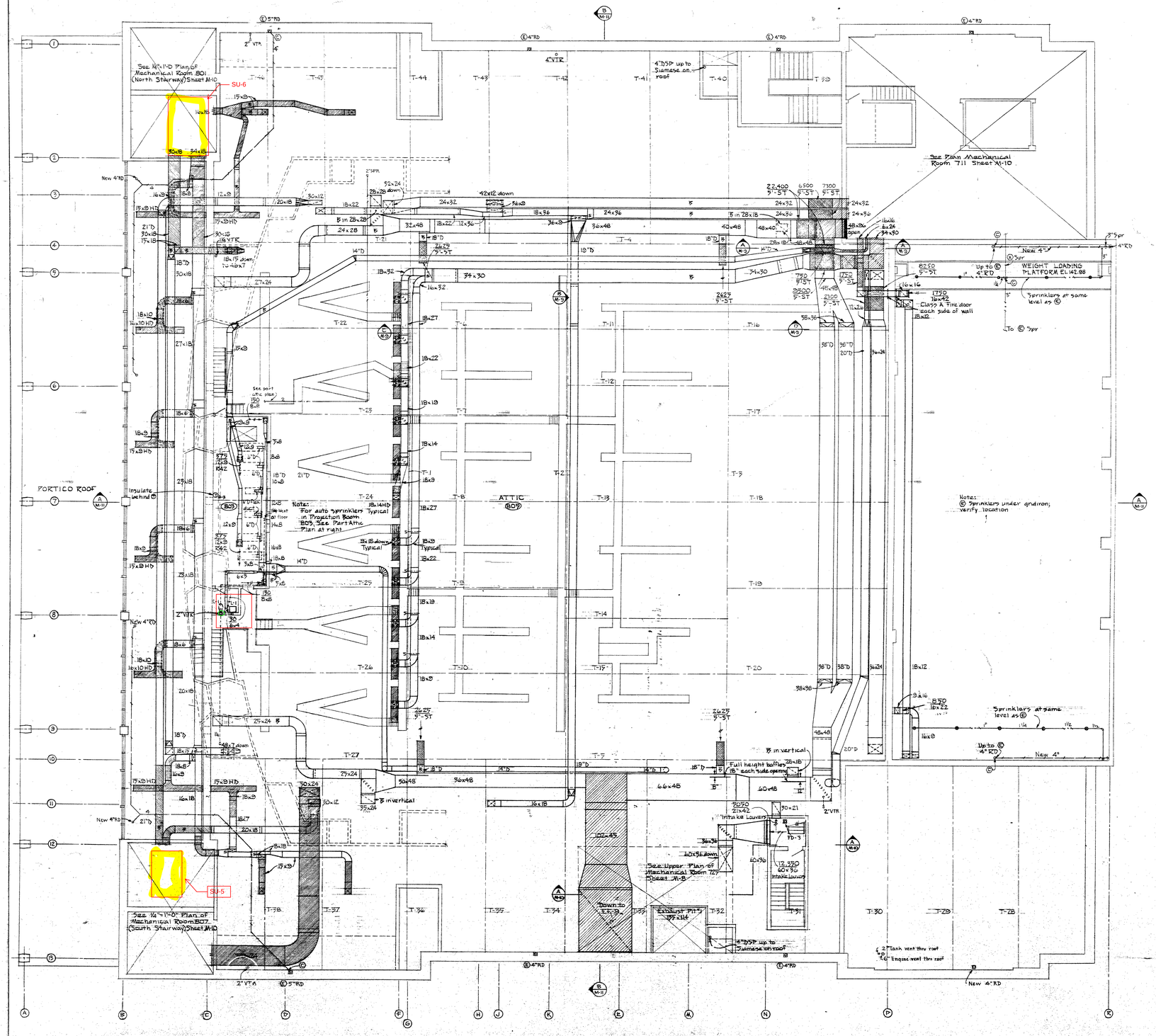
LOWER PLAN
MECHANICAL ROOM 727

MECHANICAL
SECOND BALCONY FLOOR PLAN AND DETAILS

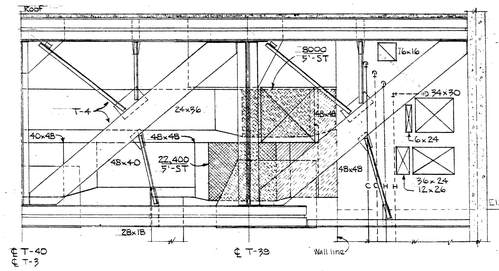
b. MARCUS PRITEKA ARCHITECT THEATER CONSULTANT PAUL VENEKLASEN & ASSOCIATES ACOUSTICAL CONSULTANTS COOPER & ROSE & ASSOCIATES STRUCTURAL ENGINEERS J. DONALD KROEKER & ASSOCIATES MECHANICAL ENGINEERS GRANT KELLEY & ASSOCIATES ELECTRICAL ENGINEERS LILA COLWELL A.I.D. (INTERIOR CONSULTANT)	REBUILDING OF PORTLAND CIVIC AUDITORIUM S. W. THIRD AVENUE & CLAY STREET FOR CITY OF PORTLAND OREGON DRAWING M-8 STANTON, BOLES, MAGUIRE & CHURCH ARCHITECTS 208 S. W. STARK ST., PORTLAND-4, OREGON COMM NO. 6323 DRAWN DATE: MAY 24 1966 CHECKED

REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND, OREGON
STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER
3124
ROBERT E. SELLERS



ATTIC PLAN
⅛"=1'-0"

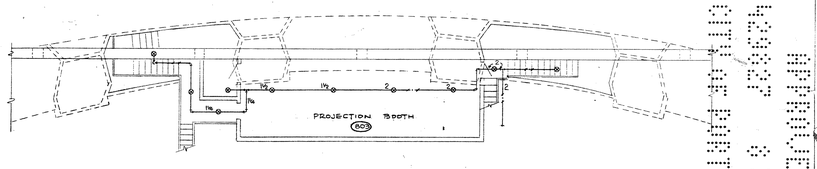


SECTION Ⓐ M-9 ¼"=1'-0"

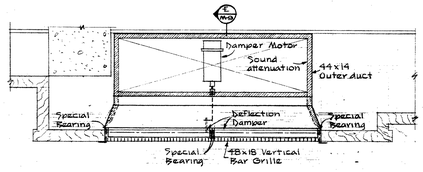
SECTION Ⓑ M-9 ¼"=1'-0"

SECTION Ⓒ M-9 ¼"=1'-0"

SECTION Ⓓ M-9 ¼"=1'-0"



PART ATTIC PLAN - SPRINKLERS IN PROJECTION BOOTH
1/8"=1'-0"



PLAN
1"=1'-0"

SECTION Ⓔ M-9 1"=1'-0"

SECTION AT GRILLE ¼"=1"

DETAILS OF TYPICAL HIGH SIDEWALL SUPPLY GRILLES IN AUDITORIUM WITH DD

REGISTERED ARCHITECT KEITH MAGUIRE PORTLAND, OREGON STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER 3124 ROBERT E. SALMON

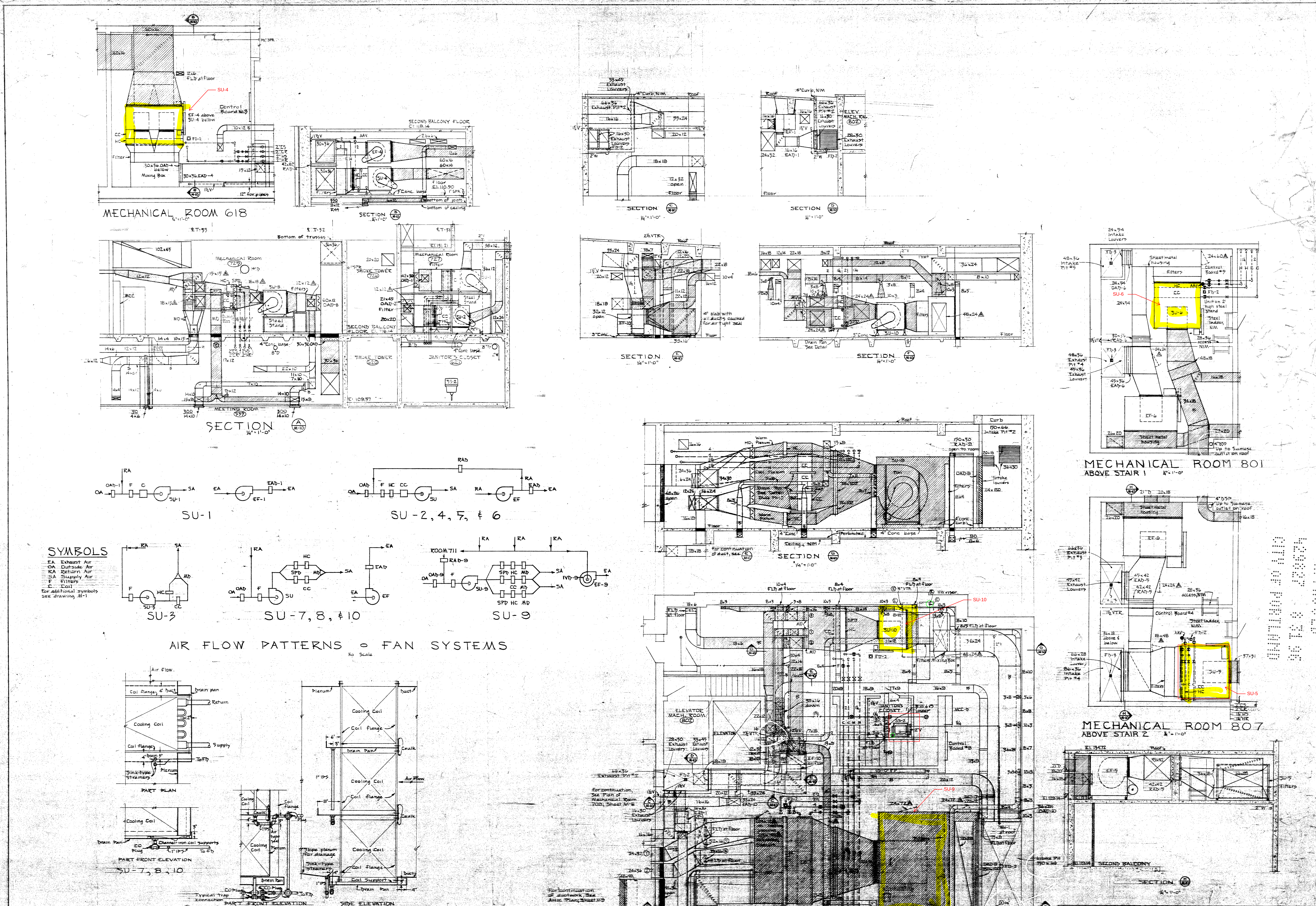
MECHANICAL
ATTIC PLAN AND DETAILS

B. MARCUS PRITECA ARCHITECT THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES STRUCTURAL ENGINEERS
I. DONALD KROEKER & ASSOCIATES MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES ELECTRICAL ENGINEERS
LILA COLWELL A.I.D. INTERIOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING M-9

STANTON, BOLES, MAGUIRE & CHURCH ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE: MAY 24 1966
DRAWN
CHECKED



MECHANICAL
MECHANICAL ROOM DETAILS

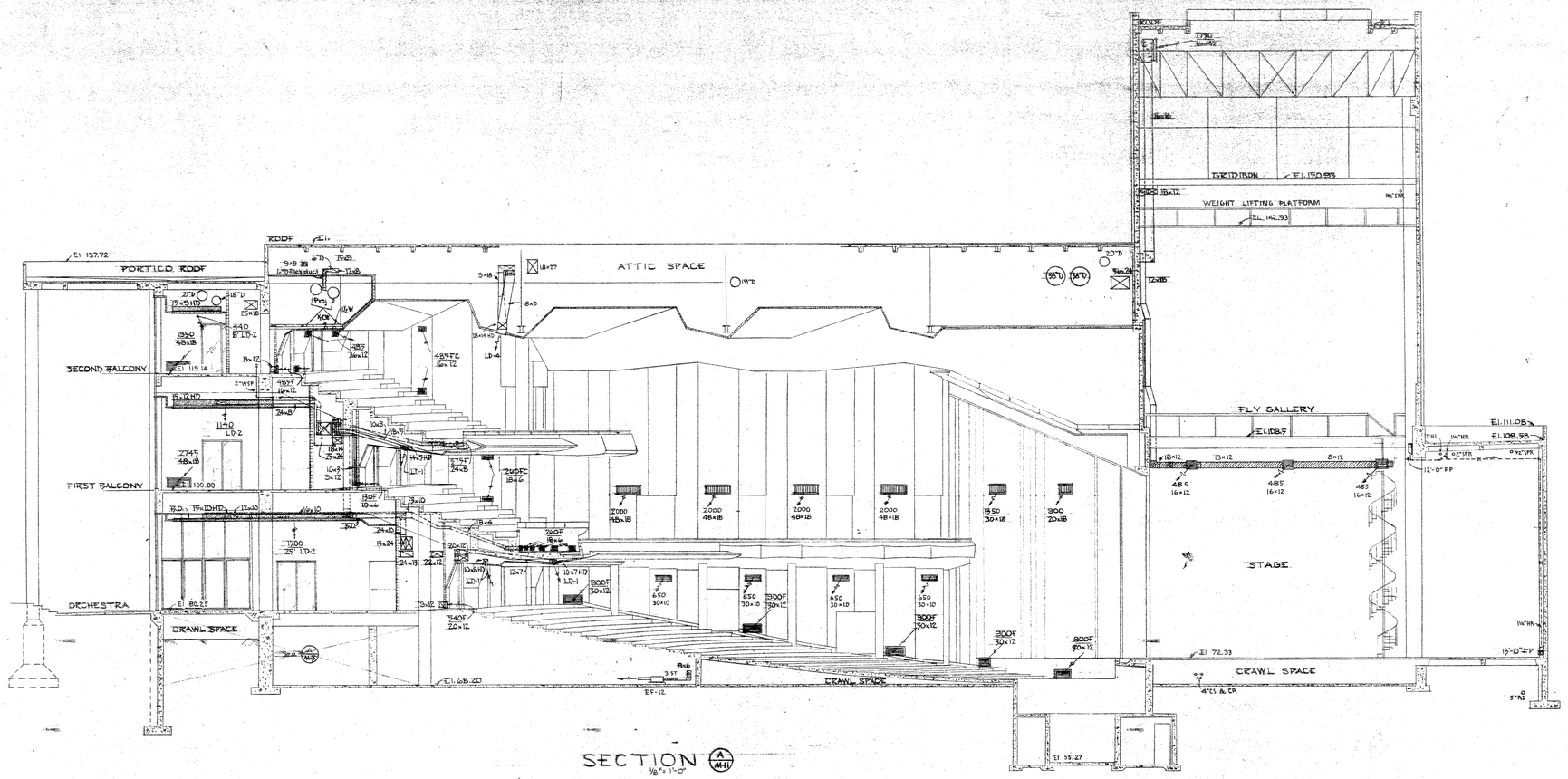
B. MARCUS PRITECA
ARCHITECT
THEATRE CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT BESLEY & ASSOCIATES
ELECTRICAL ENGINEERS

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
FOR
CITY OF PORTLAND, OREGON

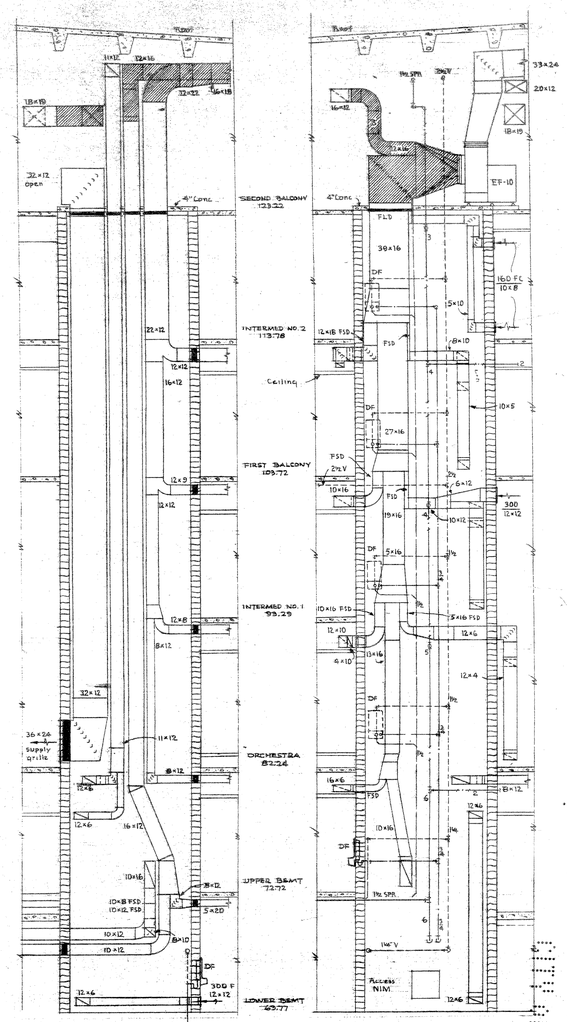
DRAWING
M-10

ARCHITECTS

1966



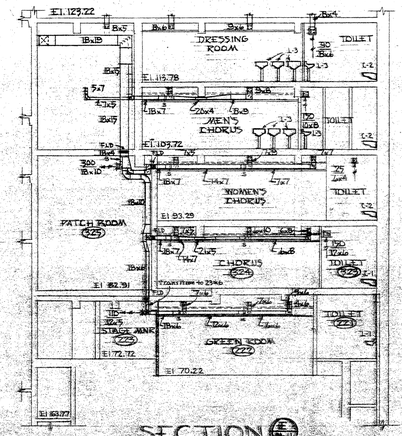
SECTION A M-11
1/8"=1'-0"



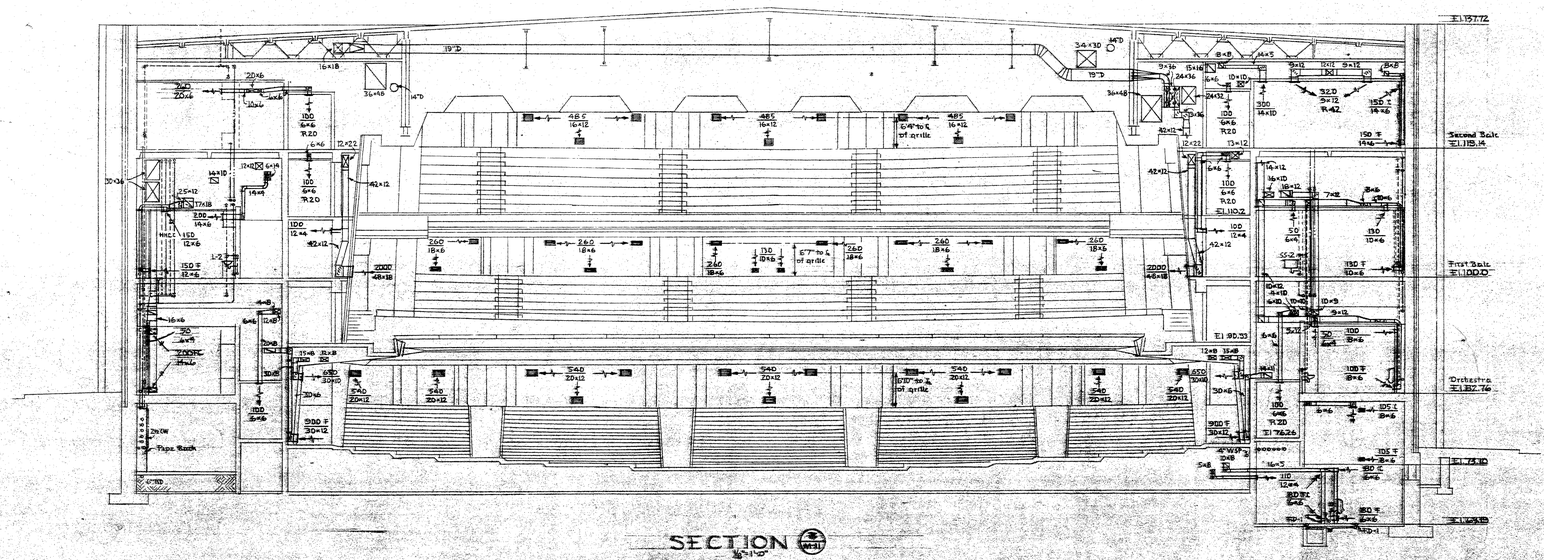
SECTION C M-11 LOOKING WEST

SECTION D M-11 LOOKING EAST

DUCT SHAFT DETAILS - DRESSING ROOM AREA
1/4"=1'-0"



SECTION E M-11
1/4"=1'-0"



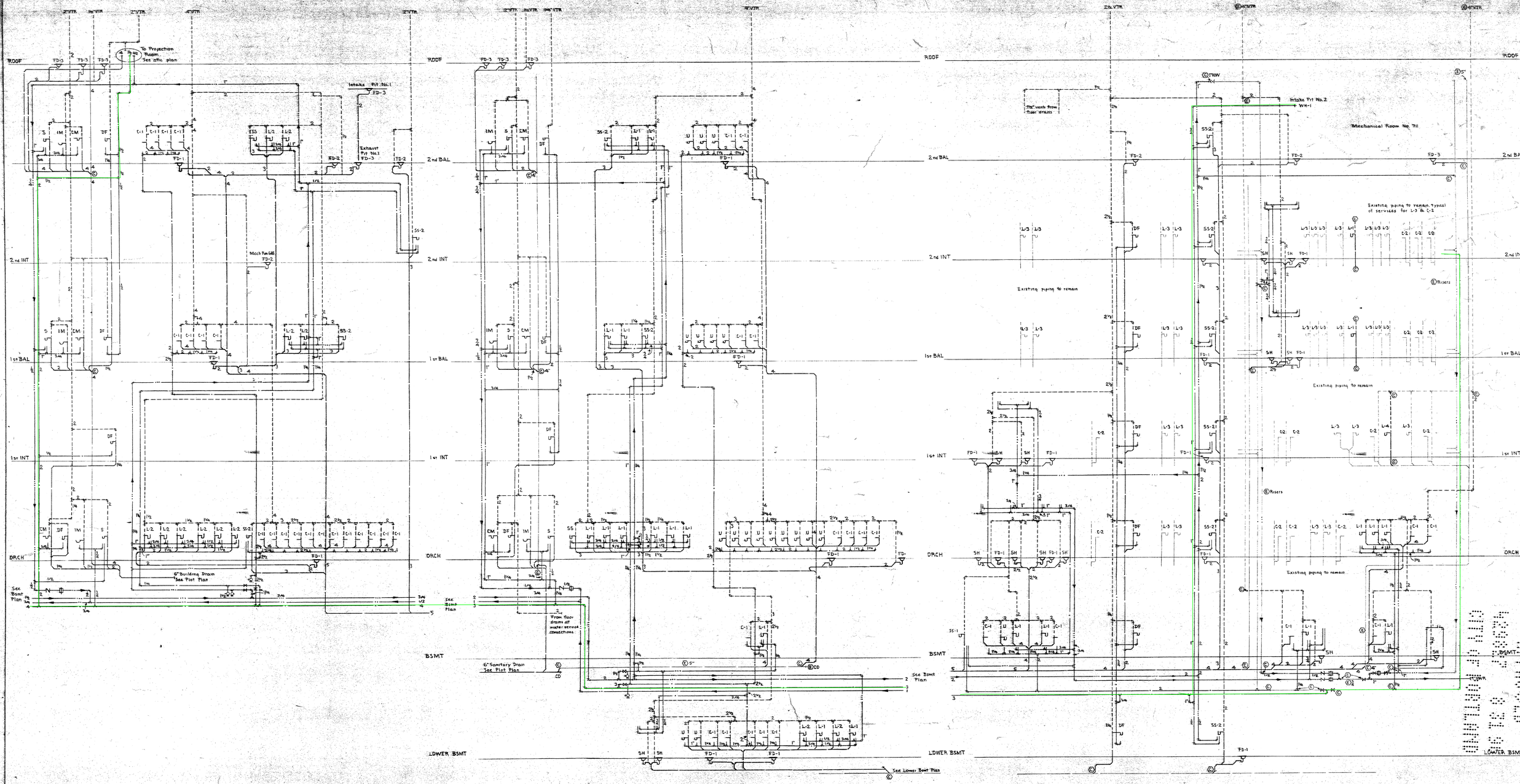
SECTION E M-11
1/4"=1'-0"

REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND OREGON
STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER
3125
STATE OF OREGON

MECHANICAL
BUILDING SECTIONS AND DETAILS

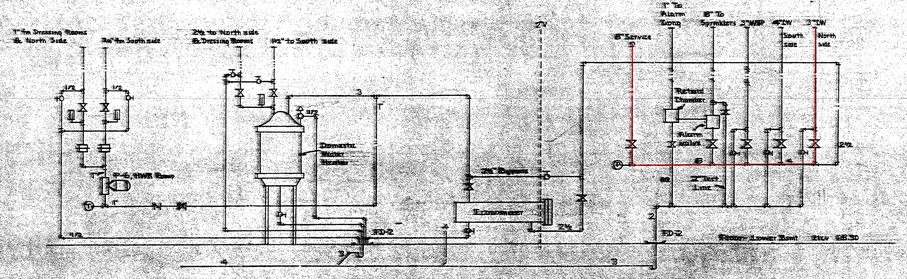
A. MARCEL PROTECA, ARCHITECT THEATRE CONSULTANT PAUL VENEKLASEN & ASSOCIATES ACOUSTICAL CONSULTANTS COOPER & ZIEGLER ASSOCIATES STRUCTURAL ENGINEERS J. DONALD KIRKER & ASSOCIATES MECHANICAL ENGINEERS GRANT KELLEY & ASSOCIATES ELECTRICAL ENGINEERS H.A. COLWELL A.I.D. INTERIOR CONSULTANT	REBUILDING OF PORTLAND CIVIC AUDITORIUM S.W. THIRD AVENUE & CLAY STREET FOR CITY OF PORTLAND, OREGON
DRAWING M-11	STANTON, BOOTH, MAGUIRE & CHURCH ARCHITECTS 520 S.W. STARK ST., PORTLAND 4, OREGON ZONAL NO. 6523 DATE: MAY 24 1956



SOUTH SIDE NORTH SIDE DRESSING ROOM AREA

PART PLUMBING RISER DIAGRAMS

No scale



PIPING DIAGRAM - WATER SERVICE CONNECTIONS

No scale

Note
See Floor Plan of Room 228, Drawings M-2 & M-3

REGISTERED ARCHITECT KEITH MAGUIRE Keith Maguire PORTLAND OREGON STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER EDA Edward D. Avery STATE OF OREGON

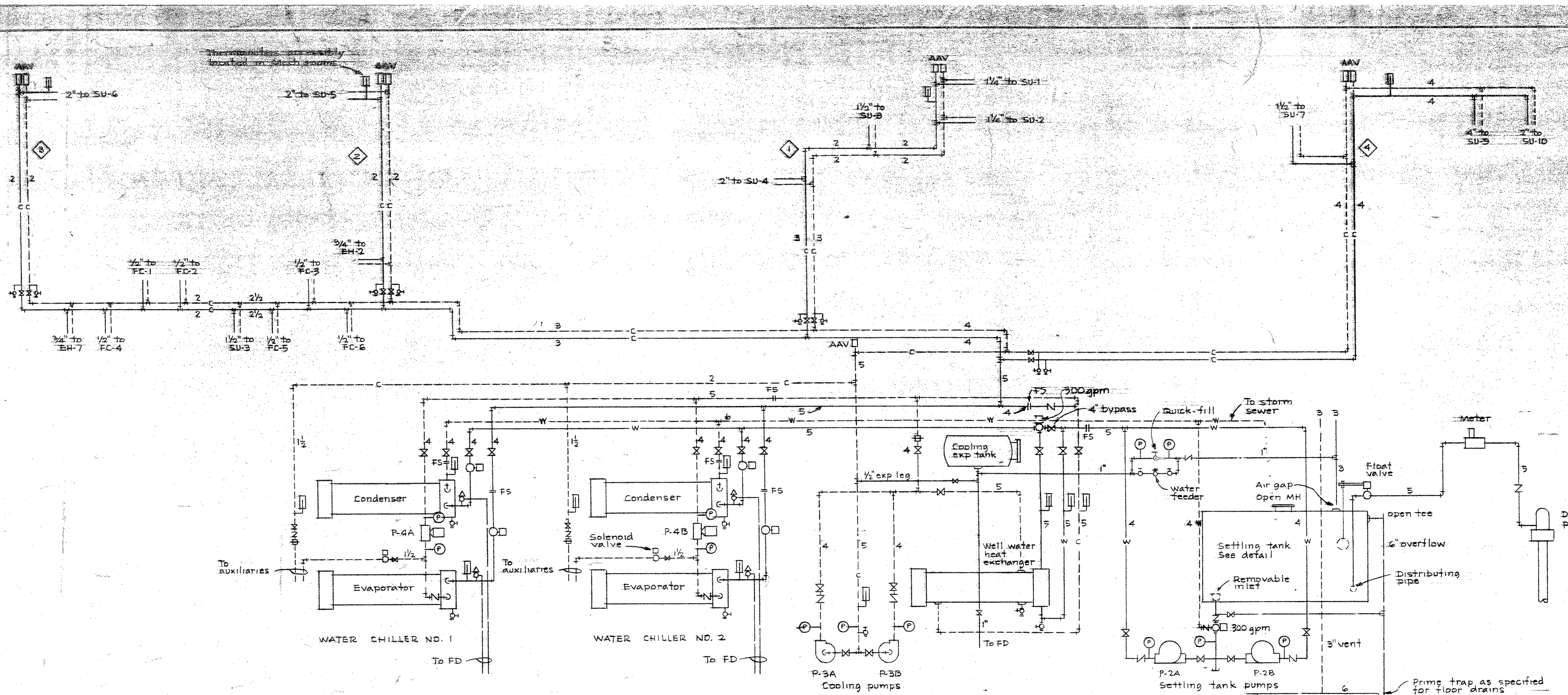
MECHANICAL
PLUMBING PIPING DIAGRAMS

B. MARCUS PRITEKA
ARCHITECT
WATER CONSULTANT
PAUL WESTLAKEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROSER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL A.I.D.
INTERIOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING M-12

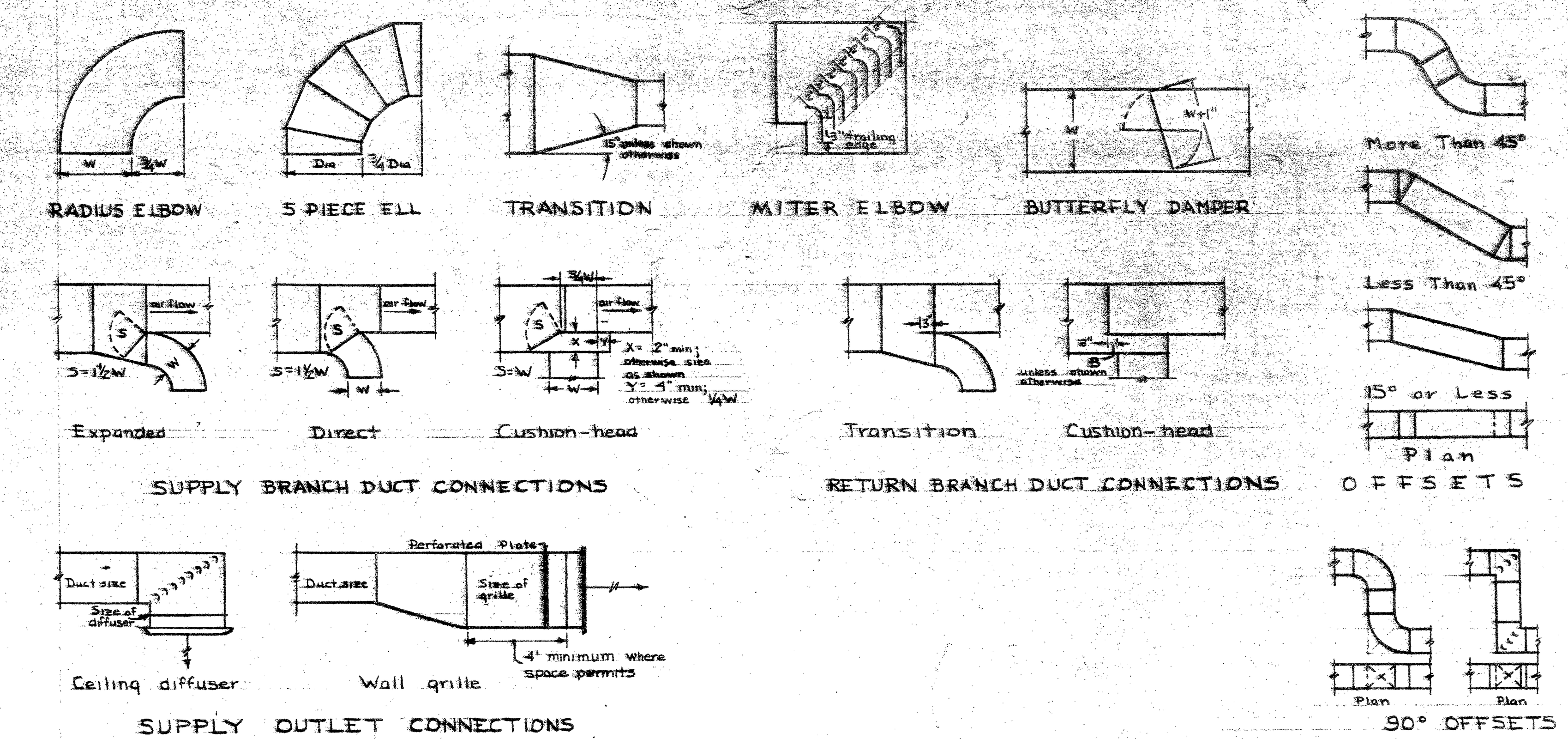
STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
228 S. W. STARK ST., PORTLAND 4, OREGON
CONTR. NO. 5323 DRAWN
DATE: MAY 24 1956 TRACED



COOLING SYSTEM PIPING DIAGRAM

No scale

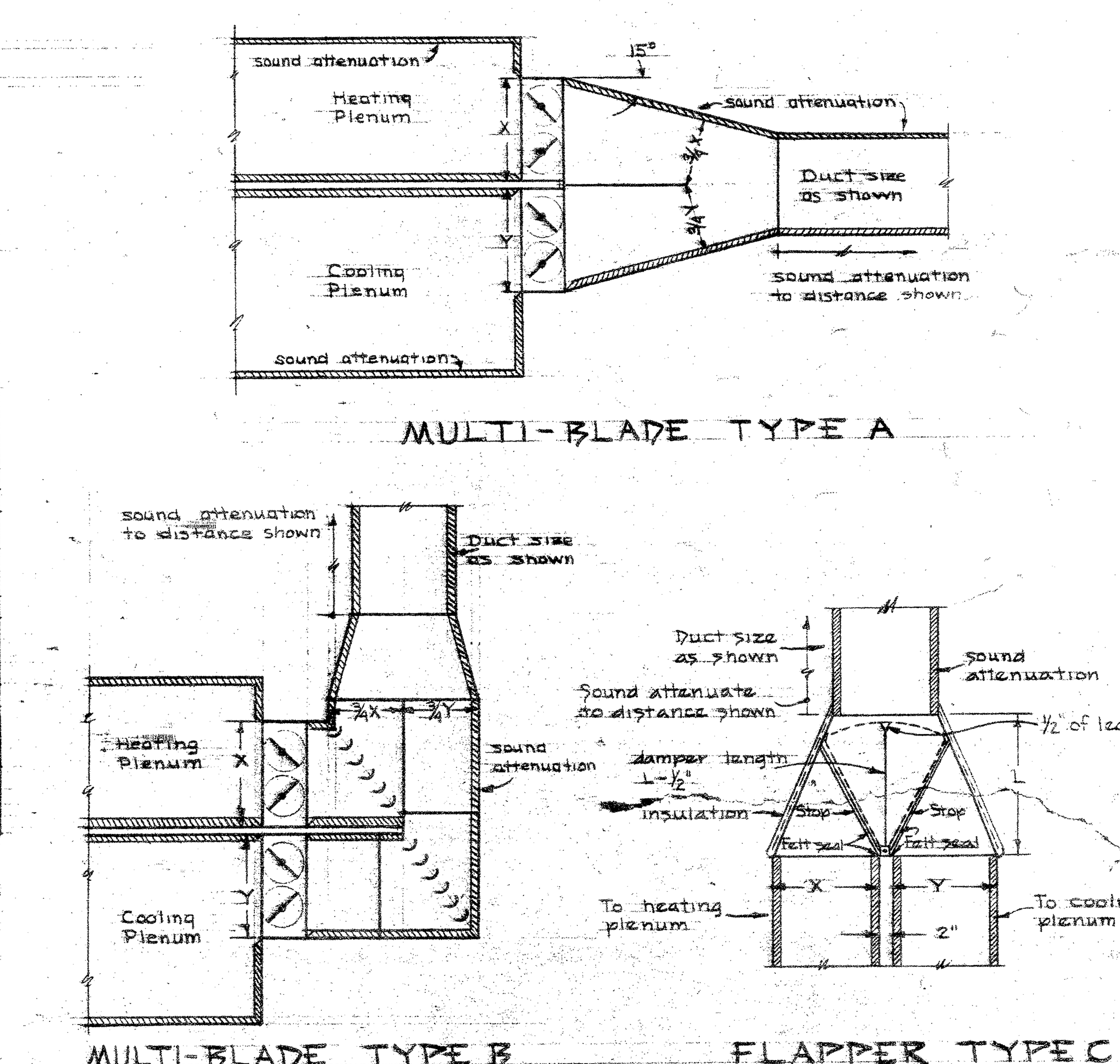
Note: Pipe sizes shown for branch piping to equipment are for both supply and return.



TYPICAL DUCT CONSTRUCTION DETAILS

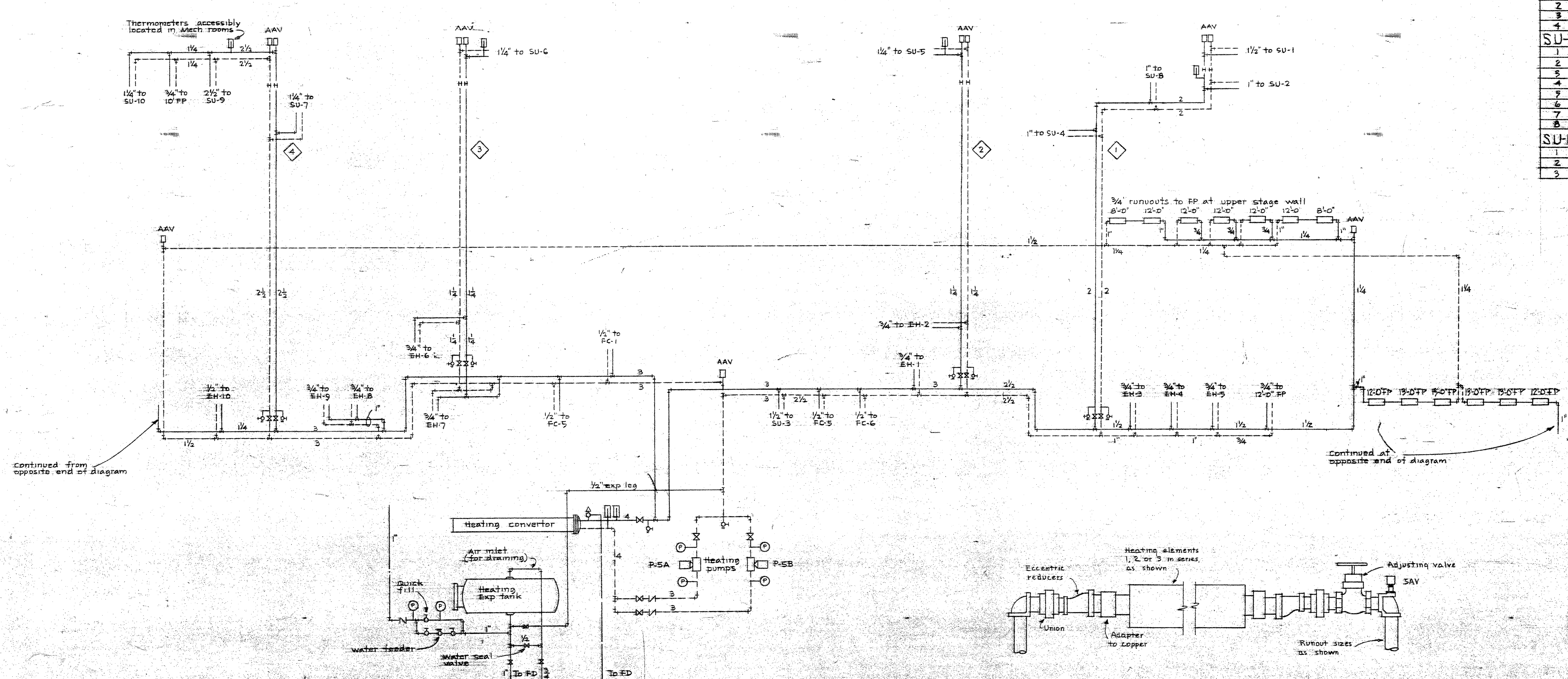
No Scale

MIXING DAMPER SCHEDULE							
UNIT ZONE	CFM	Damper Dimensions (inches) Width	Depth X (warm)	Depth Y (cool)	Length L	TYPE	Room Thermostat Location
SU-7							
1	610	14	12	12	22	C	703
2	500	10	14	14	22	C	202
3	1200	16	16	16	22	C	306
4	1000	16	14	14	22	C	401
5	550	9	18	18	22	C	404
6	1100	17	14	14	22	C	506
7	580	9	18	18	22	C	509
8	1280	14	18	18	22	C	708
SU-8							
1	1960	22	17	14	22	C	346
2	1250	19	14	14	22	C	535
3	720	14	14	14	22	C	721
4	800	14	14	14	22	C	421
SU-9							
1	6500	32	18	32		A	340
2	7300	38	18	32		A	528
3	750	8	18	26		A	803
4	9300	44	18	32		A	715.5
5	8250	34	18	32		A	340
6	2300	15	18	32		A	340
7	8250	15	18	32		A	340
8	2300	34	18	32		A	340
SU-10							
1	1330	14	12	16		B	107
2	2935	25	17	30		B	410
3	3900	20	30	30		B	222



MIXING DAMPERS

No Scale



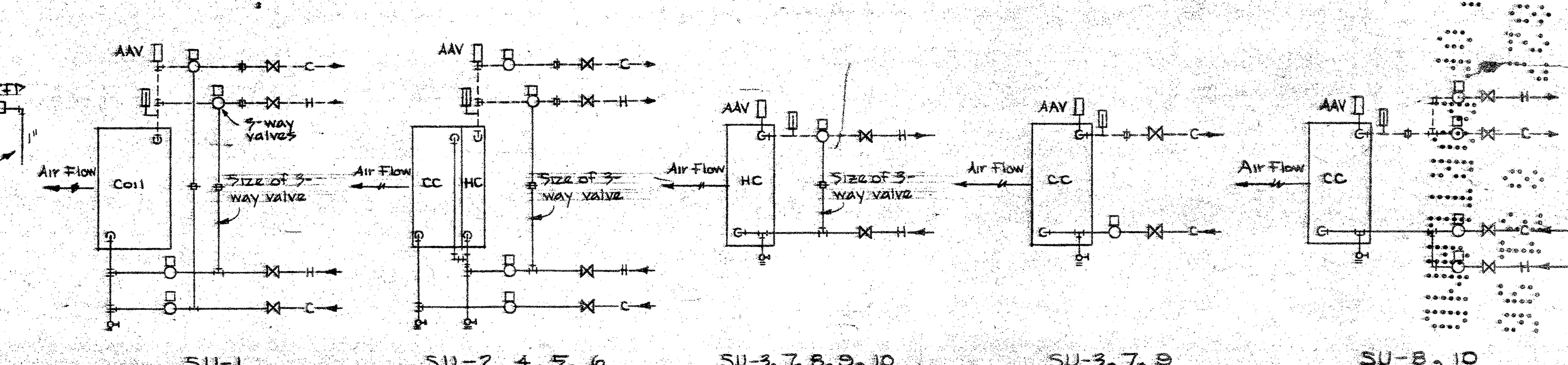
HEATING SYSTEM PIPING DIAGRAM

No scale

Note: Pipe sizes shown for branch piping to equipment are for both supply and return.

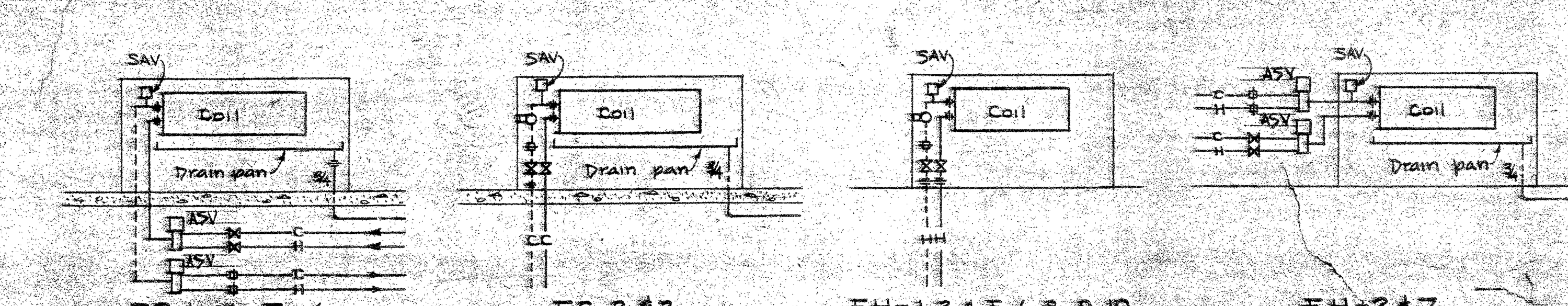
TYPICAL FP CONNECTIONS

No scale



COIL PIPING DIAGRAMS

No Scale

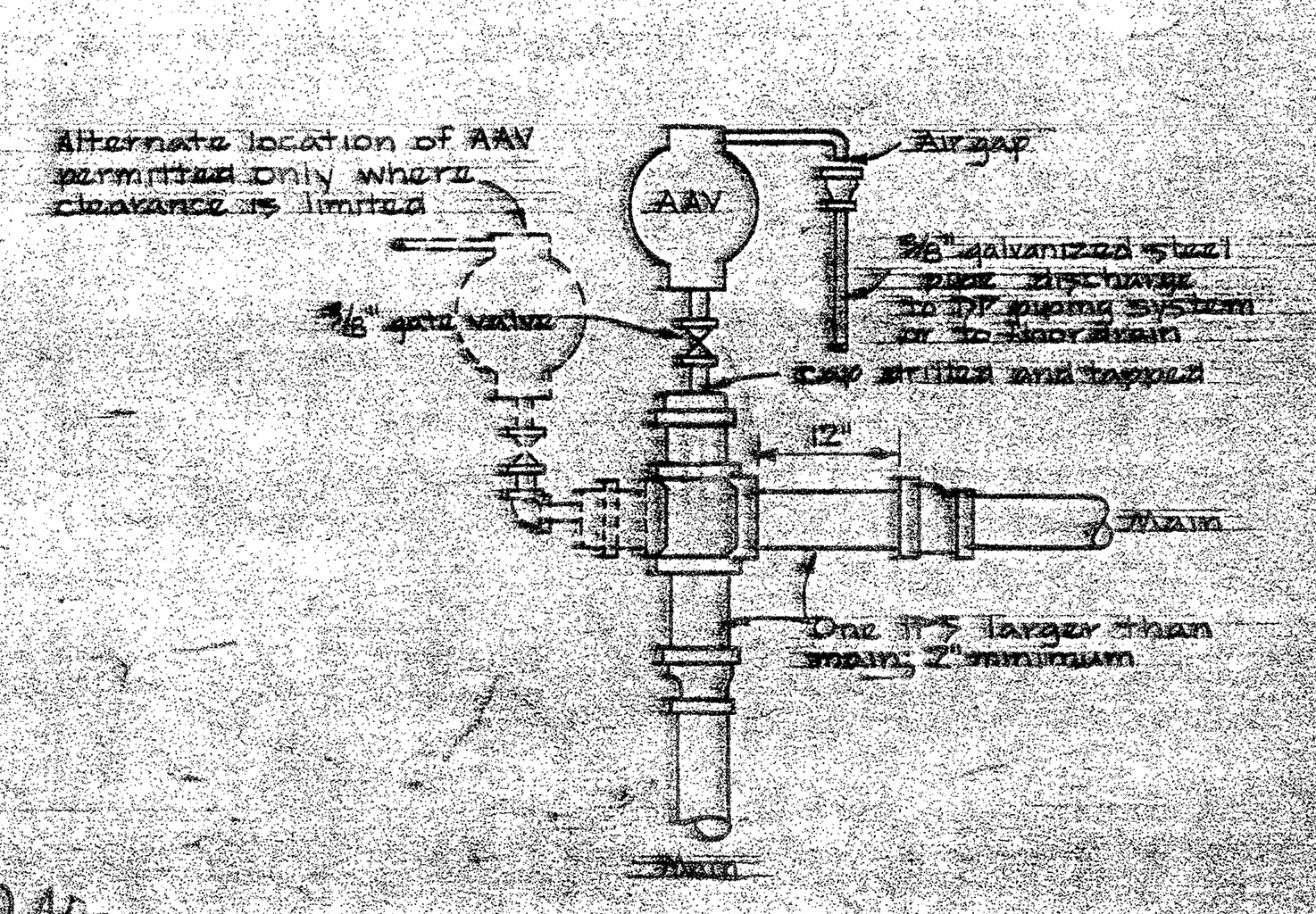


FAN COIL UNIT PIPING DIAGRAMS

No Scale

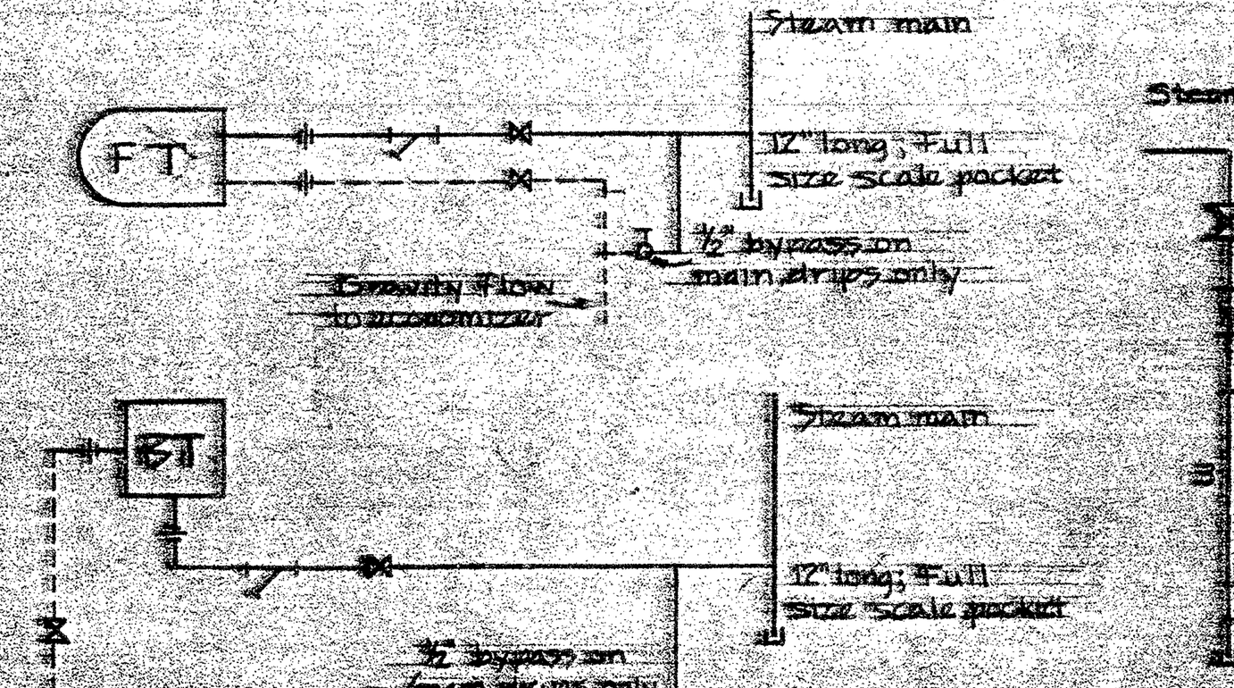
ENTRY HEATER PIPING DIAGRAMS

No Scale



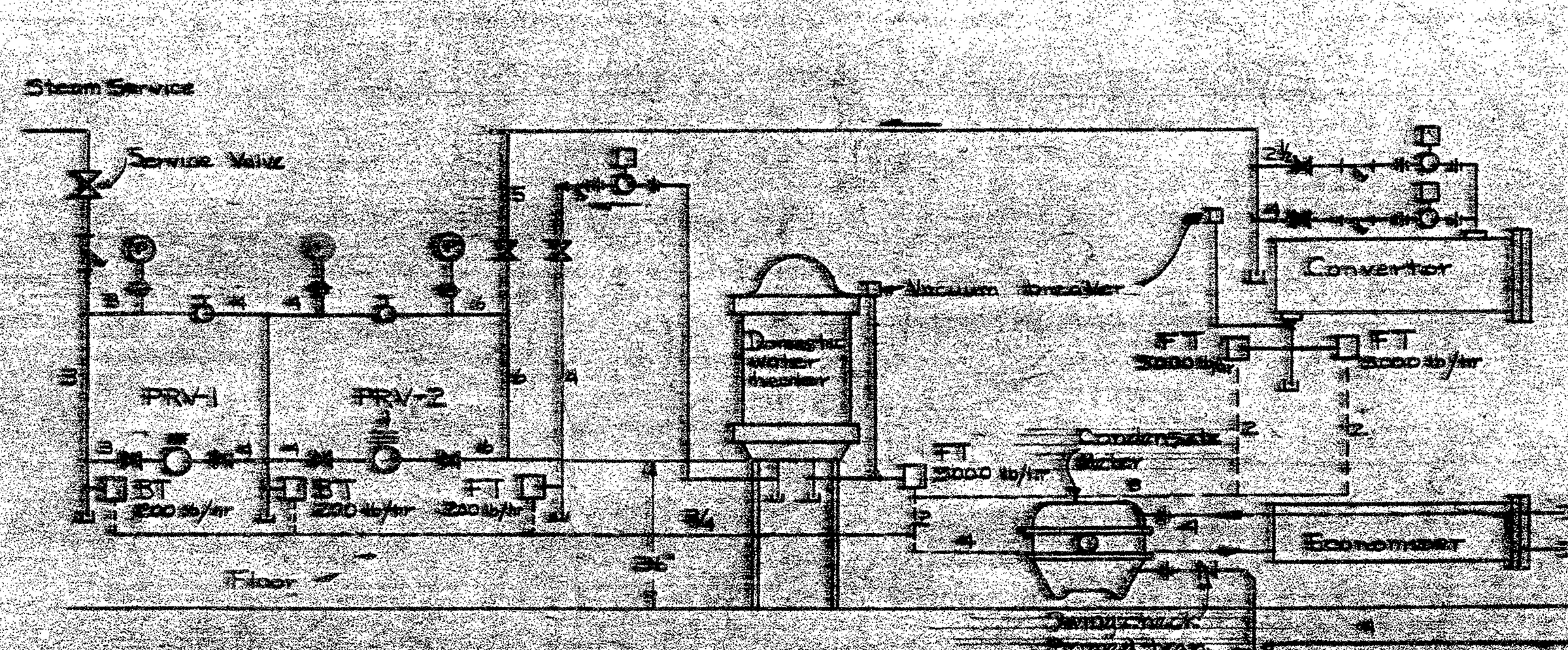
TYPICAL AAV DETAIL

No Scale



TYPICAL STEAM TRAP PIPING DIAGRAMS

No Scale



STEAM AND CONDENSATE SYSTEM PIPING DIAGRAM

No Scale

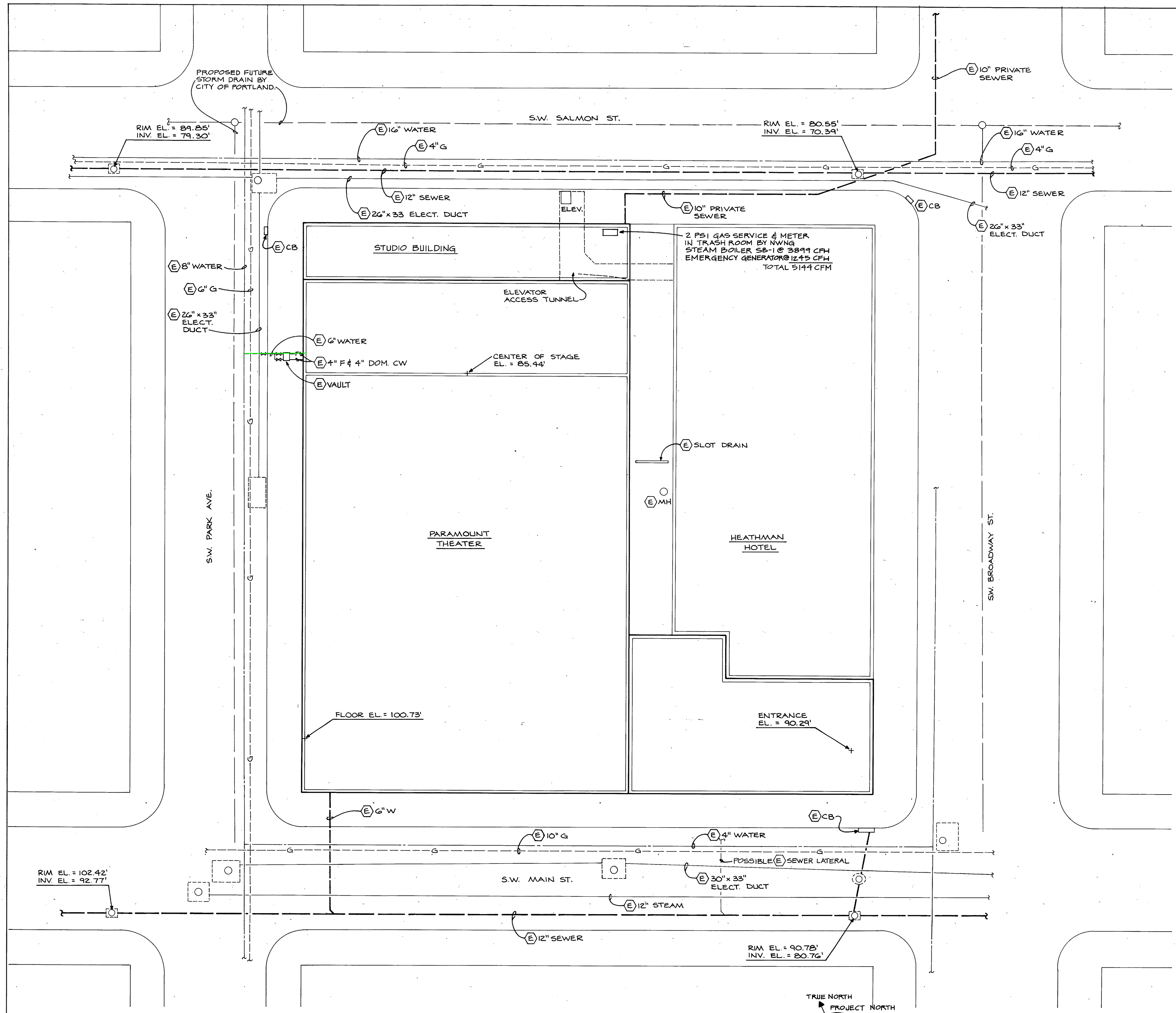
MECHANICAL
HEATING AND COOLING PIPING DIAGRAMS & DUCT DETAILS

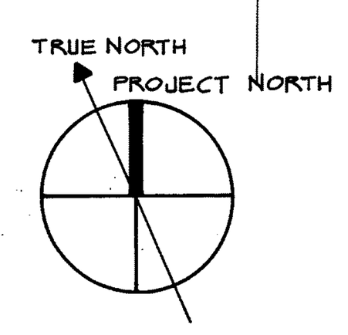
B. MARCUS PRITECA
ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING
M-13

STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS





MECHANICAL SITE PLAN

1" = 20'-0"

GENERAL NOTES

1. INFORMATION PERTAINING TO EXISTING HVAC EQUIPMENT, FIRE PROTECTION, AND PLUMBING PIPING, FIXTURES, ITEMS, ETC., SHOWN ON THESE DRAWINGS HAS BEEN TAKEN FROM C.W. & GEO. L. RAPP DRAWINGS DATED JAN. 29, 1927, AND SEVERAL SUPPLEMENT DRAWINGS, ALSO SOME FIELD INVESTIGATION.

2. THESE DRAWINGS DO NOT INDICATE ACCURATE PIPE ROUTING IN ALL AREAS. SOME CONCEALED DUCT AND PIPING RUNS & OTHER NON-VISIBLE ITEMS HAVE BEEN SHOWN IN AN ASSUMED LOCATION BUT NOT VERIFIED. THE CONTRACTOR WILL BE RESPONSIBLE FOR FIELD LOCATING ALL POINTS OF CONNECTION.

3. PRIOR TO INSTALLATION OF ANY NEW PIPING, CONTRACTOR SHALL EXPOSE ALL POINTS OF CONNECTION AND VERIFY EXACT SIZE, LOCATION, CONDITION, ELEVATION, & TYPE OF MATERIAL. HE SHALL DETERMINE THAT THE EXISTING PIPE IS THE CORRECT SIZE & THAT THE ELEVATION IS LOW ENOUGH TO ACHIEVE THE REQUIRED SLOPE BEFORE NEW PIPING IS CONNECTED; IF NOT, HE SHALL NOTIFY ARCHITECT AND NOT PROCEED WITH INSTALLATION UNTIL INSTRUCTED TO DO SO. SEE SPECIFICATIONS FOR PIPE TESTS AND CLEANING.

4. ALL EXISTING DUCTS AND PIPING WHICH ARE NO LONGER REQUIRED AND WHICH INTERFERE WITH CONSTRUCTION OR WILL BE EXPOSED SHALL BE REMOVED AND BE DISPOSED OF AS DIRECTED BY THE OWNER. IF IT IS CONCEALED AND/OR DOES NOT INTERFERE WITH CONSTRUCTION, IT MAY BE CAPPED AND ABANDONED IN PLACE. SEE SPECIFICATIONS. CAP ALL PIPING AS CLOSE TO MAIN AS POSSIBLE TO ELIMINATE DEAD END RUNS. LIMIT ALL NEW & EXISTING CAPPED DEAD END RUNS TO 2'-0" MAXIMUM FOR ALL SERVICES EXCEPT INACCESSIBLE BELOW GRADE WASTE PIPING.

5. ALL EXISTING MECHANICAL EQUIPMENT, FIRE PROTECTION ITEMS, PLUMBING FIXTURES, & APPURTENANCES WHICH ARE REMOVED AND NOT RELOCATED SHALL BE TURNED OVER TO THE OWNER. SEE SPECIFICATIONS & NOTE 9.

6. ALL EXISTING MECHANICAL EQUIPMENT, PLUMBING, AND FIRE PROTECTION ITEMS & APPURTENANCES WHICH ARE TO BE RELOCATED UNDER THIS CONTRACT SHALL BE COMPLETELY CLEANED AND INSPECTED. IF REPAIR IS REQUIRED TO PUT THEM IN A SATISFACTORY WORKING CONDITION, NOTIFY OWNER BEFORE REINSTALLING.

7. ALL INVERT ELEVATIONS, PIPE SIZES, LOCATIONS, AND DEVIATIONS FROM CONTRACT DRAWINGS, INCLUDING EXISTING, SHALL BE RECORDED ON AS-BUILT DRAWINGS.

8. ALL END OF PIPING RUN LAVATORIES, SINKS, AND DRINKING FOUNTAINS SHALL HAVE A WALL CLEANOUT BELOW FIXTURE.

9. REMOVE EXISTING FIXTURES, EQUIPMENT, AND ALL LOCAL RELATED PIPING, FITTINGS, AND APPURTENANCES WHERE INDICATED AND AS REQUIRED. CAP ALL SERVICE PIPING IN A CONCEALED LOCATION. SEE NOTE 4.

10. REFER TO ARCHITECTURAL DOCUMENTS FOR EXACT LOCATION AND HEIGHT OF ALL PLUMBING FIXTURES. COORDINATE WITH ALL OTHER TRADES.

11. PRIOR TO DISCONNECTING, REMOVING, OR CAPPING ANY EXISTING SERVICES, VERIFY THAT THEY DO NOT SERVE ANY EXISTING FIXTURES OR EQUIPMENT TO REMAIN AND THAT THEY ARE NOT REQUIRED FOR NEW FIXTURES OR EQUIPMENT. IF THEY DO, LEAVE SYSTEM INTACT OR WHERE POSSIBLE AND/OR TO SIMPLIFY OR CLEAN UP SYSTEM, CONNECT TO CLOSEST NEW SERVICES. RECORD ON AS-BUILT DRAWINGS.

12. PROVIDE & INSTALL SHUTOFF VALVES ON ALL BRANCH WATER PIPING SERVING FIXTURES AND/OR GROUPS OF FIXTURES OR EQUIPMENT. INSTALL IN LIFTOUT CEILING WHERE POSSIBLE, BEHIND CEILING OR WALL ACCESS PANELS WHERE LIFTOUT CEILING IS NOT AVAILABLE OR AS INDICATED ON THE DRAWINGS. COORDINATE WITH ARCHITECTURAL AND ALL OTHER TRADES.

13. BECAUSE OF THE SMALL SCALE OF THE DRAWINGS, IT IS NOT POSSIBLE TO INDICATE ALL OFFSETS, FITTINGS, VALVES, AND ACCESSORIES WHICH MAY BE REQUIRED. THE CONTRACTOR SHALL CAREFULLY INVESTIGATE THE CONDITIONS SURROUNDING THE INSTALLATION OF HIS WORK AND SHALL FURNISH THE NECESSARY FITTINGS, VALVES, TRAPS, ETC., WHICH MAY BE REQUIRED TO COMPLETE THE INSTALLATION IN A SATISFACTORY AND CODE APPROVED MANNER.

14. WHERE BRANCH PIPE SIZE IS NOT SHOWN ON DRAWINGS, REFER TO FIXTURE ROUGH-IN SCHEDULE FOR REQUIRED PIPE SIZE.

15. IF ANY EXISTING RISERS OR SERVICE PIPING STILL REQUIRED TO REMAIN IN SERVICE AND WHICH INTERFERES WITH NEW CONSTRUCTION IS ENCOUNTERED DURING REMODEL WORK, THE CONTRACTOR SHALL RELOCATE TO THE NEAREST ACCEPTABLE LOCATION AND RECONNECT.

16. ALL ORIGINAL INSULATION IS ASSUMED TO BE ASBESTOS TYPE. SEE SPECIFICATIONS FOR SPECIAL CONDITIONS SURROUNDING ITS HANDLING.

17. THE RECORD DRAWINGS DO NOT INDICATE THE RAIN DRAIN/STORM DRAIN ROUTING FROM BASEMENT RISER LOCATIONS TO OUTSIDE OF BUILDING. THE CONTRACTOR SHALL FIELD INVESTIGATE AND WHERE POSSIBLE, DETERMINE WHERE RAIN DRAINS EXIT BUILDING AND RECORD ON AS-BUILT DRAWINGS. IF IT IS FOUND THAT ANY RAIN DRAINS CONNECT TO SANITARY SEWER EITHER WITHIN OR OUTSIDE BUILDING, HE SHALL REPORT THIS INFORMATION TO THE ARCHITECT AND ENGINEER.

18. A NEW CODE APPROVED VALVE, RACK, HOSE, NOZZLE, AND APPURTENANCES SHALL BE INSTALLED IN ALL EXISTING FIRE HOSE CABINETS TO BE RELOCATED OR TO REMAIN.

19. ALL FIRE SPRINKLER HEADS HAVE NOT BEEN SHOWN OR SCHEDULED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE AND INSTALL A COMPLETE FIRE SPRINKLER SYSTEM IN ALL PORTIONS OF THE BUILDING EXCEPT AUDITORIUM AND OTHER AREAS THE FIRE MARSHAL HAS EXEMPTED.

20. ALL FIRE PROTECTION WITHIN THE BUILDING WHICH IS SERVED BY THE DOMESTIC WATER SERVICE INCLUDING REWORKING EXISTING FIRE HOSE CABINETS SHALL BE THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR.

21. WHERE NEW OR RELOCATED DIFFUSERS OR GRILLES ARE SHOWN, REFER TO ARCHITECTURAL CEILING PLANS & ELEVATIONS FOR THEIR EXACT LOCATION.

22. ALL ELEVATIONS SHOWN ON THESE DRAWINGS MAY BE APPROXIMATE, SEE ARCHITECTURAL DRAWING FOR ACTUAL ELEVATIONS.

LEGEND

Symbol	Abbreviation	Description
—LPS—	LPS	LOW PRESSURE STEAM SUPPLY
---LPR---	LPR	LOW PRESSURE CONDENSATE RETURN
—HWS—	HWS	HEATING WATER SUPPLY
---HWR---	HWR	HEATING WATER RETURN
—CWS—	CWS	CHILLED WATER SUPPLY
---CWR---	CWR	CHILLED WATER RETURN
—CLW—	CLW	CONDENSER LEAVING WATER
---CRW---	CRW	CONDENSER RETURN WATER
---RRV---	RRV	REFRIGERANT RELIEF VENT
—RL—	RL	REFRIGERANT LIQUID
—RS—	RS	REFRIGERANT SUCTION
—CD—	CD	CONDENSATE DRAIN
	W	SANITARY SOIL OR WASTE ABOVE FLOOR
	W	SANITARY SOIL OR WASTE BELOW FLOOR OR GRADE
—SD—	SD	STORM DRAIN ABOVE FLOOR
—SD—	SD	STORM DRAIN BELOW FLOOR OR GRADE
—OSD—	OSD	OVERFLOW STORM DRAIN ABOVE FLOOR
	V	VENT
	CW	COLD WATER
	PCW	PROCESS COLD WATER
	HW	HOT WATER
	RHW	RECIRCULATED HOT WATER
—F—	F	FIRE PROTECTION (WET)
—FS—	FS	FIRE PROTECTION (SPRINKLER FROM FCS)
—DP—	DP	FIRE PROTECTION (DRY)
—WSP—	WSP	WET STANDPIPE (CLASS II FROM DOMESTIC WATER)
—CSP—	CSP	COMBINATION STANDPIPE
—MG—	MG	NATURAL GAS (MEDIUM PRESSURE - 2 PSI)
—G—	G	NATURAL GAS (LOW PRESSURE - 11" W.C.)
---V(G)---	V(G)	VENT (GAS)
		REMOVE EXISTING PIPING OR ABANDON IN PLACE.
	OS&Y	OUTSIDE SCREW AND YOKE VALVE
	OS&Y/TS	OS&Y VALVE WITH TAMPER SWITCH
	GV	GATE VALVE
	GLV	GLOBE VALVE
	BV	BALL VALVE
	GC	GAS COCK
	CKV	CHECK VALVE
	BFV	BUTTERFLY VALVE
	BAL	BALANCING FITTING
	FCV	FLOW CONTROL VALVE
M	MV	TWO-WAY MOTORIZED VALVE
M	MV	THREE-WAY MOTORIZED VALVE
M	MV	MOTORIZED BUTTERFLY VALVE
	PRV	PRESSURE REDUCING VALVE
	RV	PRESSURE RELIEF VALVE
WH	WH	WALL HYDRANT
DV	DV	HOSE END DRAIN VALVE
HB	HB	HOSE BIBB
AV	AV	AIR VENT
VB	VB	VACUUM BREAKER
C	WHA	WATER HAMMER ARRESTOR (SIZE C)
	STR	STRAINER WITH HOSE END DRAIN VALVE
		PIPE ANCHOR
		FLEXIBLE CONNECTOR
		UNION, FLANGE
		PIPE REDUCER
		SPRINKLER HEAD - UPRIGHT, PENDENT, RECESSED & FLUSH
		SPRINKLER HEAD - SIDEWALL & PENDENT SIDEWALL
		PRESSURE GAGE WITH GAGE COCK
		GAGE COCK
		THERMOMETER
FS	FS	FLOW SWITCH
T		IMMERSION THERMOSTAT
		PITCHED DOWN
	PTT	PRESSURE TEMPERATURE TAP
		DIRECTION OF FLOW
		VALVE IN RISER
		CAP OR PLUG
	CTG	CLEANOUT TO GRADE
	FCO	FLOOR CLEANOUT
	WCO	WALL CLEANOUT
	CO	CLEANOUT
	TPV	TRAP PRIMER VALVE
	GPR	GAS PRESSURE
		AIR FLOW DIRECTION
		SUPPLY OR OSA DUCT SECTION ROUND, RECTANGULAR
		RETURN OR EXHAUST DUCT SECTION ROUND, RECTANGULAR
		INTERNALLY INSULATED DUCT DOUBLE LINE, SINGLE LINE
		FLEXIBLE EQUIPMENT CONNECTION
FLD	FLD	FUSIBLE LINK DAMPER DOUBLE LINE, SINGLE LINE
B		BUTTERFLY VOLUME DAMPER DOUBLE LINE, SINGLE LINE
		DUCT LAGGING DOUBLE LINE

Abbreviation	Description
HX	HEAT EXCHANGER
SHB	STEAM HEATING BOILER
ET	EXPANSION TANK
WCU	WATER CHILLER UNIT
HWP	HEATING WATER PUMP
CWP	CHILLED WATER PUMP
CDP	CONDENSER WATER PUMP
CCC	CLOSED CIRCUIT COOLER
ACCU	AIR COOLED CONDENSING UNIT
ASU	AIR SUPPLY UNIT
ACU	AIR CONDITIONING UNIT
SF	SUPPLY FAN
RF	RETURN FAN
EF	EXHAUST FAN
REF	ROOF EXHAUST FAN
RC	RELIEF CAP
RDR	STEAM RADIATOR
CV	CONVECTOR
CUH	CABINET UNIT HEATER
UH	UNIT HEATER
BHC	BOOSTER HEATING COIL
HC	HEATING COIL
CC	COOLING COIL
OSA	OUTSIDE AIR
AUD	AUTOMATIC DAMPER
OAD	OUTSIDE AIR DAMPER
RAD	RETURN AIR DAMPER
EAD	EXHAUST AIR DAMPER
SMD	SMOKE DAMPER
6Φ	ROUND DUCT DIAMETER, INCHES
32x14	RECTANGULAR DUCT SIZE, INCHES
CS	CEILING SUPPLY DIFFUSER
CR	CEILING RETURN GRILLE
CE	CEILING EXHAUST GRILLE
HS	HIGH SUPPLY GRILLE
HR	HIGH RETURN GRILLE
HE	HIGH EXHAUST GRILLE
LS	LOW SUPPLY GRILLE
LR	LOW RETURN GRILLE
LCS	LINEAR CEILING SUPPLY DIFFUSER
WG	WALL GRILLE
SMB	STARTER MOUNTING BOARD (SEE ELECT.)
DDCU	DIRECT DIGITAL CONTROL UNIT
MCC	MOTOR CONTROL CENTER (SEE ELECT.)
Ⓣ	ROOM THERMOSTAT OR SENSOR
(302)	ZONE AIR DUCT
N.O.	NORMALLY OPEN
N.C.	NORMALLY CLOSED
D.A.	DIRECT ACTING
R.A.	REVERSE ACTING
P.E.	PNEUMATIC - ELECTRIC
SAV	SOLENOID AIR VALVE
NLL	NIGHT LOW LIMIT
WC	WATER CLOSET
U	URINAL
L	LAVATORY
S	SINK
SS	SERVICE SINK
MS	MOP SINK
SHR	SHOWER
DF	DRINKING FOUNTAIN
EWH	ELECTRIC WATER HEATER
RHWP	RECIRCULATING HOT WATER PUMP
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
DCA	DOUBLE CHECK VALVE ASSEMBLY
DDCA	DOUBLE DETECTOR CHECK VALVE ASSEMBLY
FCS	FLOOR CONTROL STATION (FIRE SPRINKLER)
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE REEL
FHV	FIRE HOSE VALVE
FDC	FIRE DEPARTMENT CONNECTION
FD	FLOOR DRAIN
SHD	SHOWER DRAIN
DS	DOWNSPOUT
RD	ROOF DRAIN
ORD	OVERFLOW ROOF DRAIN
VTR	VENT THROUGH ROOF
CIP	CAST IRON PIPE
I.E.	INVERT ELEVATION
EL	ELEVATION
FF	FINISHED FLOOR
NIM	NOT IN MECHANICAL - SPECIFIED UNDER ANOTHER DIVISION
Ⓐ	ACCESS DOOR
Ⓒ	CONNECT TO EXISTING
Ⓔ	EXISTING TO REMAIN
Ⓚ	CAP OR PLUG
Ⓝ	NEW
Ⓡ	RELOCATE EXISTING
Ⓣ	THROUGH TRUSS WEB
Ⓦ	LOCATE IN WALL SPACE
Ⓧ	REMOVE EXISTING
■	NEW PLUMBING FIXTURE
⬚	REMOVE EXISTING FIXTURE, EQUIPMENT OR ITEM.

Portland Center for the Performing Arts

The City of Portland

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C.W. Timmer & Associates
CH2M Hill

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Portland, Oregon 97209
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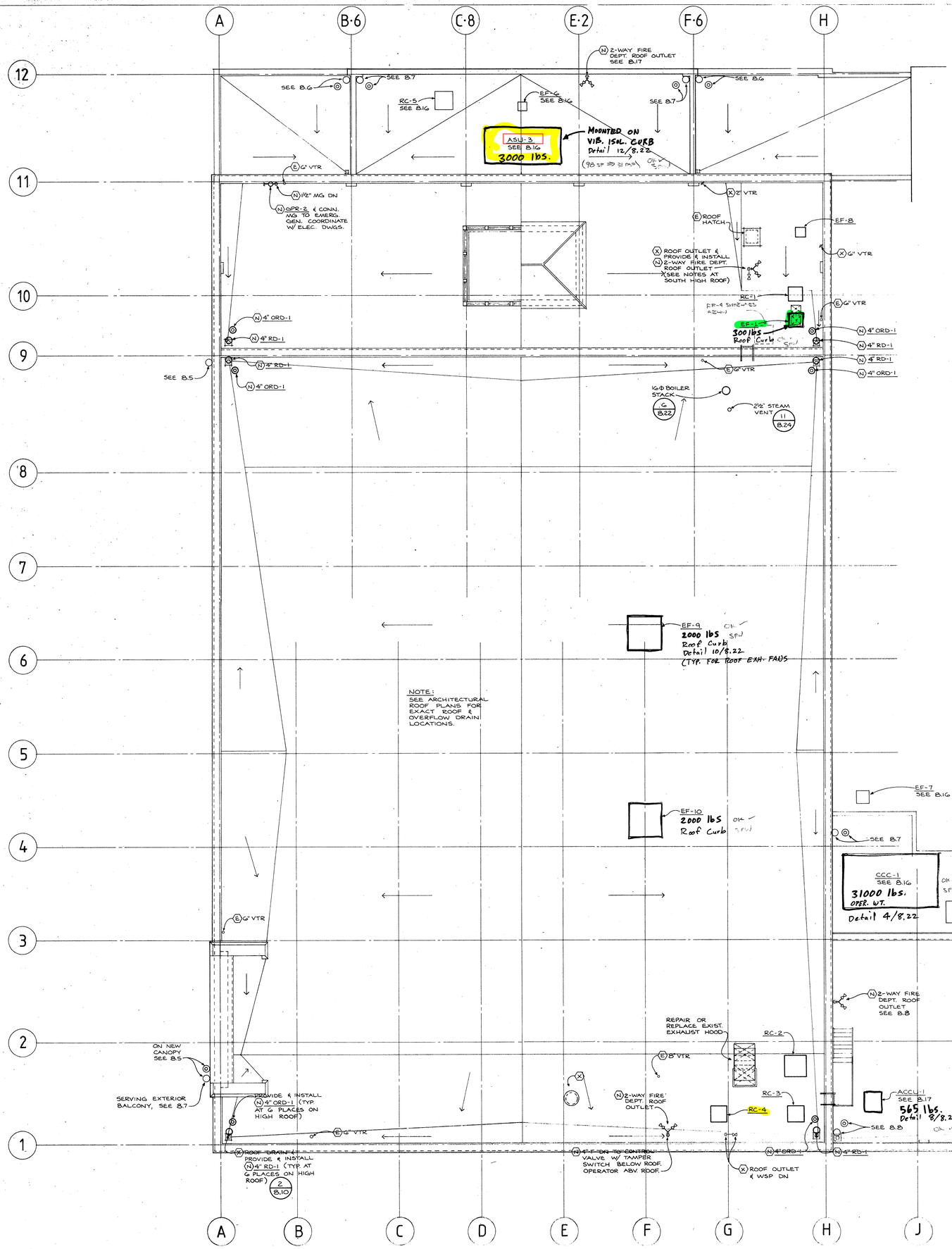
REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1962 ROBERT G. MANFULL

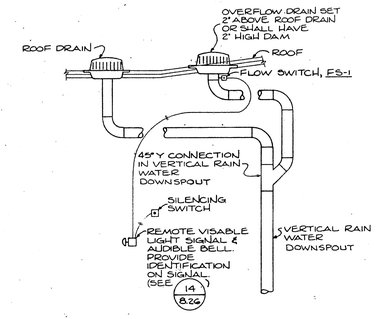
Robert G. Manfull

1693-20

SITE PLAN AND LEGEND

Job No.	Date JULY 15, 1983
Set No.	Sheet No. 8.1





2 DETAIL – OVERFLOW DRAIN
NO SCALE

REVIEWED FOR CONFORMANCE WITH ORIGINAL PERFORMANCE BASIS SEE NEW STRUCTURAL CALCULATIONS
SPW = LJE 1-26-84
CH2M Hill Inc

REGISTERED PROFESSIONAL ENGINEER 2016 OREGON JULY 9, 1982 ROBERT G. MANFULL

1993-20

Portland Performing Arts Center

ROOF PLAN MECHANICAL

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Barton Myers
Theatre Projects Inc
R. Lawrence Kirkegaard & Associates
Interface Engineering Inc
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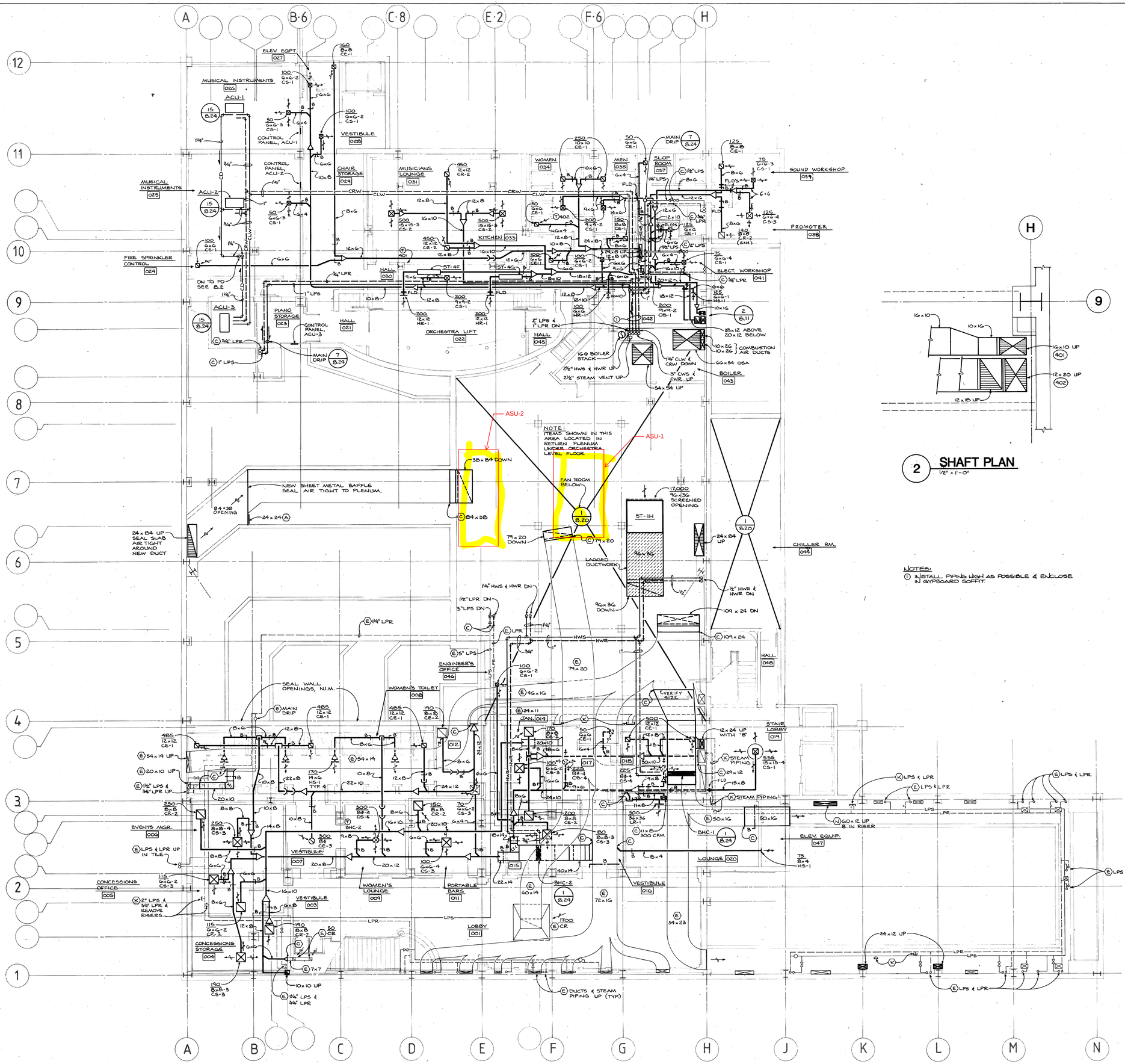
CH2M Hill

8.10

ROOF PLAN



2 SHAFT PLAN
1/2" = 1'-0"

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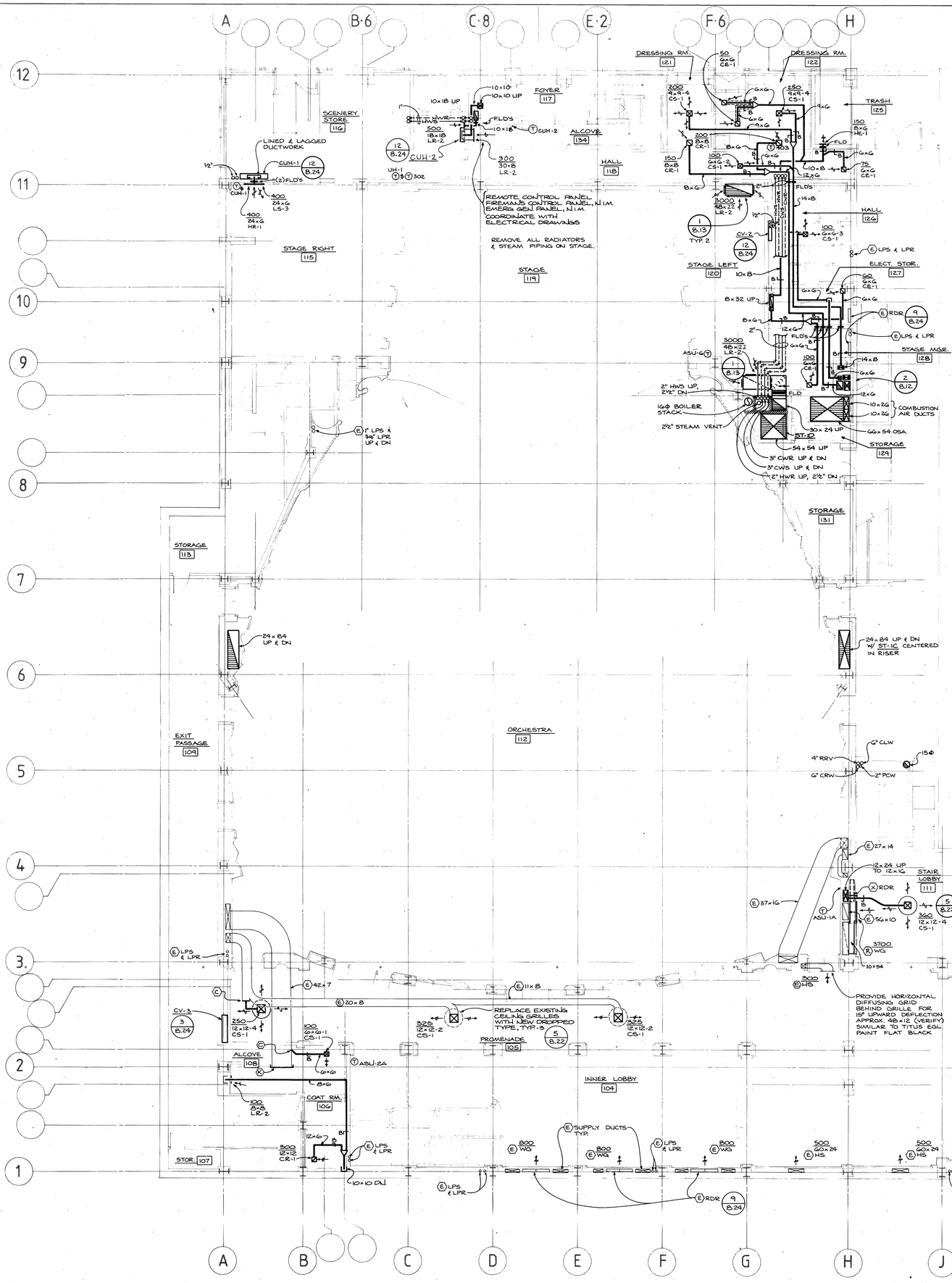
REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1948 ROBERT G. MANFULL

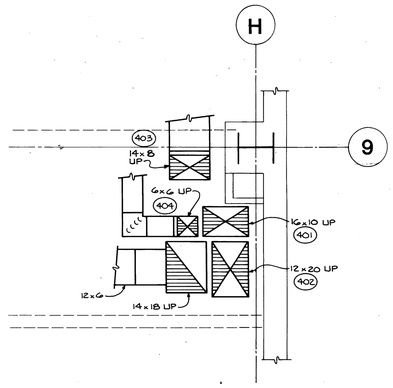
1993-20

BASEMENT PLAN – HVAC

Job No.	Date JULY 15, 1985
Set No.	Sheet No. 8.11

4.01





2 SHAFT PLAN
1/2" = 1'-0"

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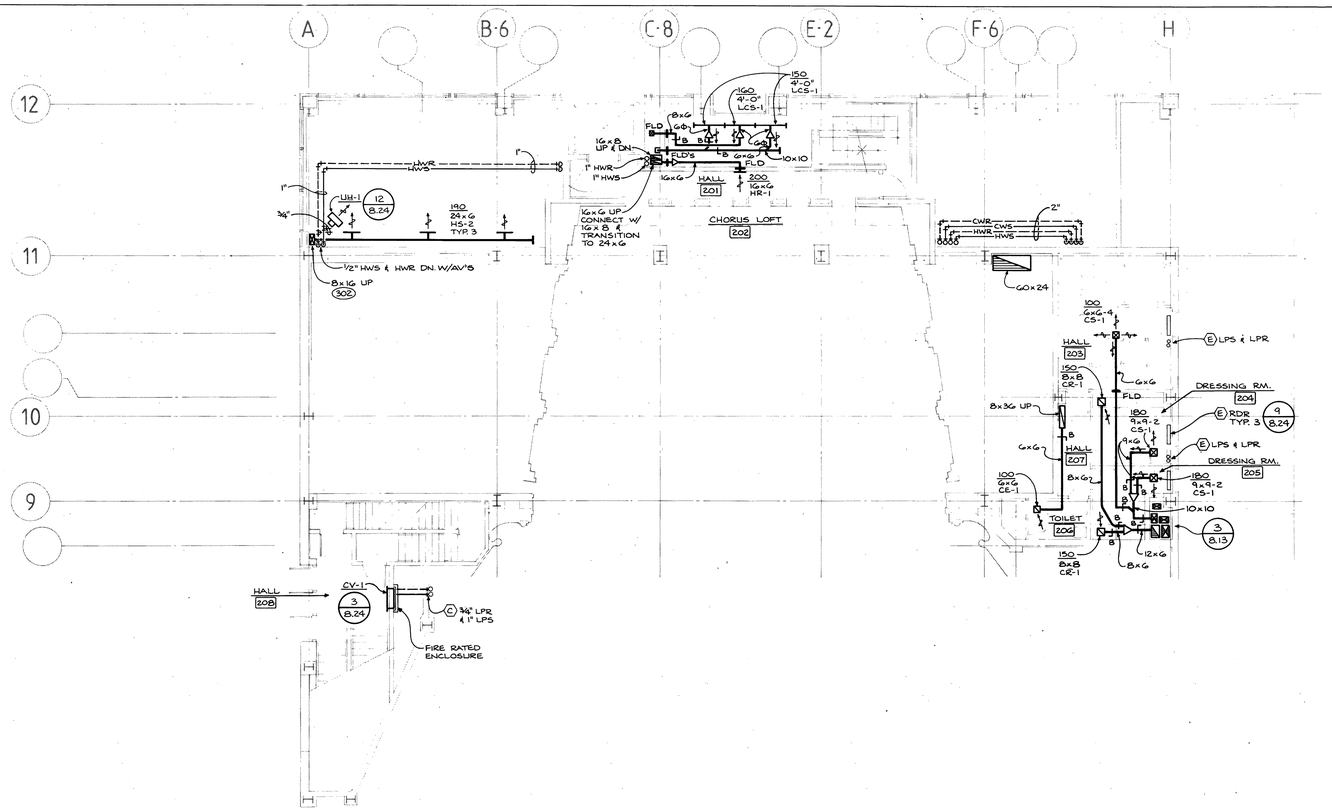
REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1948 ROBERT G. MARFULL

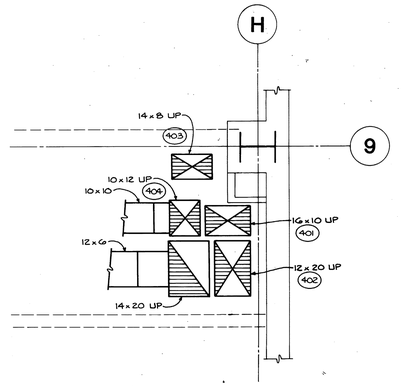
6493-20

ORCHESTRA PLAN HVAC

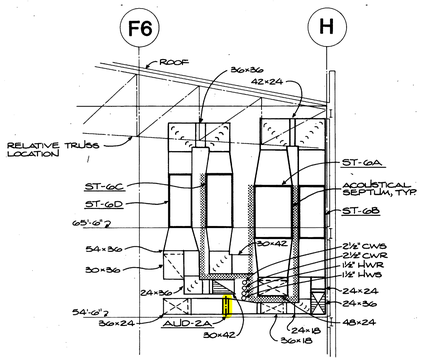
Job No.	Date
	JULY 18, 1985
Set No.	Sheet No.
	8.12

4.02

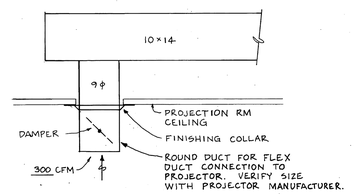




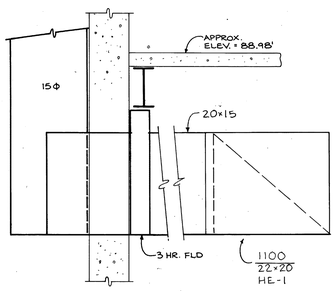
3 **SHAFT PLAN**
1/2" = 1'-0"



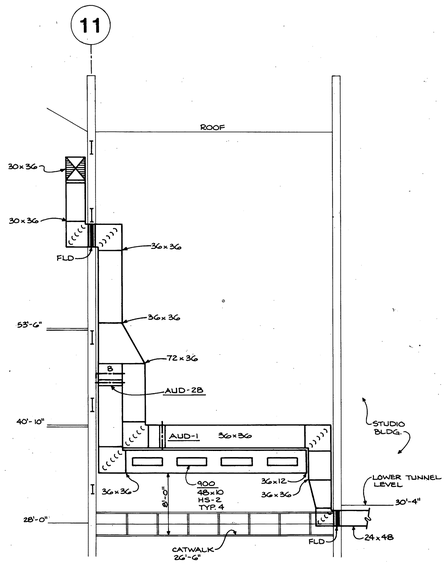
2 **SECTION – ASU-6 DUCTWORK**
1/8" = 1'-0"



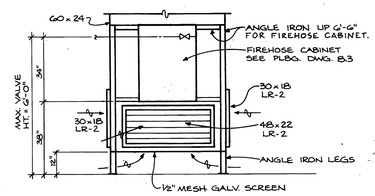
7 **DETAIL–PROJ. ROOM EXHAUST**
NO SCALE



6 **SECTION**
1" = 1'-0"



4 **SECTION – STAGE SUPPLY**
1/8" = 1'-0"



1 **DETAIL – STAGE LOW RETURN**
NO SCALE

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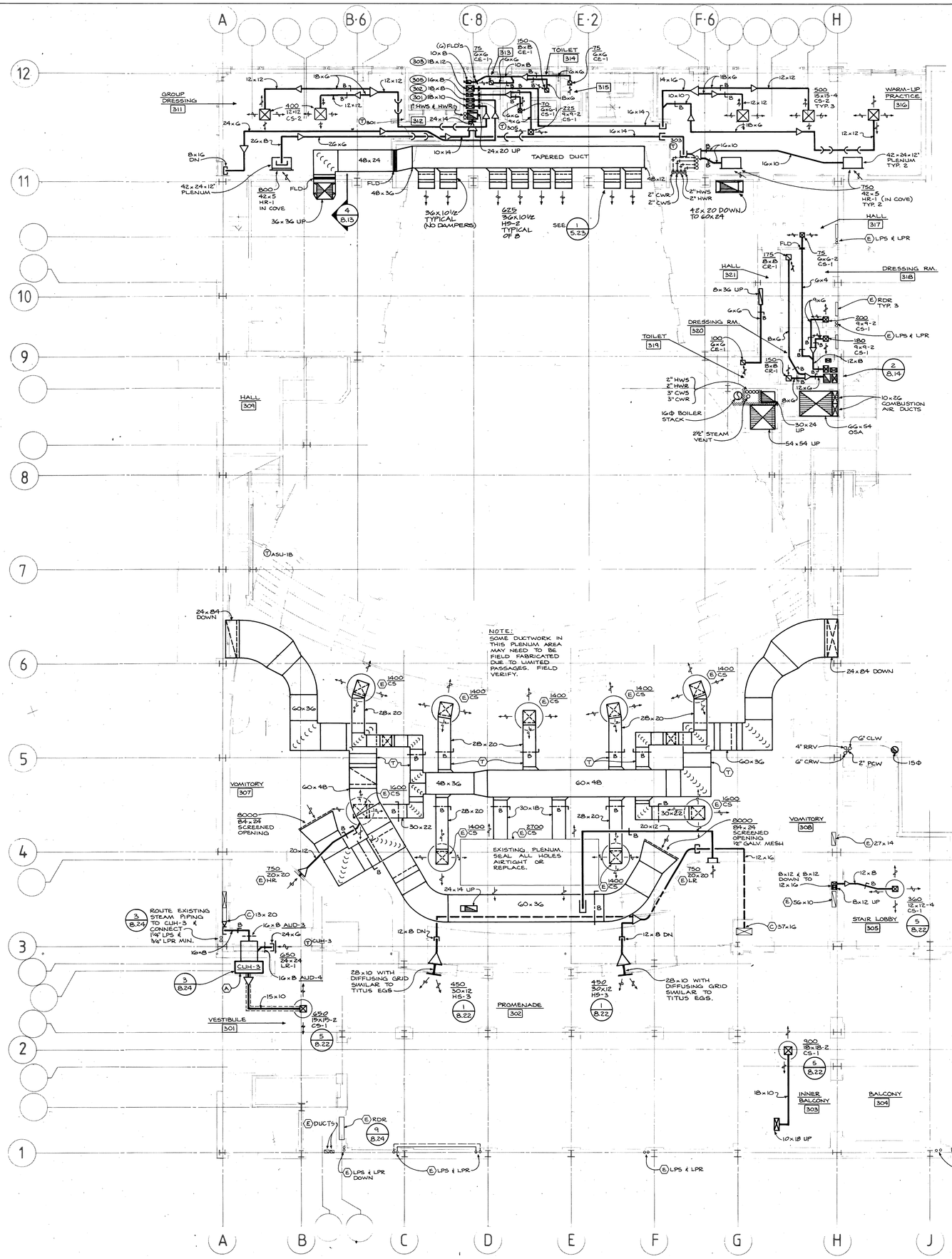
REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1948 ROBERT G. MARFELL

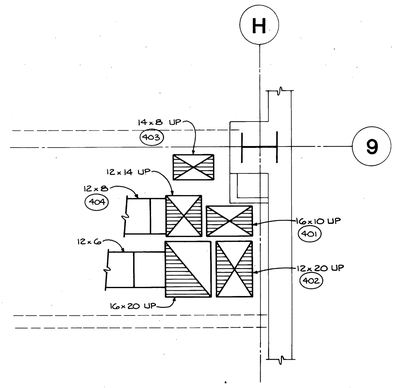
1693-20

CHORUS LOFT PLAN HVAC

Job No.	Date JULY 15, 1983
Set No.	Sheet No. 8.13

4.03
5.02





2 **SHAFT PLAN**
1/2" = 1'-0"

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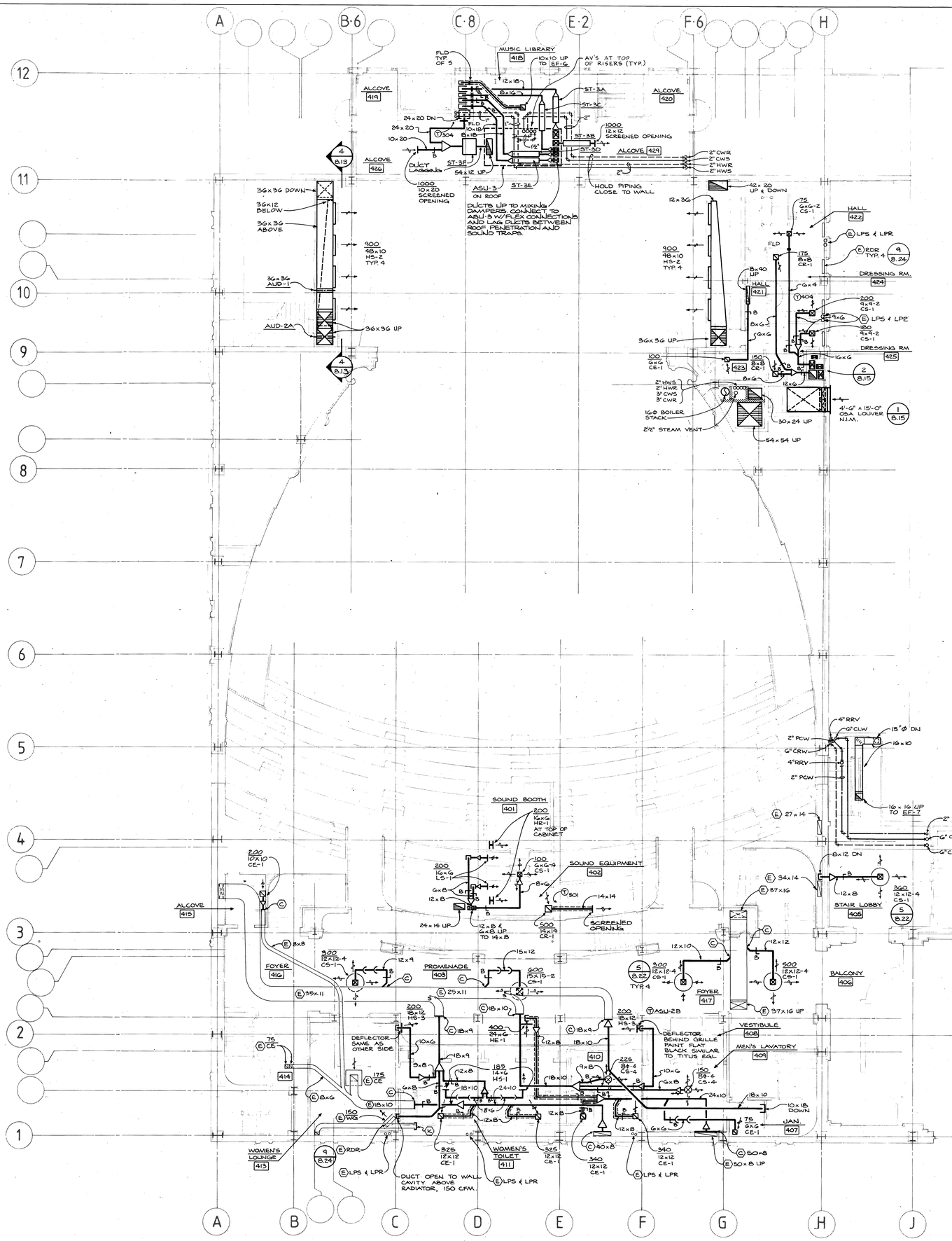
REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1979 ROBERT G. MAHRT

1693-20

MEZZANINE PLAN – HVAC

Job No.	Date
	JULY 18, 1980
Set No.	Sheet No.
	8.14



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REGISTERED PROFESSIONAL ENGINEER OREGON JULY 9, 1965 ROBERT G. MANFULL

1693-20

LOWER TUNNEL PLAN HVAC

Job No.	Date
	JULY 18, 1988
Set No.	Sheet No.
	8.15

RC-5
10
8.22

EF-6
10
8.22

ASU-3

12
8.22

42x20

75
6"x6"-2
CS-1

HALL 507

(E) LPS & LPR

(E) RDR (TYP.4)
9
8.24

150
8"x8"
CE-1
TYP. 2

FLD

175
9"x9"-4
CS-1

HALL
511

8"x44" UP

6"x6"

GROUP DRESSING RM.
508

(E) LPS & LPR

9"x6"

36"x36"
UP

6"x6"

TOILET
509

16"x6"

8"x8"

100
6"x6"
CE-1

10"x8"
FLD

2
8.16

160 BOILER STACK

18"x8"

FLD

2½" STEAM VENT

400
18"x8"
HR-1

2" HWS
2" HWR
3" CWS
3" CWR

30"x24" UP

10"x8"

54"x54"
UP

DIMMER RM.
510

400
18"x8"
HS-1

36"x36"
UP

4
8.13

H

14"x8" UP
403

16"x18"
UP
404

16"x6"

16"x10" UP
401

18"x8"

14"x20" UP
402

20"x20" UP

FLD

10"x8"

9

2 SHAFT PLAN
1/2" = 1'-0"

4" RRV

GHD

EF-7
10
8.22

2
8.22

(E) 27"x14"

6" CLW
6" CRW

2" PCW

(E) 56"x10"

CCC-1

4
8.22

RC-6
10
8.22

24"x14" DN

14"x8" DN

IN BALCONY RETURN PLENUM

14"x8"

24"x14"

(E) 37"x16"

HALL
513

(E) 51"x10"

FOYER
501

5
8.22

350
12"x12"-4
CS-1

PROMENADE
503

1500
(E) 30"x30"
HA

(T) ASU-2C

FOYER
505

500
16"x15"-1
CS-1

5
8.22

12"x6"

10"x10"

12"x6"

75
(E) 14"x14"
CE

10"x6"

75
10"x6"
HS-1

100
(E) 12"x12"
CE

100
(E) 14"x14"
HS

(K) 14"x14"
CE

100
(E) 14"x14"
HS

100
(E) 12"x12"
CE

75
(E) 12"x12"
HS

75
(E) 12"x12"
CE

STORAGE
502

9
8.24
TYP.

14"x8"

STORAGE
506

(E) RDR

(E) 20"x8" UP

(E) 1" LFS & 3/4" LFR DN

(E) RDR

(E) 1" LFS & 3/4" LFR

(E) 33"x8" UP

STORAGE
504

(E) RDR

(E) 40"x8" UP & DN

(E) 1¼" LFS & 3/4" LFR

(E) RDR

(E) 50"x8" DN

(E) 15"x8" UP

14"x8" UP

ATTIC
512

44"x44" UP
TO EF-11

36"x36" UP
TO EF-4

20,000
10'-0"x3'-0"
HE-1

44"x36"

84"x24"

A B C D E F G H J K L M N

1 2 3 4 5 6 7 8 9 10 11 12

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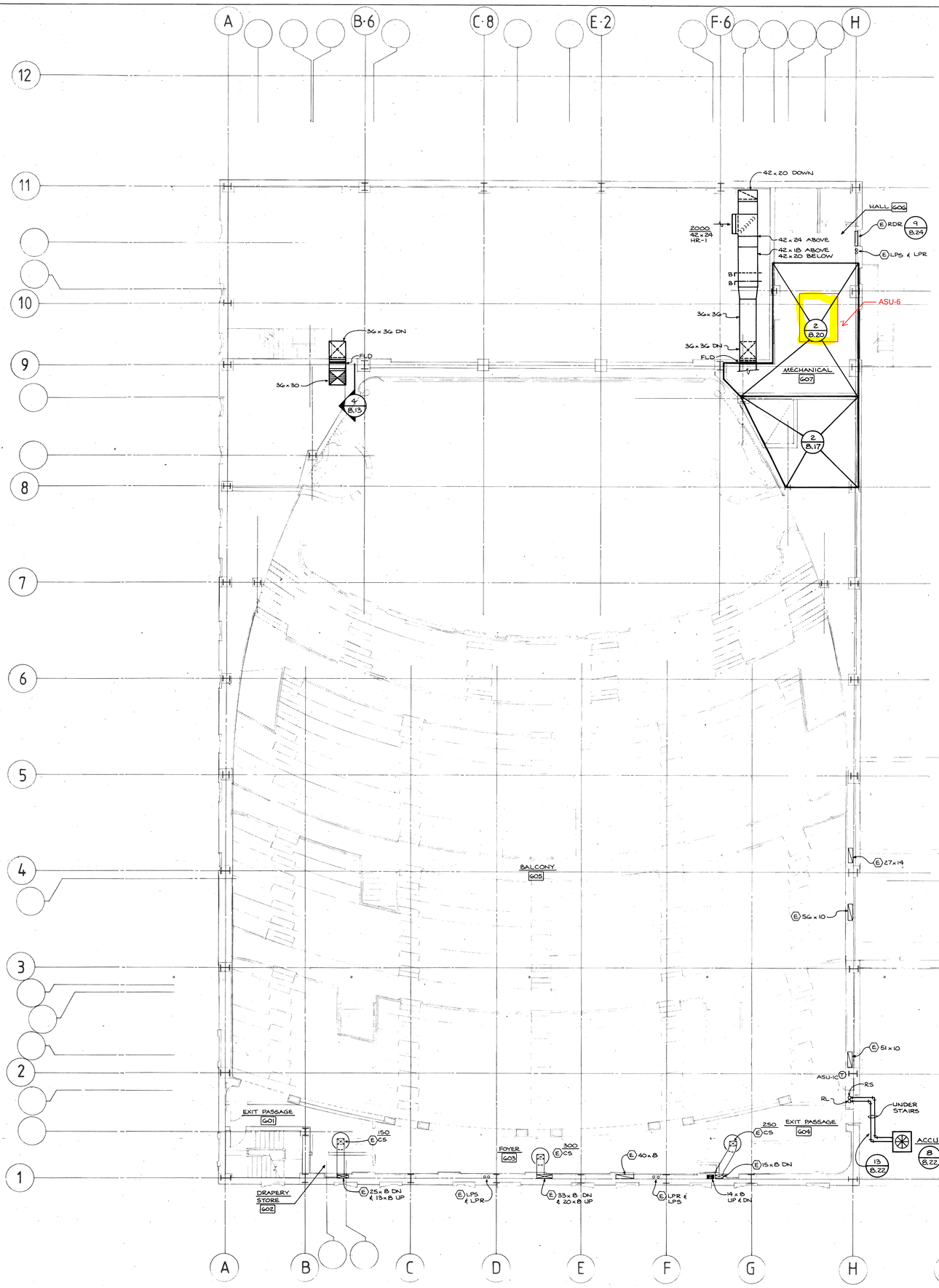
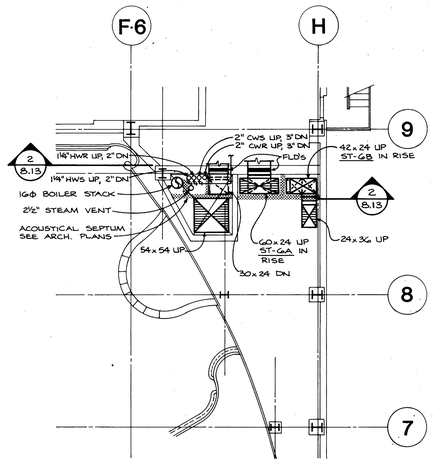
REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 9, 1969
ROBERT G. MANFULL

1693-20

UPPER TUNNEL PLAN HVAC

Job No.	Date JULY 18, 1983
Set No.	Sheet No. 8.16





2 **PARTIAL BALCONY PLAN**
1/8" = 1'-0"

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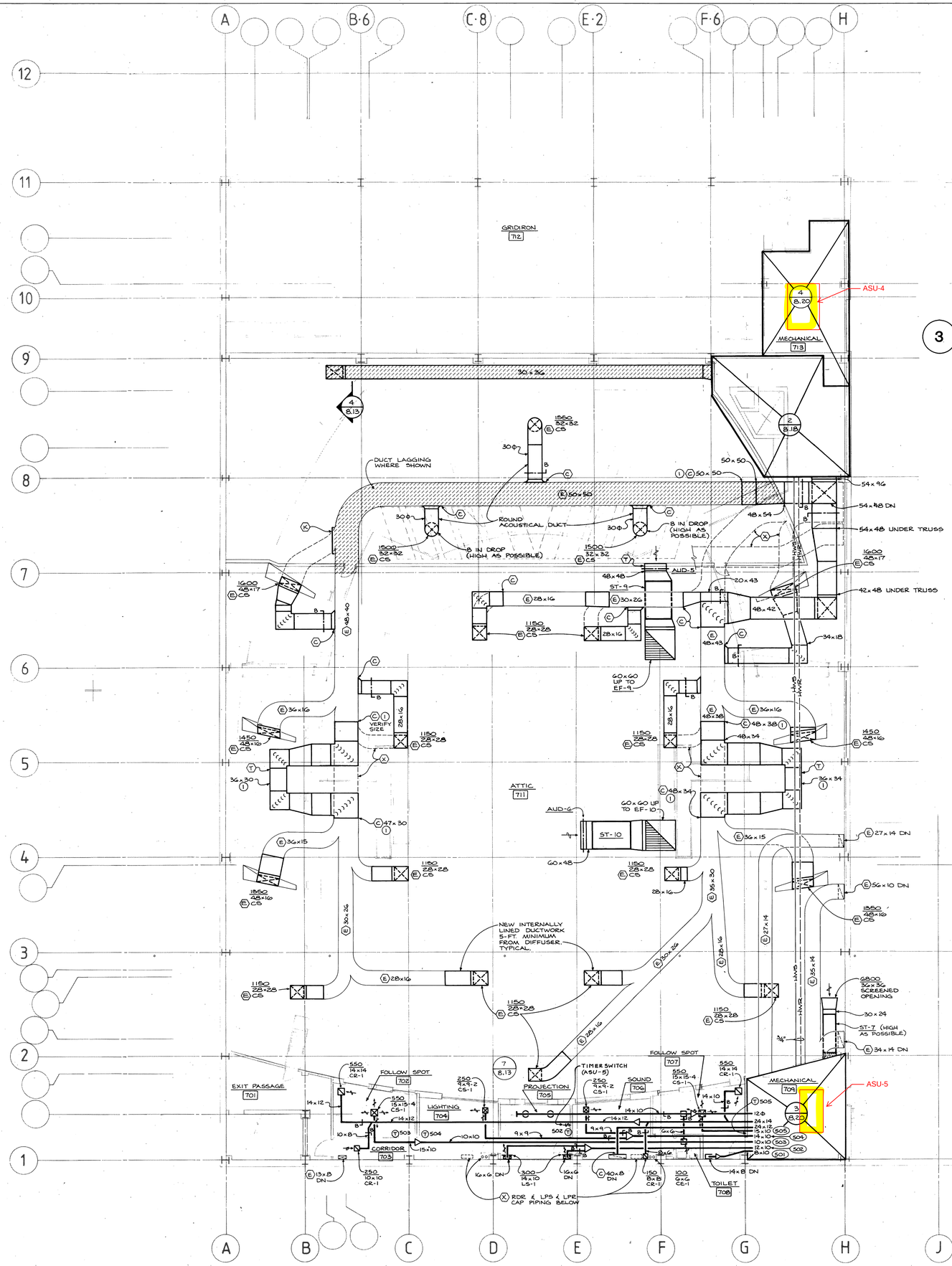
REGISTERED PROFESSIONAL ENGINEER OREGON JULY 9, 1948 ROBERT G. MANFULL

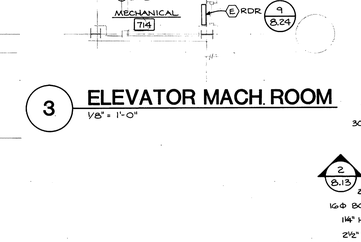
1693-20

BALCONY PLAN – HVAC

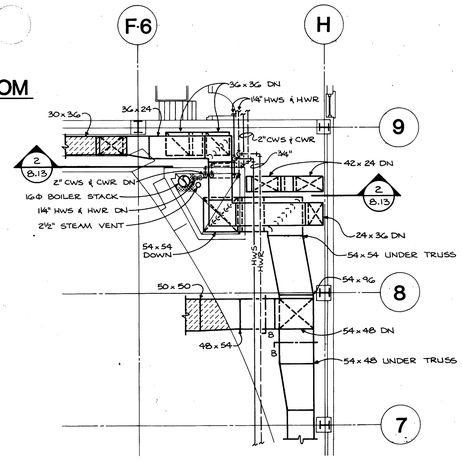
Job No.	Date
	JULY 18, 1983
Set No.	Sheet No.
	8.17

4.07
E6.83





3 ELEVATOR MACH. ROOM
1/8" = 1'-0"



2 PARTIAL PROJECTION PLAN
1/8" = 1'-0"

NOTES:
1. DUCTS MAY BE AN IRREGULAR SHAPE & SIZE, VERIFY.

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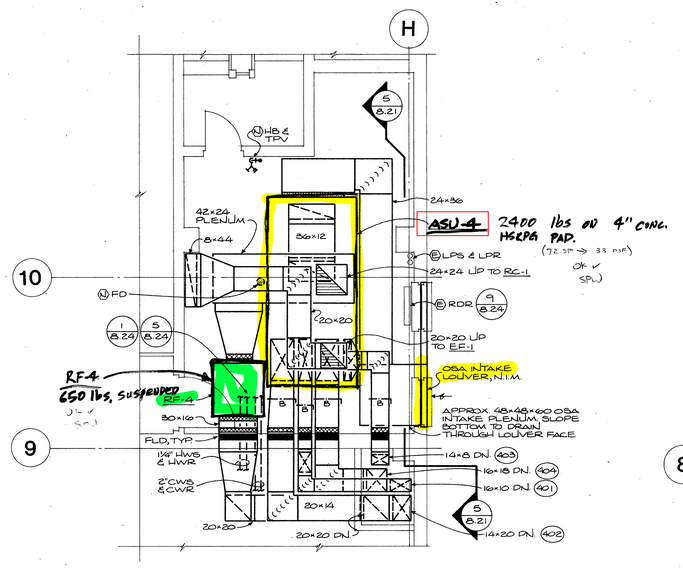
REGISTERED PROFESSIONAL ENGINEER OREGON JULY 9, 1943 ROBERT G. MANFULL
1693-20

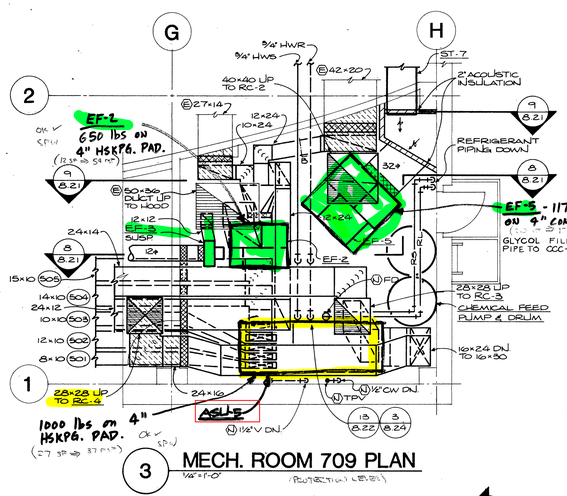
PROJECTION LEVEL PLAN HVAC

Job No.	Date JULY 15, 1985
Set No.	Sheet No. 8.18

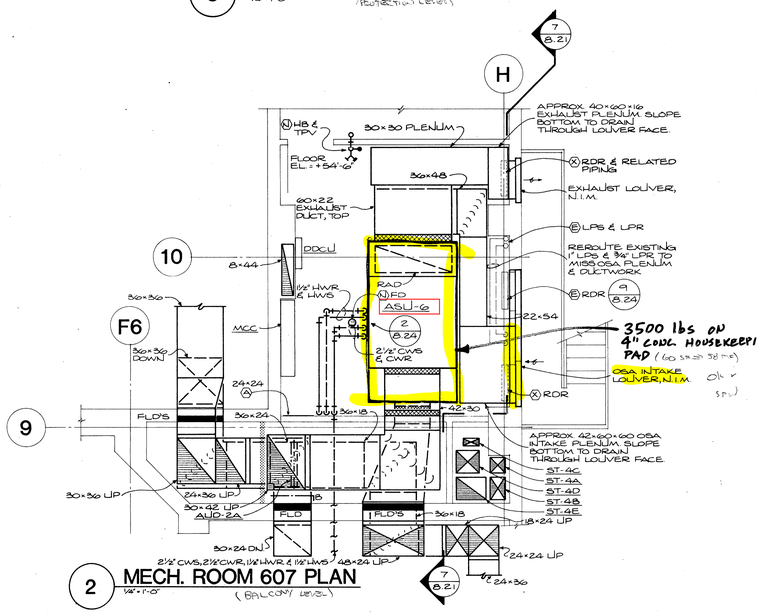
4.08
5-1-85



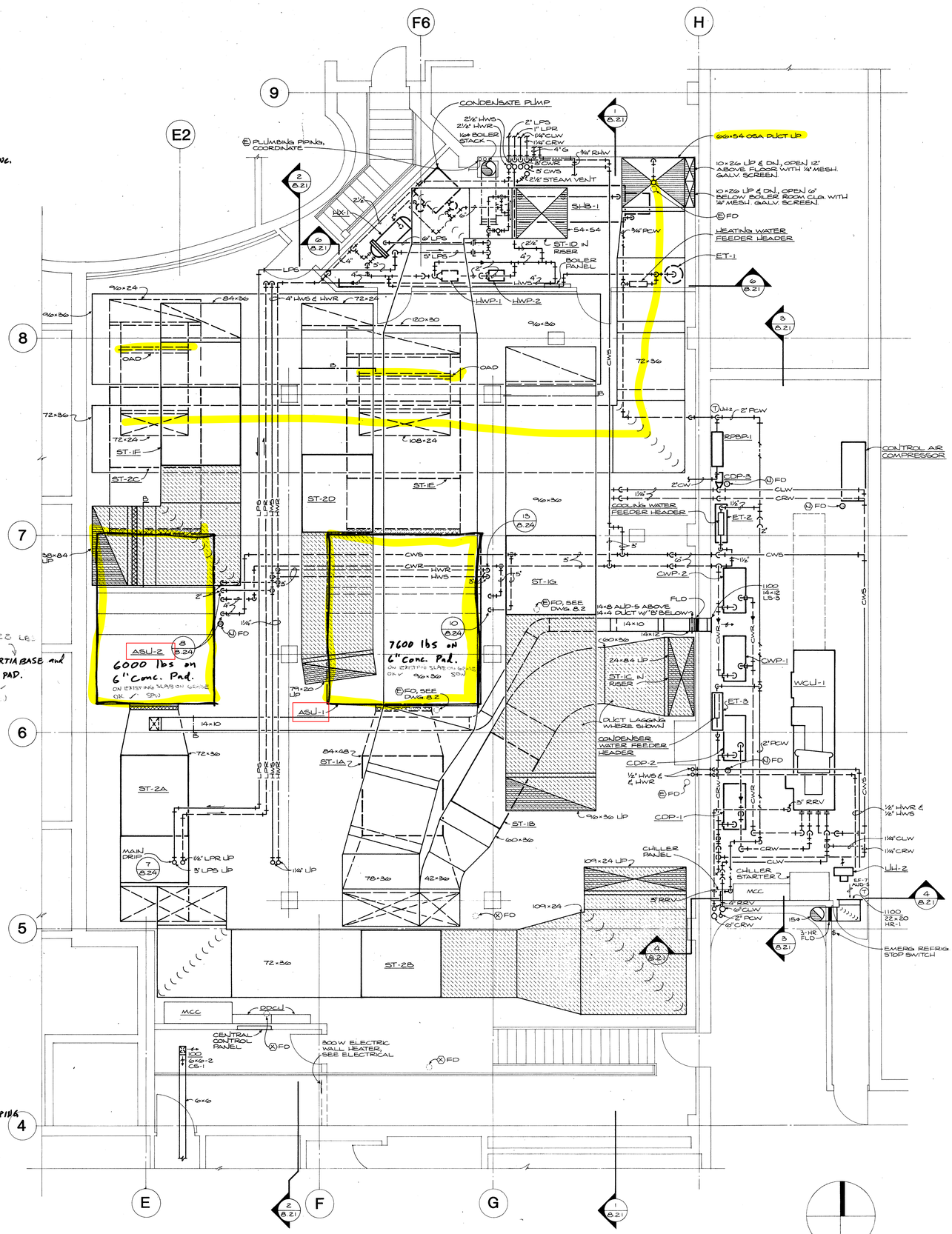
4 MECH. ROOM 713 PLAN
1/8"=1'-0" (PROJECTION LEVEL)



3 MECH. ROOM 709 PLAN
1/8"=1'-0" (PROJECTION LEVEL)



2 MECH. ROOM 607 PLAN
1/4"=1'-0" (BALCONY LEVEL)



1 BASEMENT FAN ROOM, BOILER ROOM AND CHILLER ROOM PLAN
1/8"=1'-0"

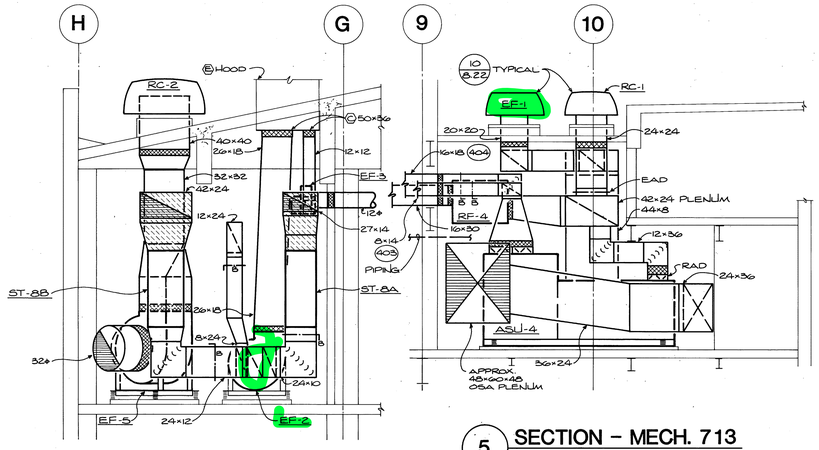
REVIEWED FOR CONFORMANCE W/ ORIGINAL MECHANICAL DESIGN. DOES NOT SUPERSEDE STRUCTURAL REQUIREMENTS. SPW FOR LJE 1-26-21
CH2M HILL, INC.

REGISTERED PROFESSIONAL ENGINEER 4810 OREGON JAN. 9, 1942 ROBERT D. MARKLEY

1693-20

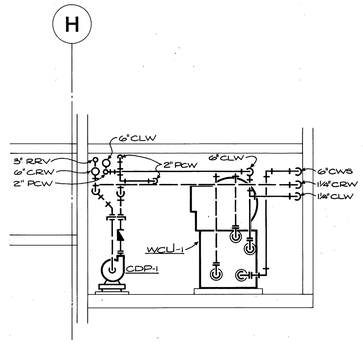
MECHANICAL ROOM PLANS

8.20

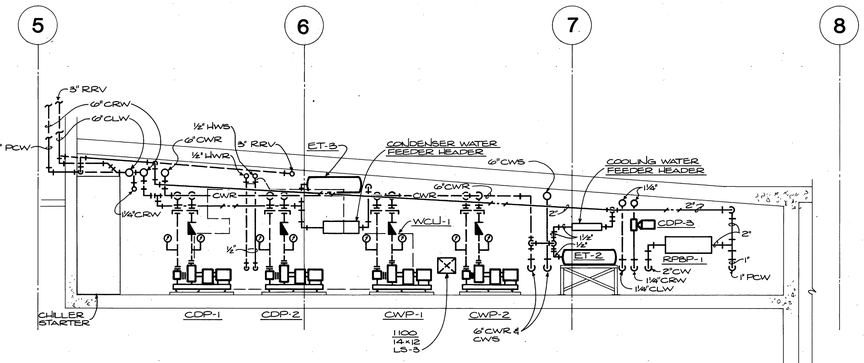


9 SECTION – MECH. 709
1/4"=1'-0"

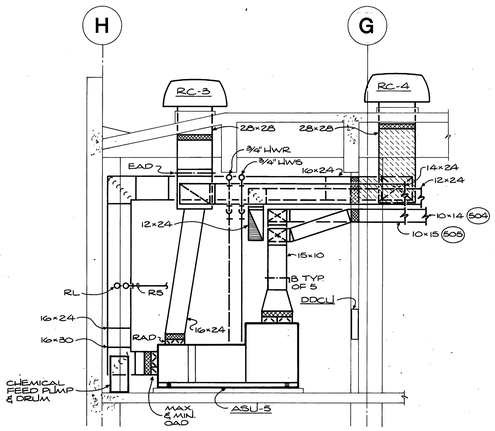
5 SECTION – MECH. 713
1/4"=1'-0"



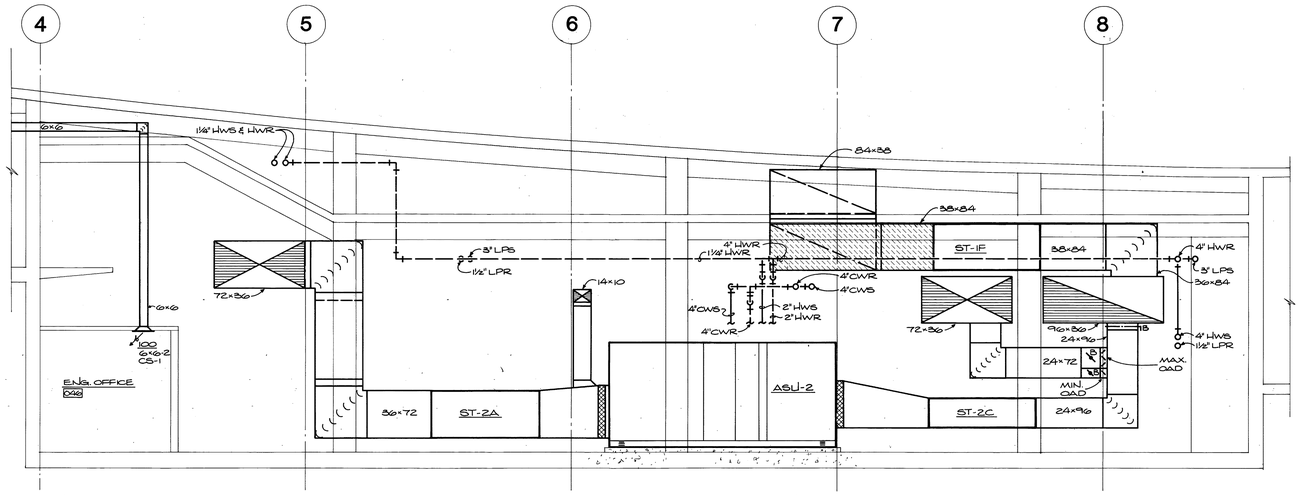
4 SECTION – CHILLER ROOM
1/4"=1'-0"



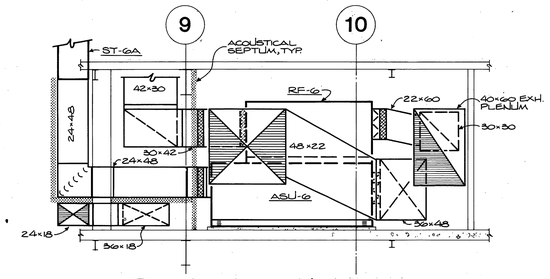
3 SECTION – CHILLER ROOM
1/4"=1'-0"



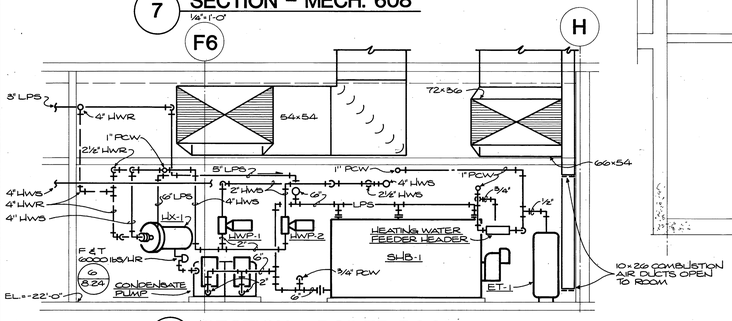
8 SECTION – MECH. 709
1/4"=1'-0"



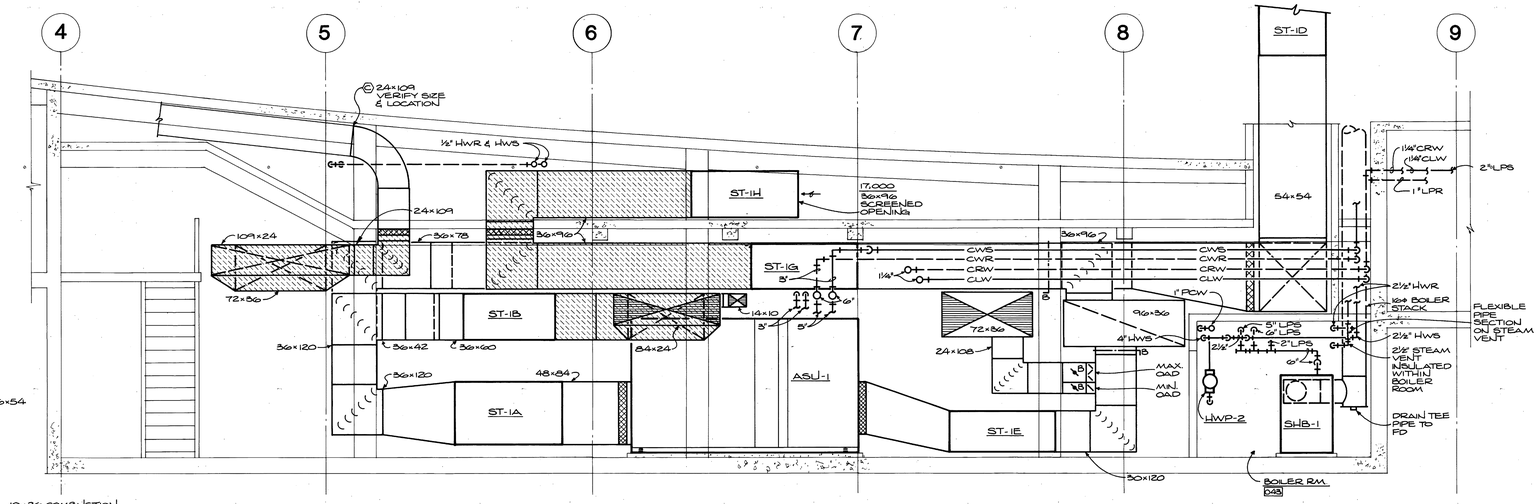
2 SECTION – BASEMENT FAN ROOM
1/8"=1'-0"



7 SECTION – MECH. 608
1/4"=1'-0"



6 SECTION – BOILER ROOM
1/4"=1'-0"



1 SECTION – BASEMENT FAN ROOM
1/4"=1'-0"

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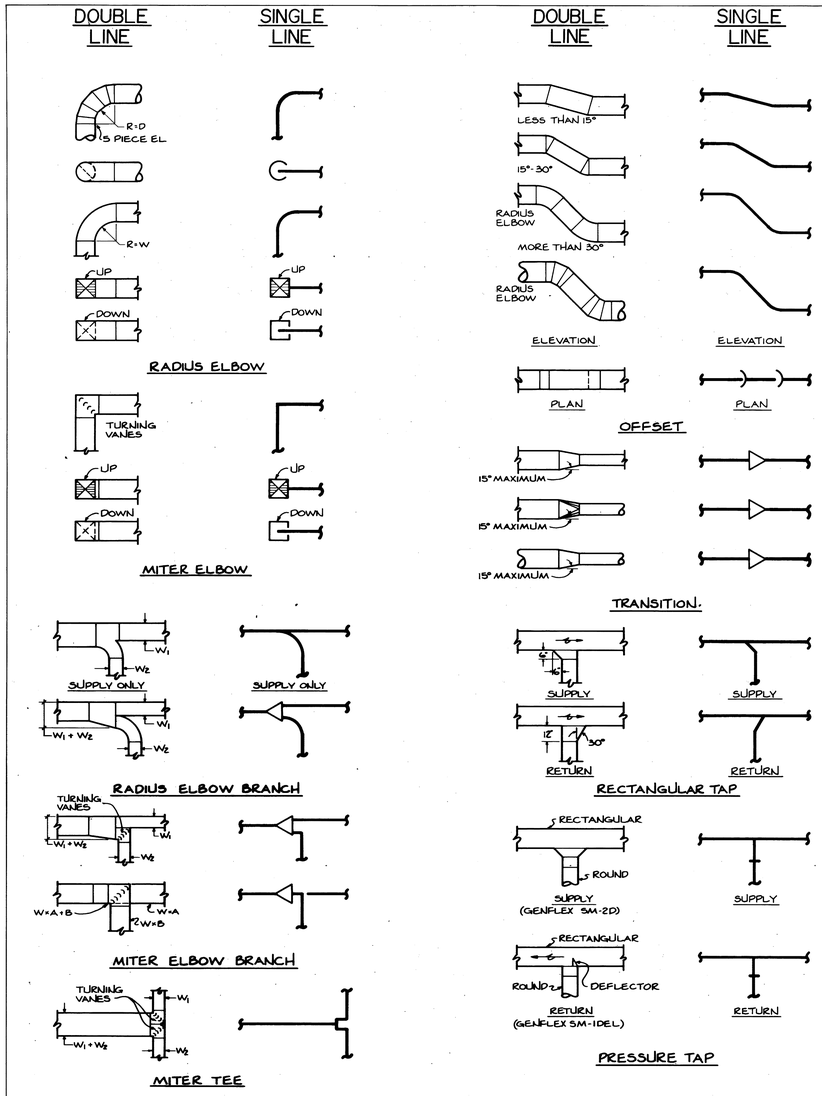
REGISTERED PROFESSIONAL ENGINEER OREGON JULY 9, 1965 ROBERT G. MANFULL
1693-20

MECHANICAL ROOM SECTIONS

Job No.	Date
	JULY 18, 1983
Set No.	Sheet No.
	8.21

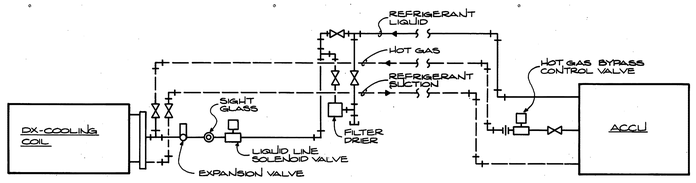


14 DETAILS – DUCT FITTINGS

NO SCALE

NOTES:

1. ADJUSTING DAMPER REQUIRED FOR EACH LOW PRESSURE SUPPLY AND RETURN BRANCH.
2. 32×14 - FIRST DIMENSION IS THE SIDE SEEN IN SECTION. THE FIRST DIMENSION IS THE HORIZONTAL SIDE.

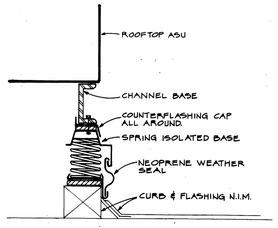


13 REFRIGERANT PIPING DIAGRAM

NO SCALE

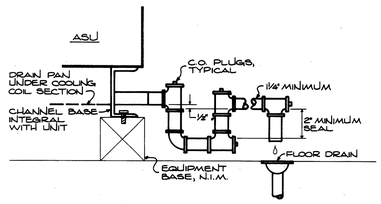
NOTES:

1. TRAP & PITCH PIPING AS REQUIRED FOR ACTUAL RELATIVE POSITIONS OF COMPRESSORS & COILS.
2. PIPING SLEEVED & SEALED THROUGH ROOF OR WALL.
3. ALL VALVES OF REFRIGERANT TYPE.
4. ISOLATING VALVES AT ACCU ARE NOT SHOWN.



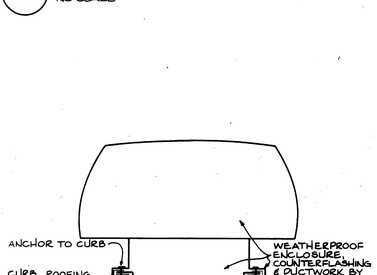
12 DETAIL – ROOFTOP ASU MOUNTING

NO SCALE



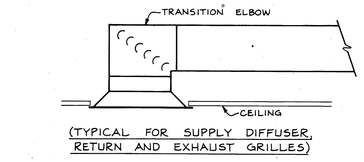
11 DETAIL – CONDENSATE TRAP

NO SCALE

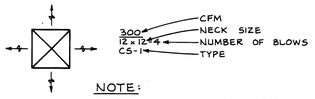


10 DETAIL – EF & RC ROOF PENETRATION

NO SCALE



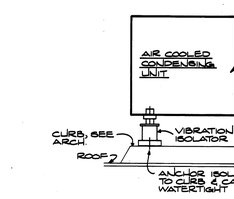
(TYPICAL FOR SUPPLY DIFFUSER, RETURN AND EXHAUST GRILLES)



NOTE:
SUPPLY IS SHOWN, DESIGNATION IS SIMILAR FOR RETURN OR EXHAUST.

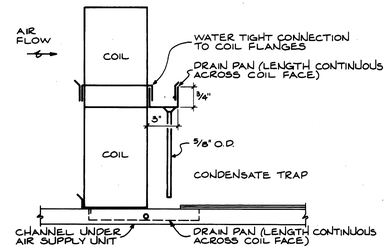
9 DETAIL – CEILING OUTLET

NO SCALE



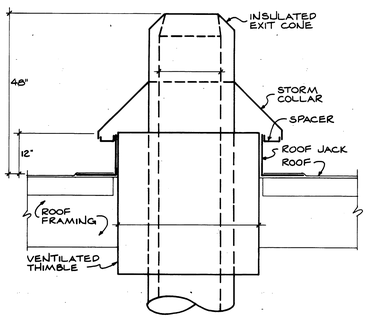
8 DETAIL – ACCU MOUNTING

NO SCALE



7 DETAIL – COOLING COIL DRAIN PAN

NO SCALE

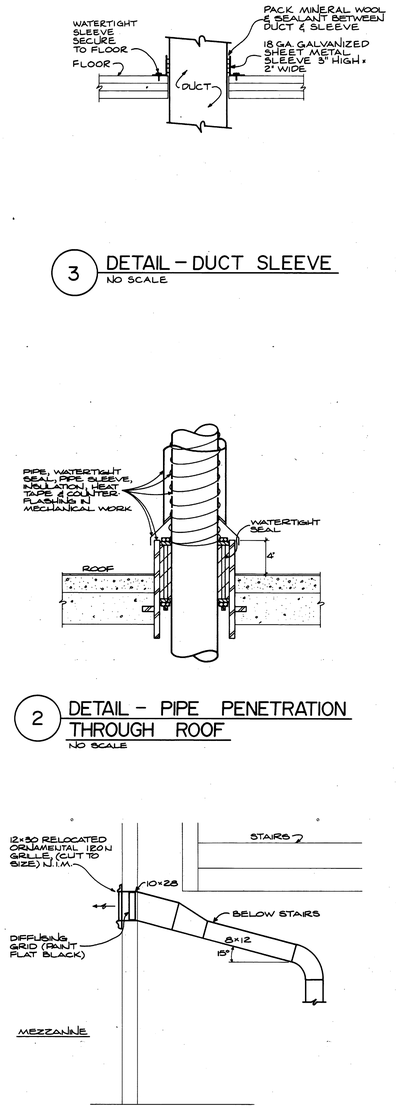


6 DETAIL – BOILER STACK ROOF PENETRATION

NO SCALE

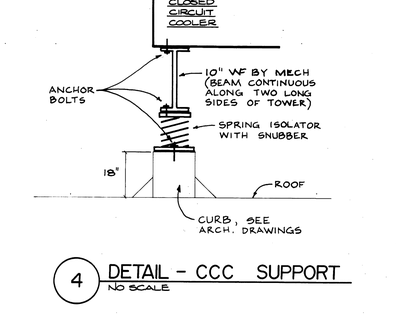
5 DETAIL – ORNAMENTAL CEILING GRILLE

NO SCALE



4 DETAIL – CCC SUPPORT

NO SCALE



2 DETAIL – PIPE PENETRATION THROUGH ROOF

NO SCALE

3 DETAIL – DUCT SLEEVE

NO SCALE

1 DETAIL – HS-3 AT MEZZ

NO SCALE

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REGISTERED PROFESSIONAL ENGINEER 4916 OREGON JULY 9, 1948 ROBERT G. MARFELL
1693-20

DETAILS – HVAC

Job No.	Date JULY 18, 1983
Set No.	Sheet No. 8.22

LEGEND

HWS	HWS	HEATING WATER SUPPLY
HWR	HWR	HEATING WATER RETURN
CWS	CWS	CHILLED WATER SUPPLY
CWR	CWR	CHILLED WATER RETURN
CLW	CLW	CONDENSER LEAVING WATER
CRW	CRW	CONDENSER RETURN WATER
RRV	RRV	REFRIGERANT RELIEF VENT
RL	RL	REFRIGERANT LIQUID
RS	RS	REFRIGERANT SUCTION
RHG	RHG	REFRIGERANT HOT GAS
DOS	DOS	DIESEL OIL SUPPLY
DOR	DOR	DIESEL OIL RETURN
CD	CD	CONDENSATE DRAIN
W	W	SANITARY SOIL OR WASTE ABOVE FLOOR
W	W	SANITARY SOIL OR WASTE BELOW GRADE OR FLOOR
D	D	INDIRECT WASTE OR DRAIN ABOVE FLOOR
SD	SD	STORM DRAIN ABOVE FLOOR
SD	SD	STORM DRAIN BELOW GRADE OR FLOOR
V	V	VENT
CW	CW	COLD WATER
PCW	PCW	PROCESS COLD WATER
HW	HW	HOT WATER
HWTM	HWTM	HOT WATER TEMPERATURE MAINTAINED
F	F	FIRE PROTECTION (WET)
FS	FSP	FIRE SPRINKLER PIPE (FROM FCS)
CSP	CSP	COMBINATION STANDPIPE
WSP	WSP	WET STANDPIPE
MG	MG	NATURAL GAS (MEDIUM PRESSURE - 2 PSI)
G	G	NATURAL GAS (LOW PRESSURE - 11" W.C.)
V(G)	V(G)	VENT (GAS)
A	A	COMPRESSED AIR
		HEAT TAPE
TPL	TPL	TRAP PRIMER LINE
ARW	ARW	ACID RESISTING WASTE
ARV	ARV	ACID RESISTING VENT
IRW	IRW	IRRIGATION WATER

	OS&Y	OUTSIDE SCREW AND YOKE VALVE
	GV	GATE VALVE
	GLV	GLOBE VALVE
	BV	BALL VALVE
	GC	GAS COCK
	CKV	CHECK VALVE
	BWV	BACKWATER VALVE
	BFV	BUTTERFLY VALVE
	BAL	BALANCING FITTING
	FCV	FLOW CONTROL VALVE
M	MV	TWO-WAY MOTORIZED VALVE
M	MV	THREE-WAY MOTORIZED VALVE
M	MV	MOTORIZED BUTTERFLY VALVE
	PRV	PRESSURE REDUCING VALVE
	RV	PRESSURE RELIEF VALVE
	PTRV	PRESSURE TEMPERATURE RELIEF VALVE
		COMPRESSED AIR OUTLET
WH	WH	WALL HYDRANT
DV	DV	HOSE END DRAIN VALVE
HB	HB	HOSE BIBB
AV	AV	AIR VENT
	WHA	WATER HAMMER ARRESTOR
	TPV	TRAP PRIMER VALVE
	STR	STRAINER WITH HOSE END DRAIN VALVE
		UNION, FLANGE
		PIPE REDUCER
		SPRINKLER HEAD - UPRIGHT/ PENDENT & SIDEWALL
		SPRINKLER HEAD - DRY PENDENT, 45° DRY PENDENT
		PRESSURE GAGE WITH GAGE COCK
		GAGE COCK
		THERMOMETER
FS	FS	FLOW SWITCH
		IMMERSION THERMOSTAT
		PITCHED DOWN
	PTT	PRESSURE TEMPERATURE TAP
		DIRECTION OF FLOW
		VALVE IN RISER
		CAP OR PLUG
	CTG	CLEANOUT TO GRADE
	FCO	FLOOR CLEANOUT
	WCO	WALL CLEANOUT
	CO	CLEANOUT PLUG
TS	TS	TAMPER SWITCH
		SQUARE FEET

	AIR FLOW DIRECTION
	SUPPLY OR OSA DUCT SECTION ROUND, RECTANGULAR
	RETURN OR EXHAUST DUCT SECTION ROUND, RECTANGULAR
	INTERNALLY INSULATED DUCT DOUBLE LINE, SINGLE LINE
	FLEXIBLE EQUIPMENT CONNECTION
FLD FLD	FUSIBLE LINK DAMPER DOUBLE LINE, SINGLE LINE
B B	BUTTERFLY VOLUME DAMPER DOUBLE LINE, SINGLE LINE
	FLEXIBLE DUCT CONNECTOR DOUBLE LINE, SINGLE LINE
	ACOUSTICAL ENCLOSURE OVER DUCT (ENCLOSURE N.I.M.) SEE 33/G.9

N.O.	NORMALLY OPEN
N.C.	NORMALLY CLOSED
D.A.	DIRECT ACTING
R.A.	REVERSE ACTING
P.E.	PNEUMATIC - ELECTRIC
SAV	SOLENOID AIR VALVE
NLL	NIGHT LOW LIMIT

(701)	MZU ZONE NUMBER
(A)	ACCESS DOOR
(C)	CONNECT
(E)	EXISTING
(F)	LOCATE BELOW FLOOR
(K)	CAP OR PLUG
(X)	REMOVE EXISTING
(T)	THROUGH TRUSS WEB

HWB	HEATING WATER BOILER
WCU	WATER CHILLER UNIT
HWP	HEATING WATER PUMP
CWP	CHILLED WATER PUMP
CDP	CONDENSER WATER PUMP
CT	COOLING TOWER
ACCU	AIR COOLED CONDENSING UNIT
ASU	AIR SUPPLY UNIT
MZU	MULTIZONE UNIT
SF	SUPPLY FAN
RF	RETURN FAN
EF	EXHAUST FAN
REF	ROOF EXHAUST FAN
CUH	CABINET UNIT HEATER
UH	UNIT HEATER
TU	TERMINAL UNIT
BHC	BOOSTER HEATING COIL
EHC	ELECTRIC HEATING COIL
HC	HEATING COIL
CC	COOLING COIL
OSA	OUTSIDE AIR
AUD	AUTOMATIC DAMPER
OAD	OUTSIDE AIR DAMPER
RAD	RETURN AIR DAMPER
EAD	EXHAUST AIR DAMPER
SMD	SMOKE DAMPER
SPS	STATIC PRESSURE SENSOR
6Φ	ROUND DUCT DIAMETER, INCHES
32x14	RECTANGULAR DUCT SIZE, INCHES
CS	CEILING SUPPLY DIFFUSER
CR	CEILING RETURN GRILLE
CE	CEILING EXHAUST GRILLE
HS	HIGH SUPPLY GRILLE
HR	HIGH RETURN GRILLE
HE	HIGH EXHAUST GRILLE
LR	LOW RETURN GRILLE
LDS	LINEAR DUCT SUPPLY
LDR	LINEAR DUCT RETURN
DDCU	DIRECT DIGITAL CONTROL UNIT
FCP	FAN CONTROL PANEL
MCC	MOTOR CONTROL CENTER (SEE ELECT.)
(T)	ROOM THERMOSTAT
TP	TRANSFER PUMP (DIESEL OIL)

WC	WATER CLOSET
U	URINAL
L	LAVATORY
S	SINK
SS	SERVICE SINK
MS	MOP SINK
SHR	SHOWER
DF	DRINKING FOUNTAIN
EWH	ELECTRIC WATER HEATER
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
DCA	DOUBLE CHECK VALVE ASSEMBLY
DDCVA	DOUBLE DETECTOR CHECK VALVE ASSEMBLY
FHC	FIRE HOSE CABINET
FCS	FLOOR CONTROL STATION
FDC	FIRE DEPARTMENT CONNECTION
FH	FIRE HYDRANT
FHV	FIRE HOSE VALVE
HDR	HEADER
CB	CATCH BASIN
AD	AREA DRAIN
FS	FLOOR SINK
FD	FLOOR DRAIN
SHD	SHOWER DRAIN
DS	DOWNSPOUT
RD	ROOF DRAIN
ORD	OVERFLOW ROOF DRAIN
VTR	VENT THROUGH ROOF
MH	MANHOLE
CIP	CAST IRON PIPE
CSP	CONCRETE SEWER PIPE
CONC	CONCRETE
TC	TOP OF CURB
I.E.	INVERT ELEVATION
EL	ELEVATION
RI&C	ROUGH-IN AND CONNECT
N.I.M.	NOT IN MECHANICAL - SPECIFIED UNDER ANOTHER DIVISION
S.O.V.	SHUT-OFF VALVE (GATE UNLESS OTHERWISE NOTED)
ASR	AUTOMATIC SPRINKLER RISER
ASD	AUTOMATIC SPRINKLER DRAIN
AGD	AIR GAP DRAIN

GENERAL NOTES

1. THE CONTRACTOR SHALL RECORD ALL INVERT ELEVATIONS, PIPE SIZES, LOCATIONS, AND ANY OTHER DEVIATIONS FROM CONTRACT DRAWINGS, ON AS-BUILT DRAWINGS.
2. ALL END OF WASTE PIPING RUN LAVATORIES, SINKS, AND DRINKING FOUNTAINS SHALL HAVE A WALL CLEANOUT BELOW FIXTURE.
3. REFER TO ARCHITECTURAL DOCUMENTS FOR EXACT LOCATION AND HEIGHT OF ALL PLUMBING FIXTURES. COORDINATE WITH ALL OTHER TRADES.
4. PROVIDE & INSTALL SHUTOFF VALVES ON ALL BRANCH WATER PIPING SERVING FIXTURES AND/OR GROUPS OF FIXTURES OR EQUIPMENT. INSTALL IN LIFTOUT CEILING WHERE POSSIBLE, BEHIND CEILING OR WALL ACCESS PANELS WHERE LIFTOUT CEILING IS NOT AVAILABLE OR AS INDICATED ON THE DRAWINGS. COORDINATE WITH ARCHITECTURAL AND ALL OTHER TRADES.
5. BECAUSE OF THE SMALL SCALE OF THE DRAWINGS, IT IS NOT POSSIBLE TO INDICATE ALL OFFSETS, FITTINGS, VALVES, AND ACCESSORIES WHICH MAY BE REQUIRED. THE CONTRACTOR SHALL CAREFULLY INVESTIGATE THE CONDITIONS SURROUNDING THE INSTALLATION OF HIS WORK AND SHALL FURNISH THE NECESSARY FITTINGS, VALVES, TRAPS, ETC., WHICH MAY BE REQUIRED TO COMPLETE THE INSTALLATION IN A SATISFACTORY AND CODE APPROVED MANNER.
6. WHERE BRANCH PIPE SIZE IS NOT SHOWN ON DRAWINGS, REFER TO PLUMBING FIXTURE ROUGH-IN SCHEDULE FOR REQUIRED PIPE SIZE.
7. ALL FIRE SPRINKLER HEADS HAVE NOT BEEN SHOWN OR SCHEDULED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE AND INSTALL A COMPLETE FIRE SPRINKLER SYSTEM IN ALL PORTIONS OF THE BUILDING EXCEPT AS SPECIFICALLY NOTED.
8. SEE ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF PIPE AND DUCTS IN EXPOSED AREAS WITHOUT CEILINGS; ALSO FOR EXACT LOCATIONS OF SPRINKLER HEADS.
9. FOR LOCATIONS OF EXPANSION JOINTS IN GENERAL CONSTRUCTION WORK, SEE ARCHITECTURAL DRAWINGS.
10. THE LOCATIONS OF THE PLUMBING, MECHANICAL, AND FIRE PROTECTION PIPING, EQUIPMENT, DUCTS, AND FIRE SPRINKLER HEADS IS TO BE STRICTLY CONTROLLED IN MANY AREAS. THE ARCHITECTURAL REFLECTED CEILING PLANS AND THE MECHANICAL DRAWINGS INDICATE THE LOCATION OF MANY OF THESE ITEMS AND ANY DEVIATION FROM THESE DRAWINGS MUST BE APPROVED BY THE ARCHITECT PRIOR TO INSTALLATION.

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Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4916 OREGON JULY 9, 1948 ROBERT G. MANFULL

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
3	Addendum #4	11/13/84
4	Addendum #5	11/21/84
5	Proposal Request #1	03/01/85
6	Proposal Request #2	03/01/85
7	Proposal Request #3	03/01/85
8	Proposal Request #4	
9	Proposal Request #5	03/08/85
10	Proposal Request #6	03/01/85
11	Proposal Request #7	03/01/85
12	Proposal Request #8	03/01/85
13	Proposal Request #9	03/01/85
14	Proposal Request #10	03/01/85
15	Proposal Request #11	03/01/85
16	Proposal Request #12	03/01/85
17	Proposal Request #13	03/01/85
18	Proposal Request #14	03/01/85
19	Clarification Items	03/01/85
20	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

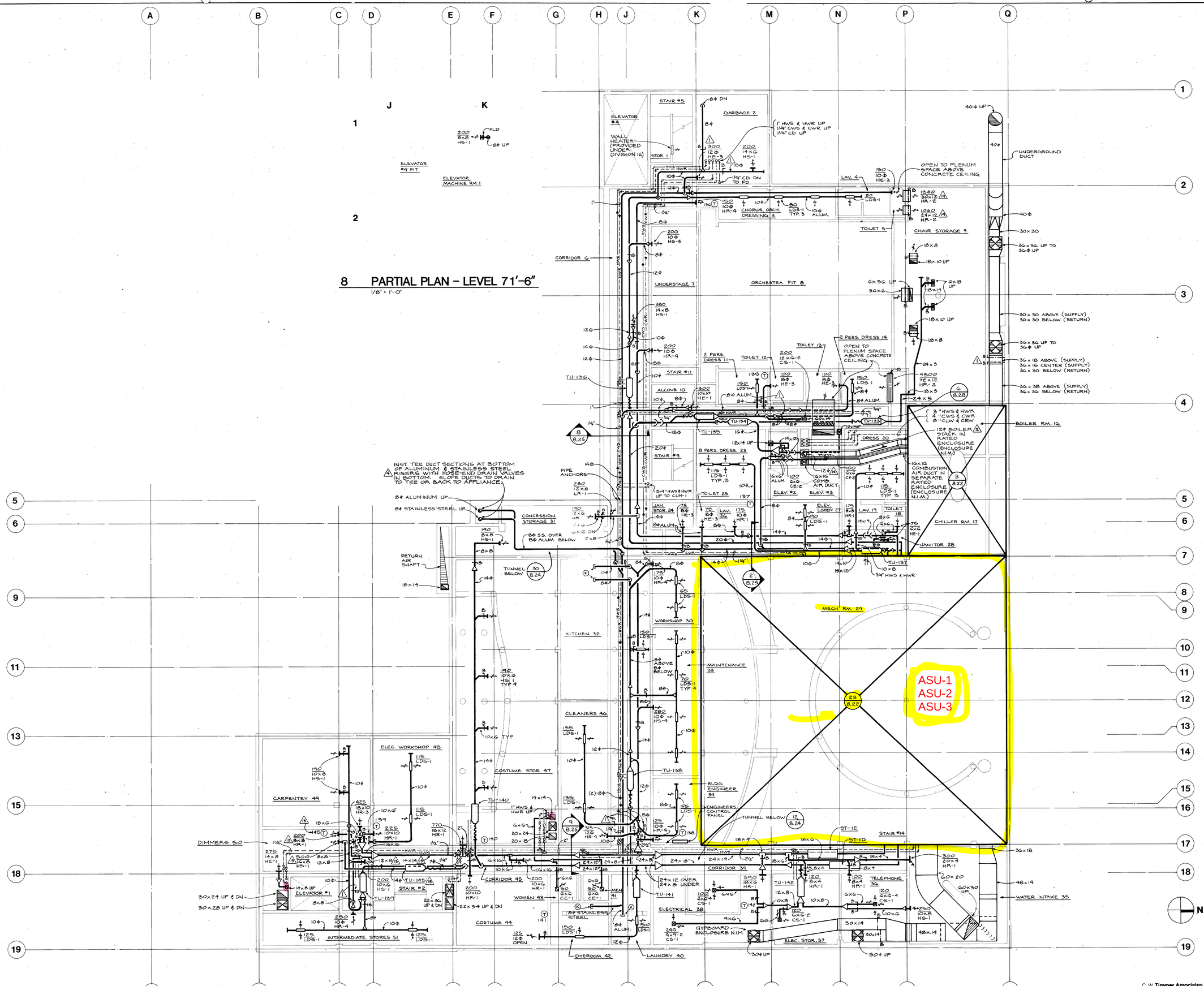
LEGEND & NOTES MECHANICAL

Date OCT. 12, 1984
Scale NONE
Drawing No. **8.0**

C.W. Timmer Associates Inc.
Consulting Engineers
1694-20

CASCADE A. & E. SUPPLIES CO.

8 PARTIAL PLAN – LEVEL 71'-6"
1/8" = 1'-0"



SCREEN VALUE 10 120 81
COMPOSITE INSTRUCTIONS 57 80
BASE/OVERLAY NO.

CADCAM A. & E. SUPPLIES CO.

Portland Center for the Performing Arts

The City of Portland

Honorable Mildred A. Schwab
Commissioner in Charge

Ronald K. Ragen
Chairman
Performing Arts Center Committee

Architects

Broome, Oringdulph, O'Toole, Rudolf & Associates pc
ELS Design Group
Barton Myers

Project Address
733 N.W. 20th Avenue
Portland, Oregon 97209
(503) 226-1575

Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
3	Addendum #4	11/13/84
4	Addendum #5	11/21/84
5	Proposal Request #1	03/01/85
6	Proposal Request #2	03/01/85
7	Proposal Request #3	03/01/85
8	Proposal Request #4	
9	Proposal Request #5	03/08/85
10	Proposal Request #6	03/01/85
11	Proposal Request #7	03/01/85
12	Proposal Request #8	03/01/85
13	Proposal Request #9	03/01/85
14	Proposal Request #10	03/01/85
15	Proposal Request #11	03/01/85
16	Proposal Request #12	03/01/85
17	Proposal Request #13	03/01/85
18	Proposal Request #14	03/01/85
19	Clarification Items	03/01/85
20	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

PLAN LEVEL 79'-0"
HVAC

Date OCT. 12 1984
Scale 1/8"=1'-0"
Drawing No. **8.10**

C W **Timmer Associates** Inc.
Consulting Engineers
1694-20

Portland Center for the Performing Arts

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Theatre Consultants

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Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER OREGON JULY 9, 1944 ROBERT Q. MANWILL

Target		Revision Item	Revision Date
1	-	Addendum #1	10/29/84
2	-	Addendum #2	11/06/84
4	-	Addendum #4	11/13/84
5	-	Addendum #5	11/21/84
1	-	Proposal Request #1	03/01/85
2	-	Proposal Request #2	03/01/85
3	-	Proposal Request #3	03/01/85
4	-	Proposal Request #4	
5	-	Proposal Request #5	03/08/85
6	-	Proposal Request #6	03/01/85
7	-	Proposal Request #7	03/01/85
8	-	Proposal Request #8	03/01/85
9	-	Proposal Request #9	03/01/85
10	-	Proposal Request #10	03/01/85
11	-	Proposal Request #11	03/01/85
12	-	Proposal Request #12	03/01/85
13	-	Proposal Request #13	03/01/85
14	-	Proposal Request #14	03/01/85
20	-	Clarification Items	03/01/85
21	-	Miscellaneous Items	03/01/85

Revisions

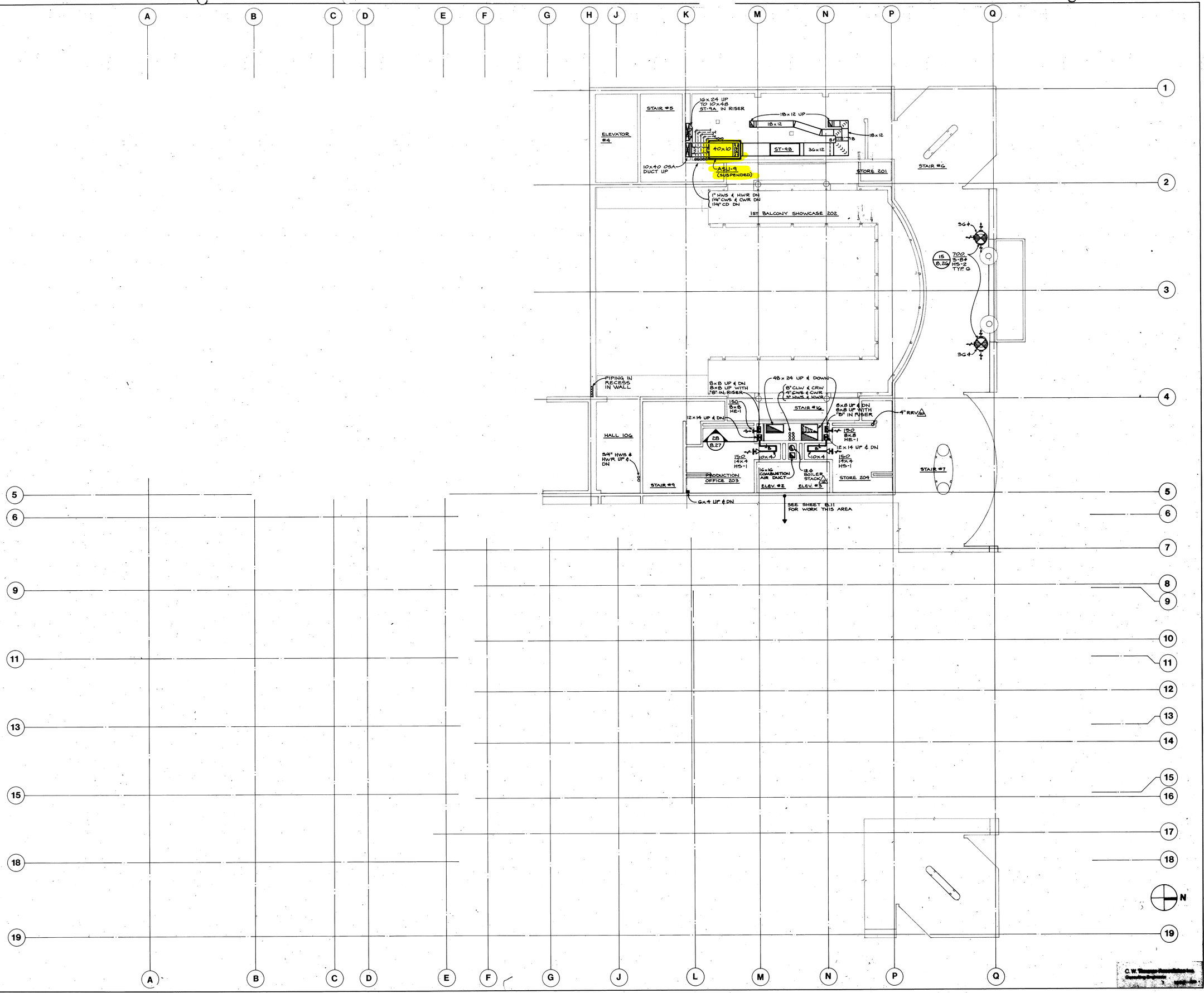
New Theatre Building

PLAN LEVEL 91'-0"/97'-6" HVAC

Date · OCT 12, 1984
Scale 1/8"=1'-0"
Drawing No. **8.11**

C.W. Timmer Associates Inc.
Consulting Engineers
10-94-20

CASCADE A. & E. SUPPLIES CO.



Portland Center for the Performing Arts

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Barton Myers

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Consultants

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R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1972 ROBERT G. MANFULL

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
4	Addendum #4	11/13/84
5	Addendum #5	11/21/84
1	Proposal Request #1	03/01/85
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3	Proposal Request #3	03/01/85
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9	Proposal Request #9	03/01/85
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11	Proposal Request #11	03/01/85
12	Proposal Request #12	03/01/85
13	Proposal Request #13	03/01/85
14	Proposal Request #14	03/01/85
15	Clarification Items	03/01/85
16	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

PLAN LEVEL 99'-0" HVAC

Date OCT. 12, 1984
Scale 1/8"=1'-0"
Drawing No. 6.8.12

C.W. Timmer Associates Consulting Engineers

CAMCARD ®, U.S. SUPPLIES CO.

Portland Center for the Performing Arts

The City of Portland

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Performing Arts Center Committee

Architects

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ELS Design Group
Barton Myers

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Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4010 OREGON JULY 9, 1963 ROBERT E. MANFUL

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
4	Addendum #4	11/13/84
5	Addendum #5	11/21/84
1	Proposal Request #1	03/01/85
2	Proposal Request #2	03/01/85
3	Proposal Request #3	03/01/85
4	Proposal Request #4	
5	Proposal Request #5	03/08/85
6	Proposal Request #6	03/01/85
7	Proposal Request #7	03/01/85
8	Proposal Request #8	03/01/85
9	Proposal Request #9	03/01/85
10	Proposal Request #10	03/01/85
11	Proposal Request #11	03/01/85
12	Proposal Request #12	03/01/85
13	Proposal Request #13	03/01/85
14	Proposal Request #14	03/01/85
15	Clarification Items	03/01/85
16	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

PLAN LEVEL 107'-0"/108'-0"
HVAC

Date 4-84
Scale 1/8" = 1'-0"
Drawing No. **8.13**

C. W. **Timmer Associates** Inc.
Consulting Engineers 1694-20

SCREEN VALUE
COMPOSITE INSTRUCTIONS 10 123 813
BASE/OVERLAY NO 63 813

CASCADE A. & E. SUPPLIES CO.

Portland Center for the Performing Arts

The City of Portland

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Architects

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ELS Design Group
Barton Myers

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Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 1916 OREGON JULY 1, 1977 ROBERT G. MANFULL

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
3	Addendum #4	11/13/84
4	Addendum #5	11/21/84
5	Proposal Request #1	03/01/85
6	Proposal Request #2	03/01/85
7	Proposal Request #3	03/01/85
8	Proposal Request #4	
9	Proposal Request #5	03/08/85
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13	Proposal Request #9	03/01/85
14	Proposal Request #10	03/01/85
15	Proposal Request #11	03/01/85
16	Proposal Request #12	03/01/85
17	Proposal Request #13	03/01/85
18	Proposal Request #14	03/01/85
19	Clarification Items	03/01/85
20	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

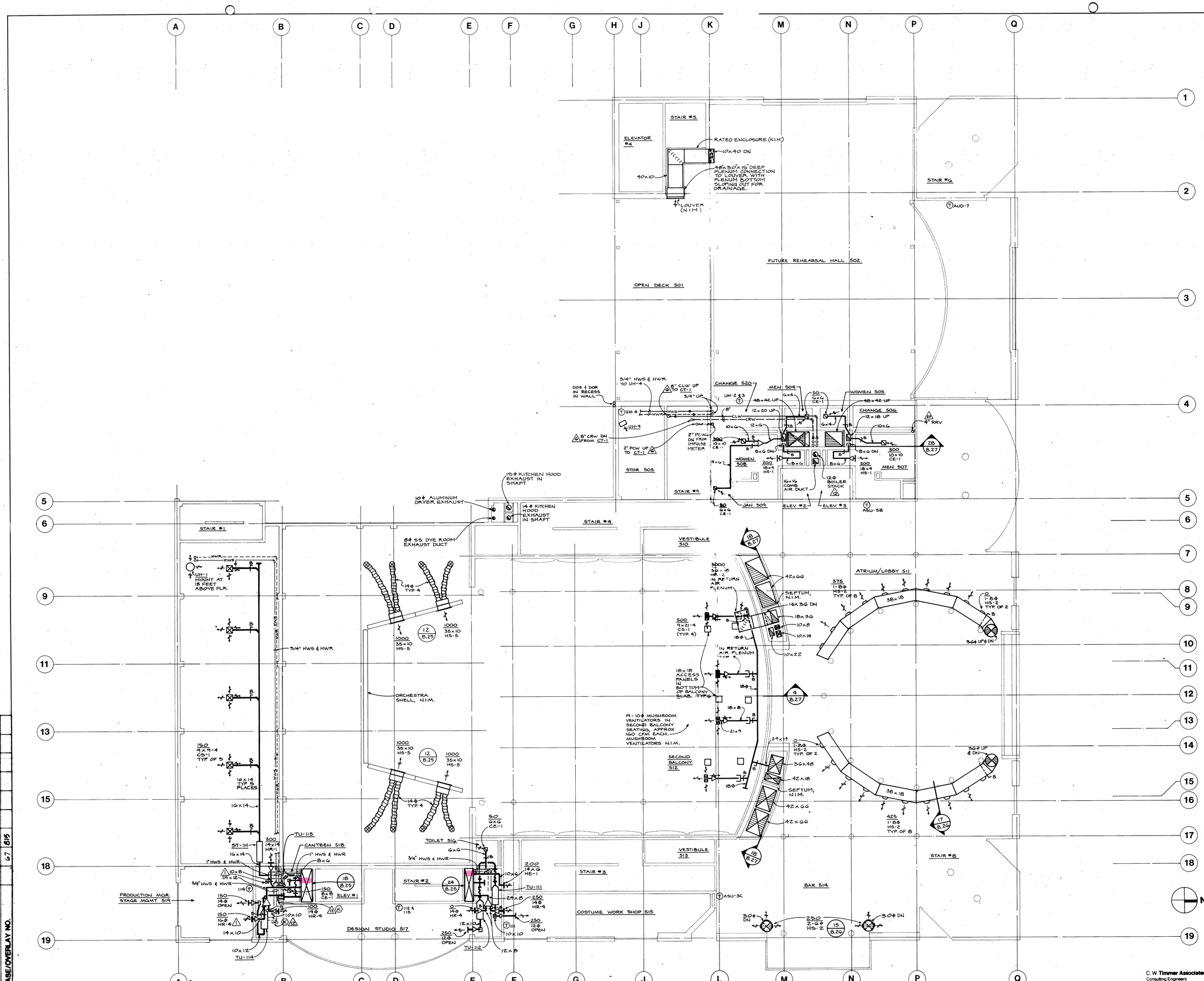
PLAN LEVEL 115'-0"/118'-6" HVAC

Date [illegible] 1984
Scale 1/8" = 1'-0"
Drawing No. **8.14**

C.W. **Timmer Associates** Inc
Consulting Engineers
1694 - 20

SCREEN VALUE
COMPOSITE INSTRUCTIONS
BASE/OVERLAY NO.
10, 124, 814, 65, 814

CASCADE A. & E. SUPPLIES CO.



SCREEN VALUE			
COMPOSITE INSTRUCTIONS	10	126	815
BASE/OVERLAY NO.		67	815

GARGARE A. B.S. SUPPLIES CO.

C.W. **Timmer Associates** Inc.
Consulting Engineers
1494-20

Portland Center for the Performing Arts

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ELS Design Group
Barton Myers

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733 N.W. 20th Avenue
Portland, Oregon 97209
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Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4916 OREGON JULY 9, 1948 Robert K. Manfield

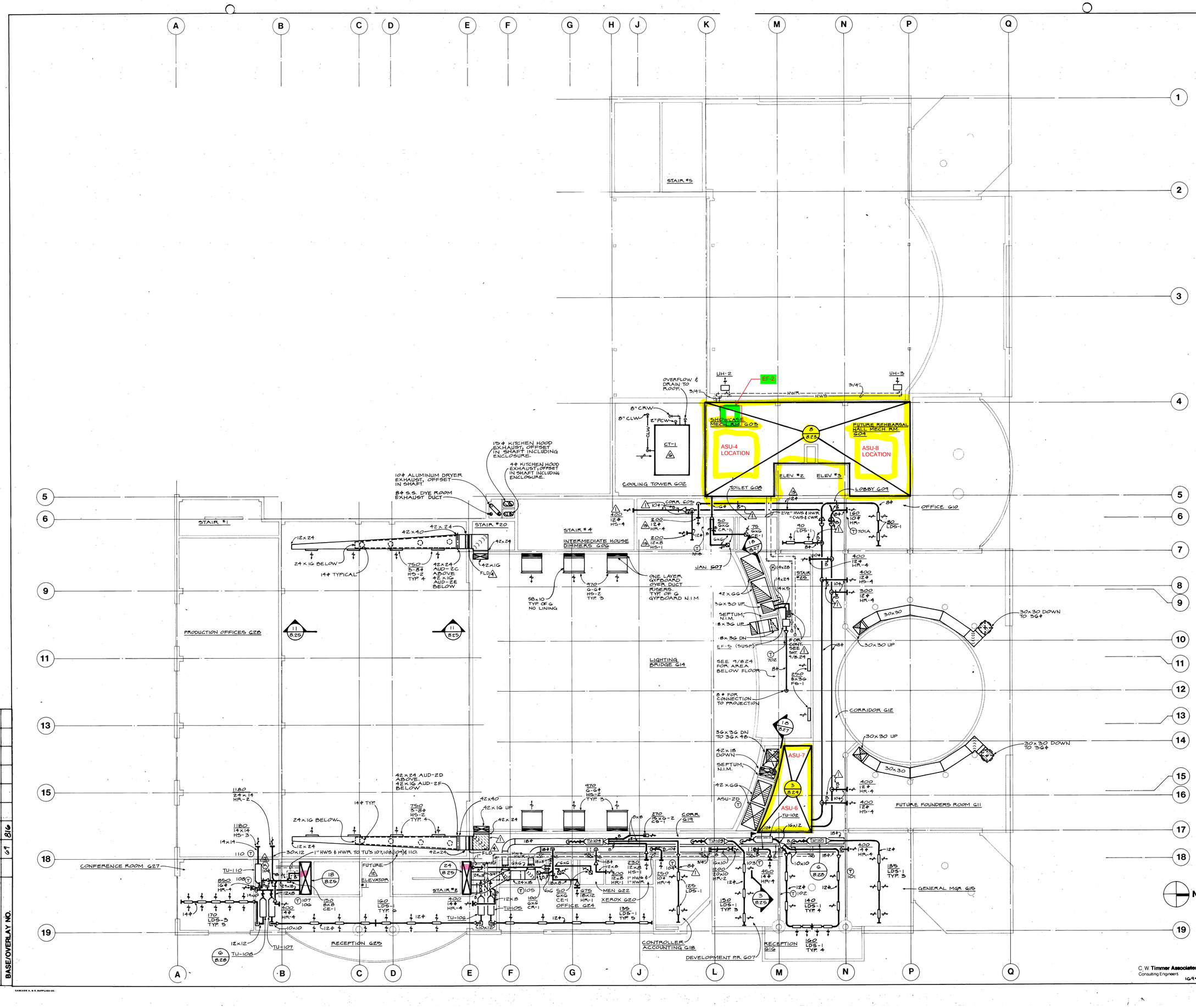
Target		Revision Item	Revision Date
1	-	Addendum #1	10/29/84
2		Addendum #2	11/06/84
4		Addendum #4	11/13/84
5		Addendum #5	11/21/84
A		Proposal Request #1	03/01/85
A		Proposal Request #2	03/01/85
A		Proposal Request #3	03/01/85
A		Proposal Request #4	
A		Proposal Request #5	03/08/85
A		Proposal Request #6	03/01/85
A		Proposal Request #7	03/01/85
A		Proposal Request #8	03/01/85
A		Proposal Request #9	03/01/85
A		Proposal Request #10	03/01/85
A		Proposal Request #11	03/01/85
A		Proposal Request #12	03/01/85
A		Proposal Request #13	03/01/85
A		Proposal Request #14	03/01/85
A		Clarification Items	03/01/85
A		Miscellaneous Items	03/01/85

Revisions

New Theatre Building

PLAN LEVEL 120'-0" HVAC

Date OCT 12, 1984
Scale 1/8" = 1'-0"
Drawing No. **8.15**



Portland Center for the Performing Arts

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ELS Design Group
Barton Myers

Project Address
733 N.W. 20th Avenue
Portland, Oregon 97209
(503) 226-1575

Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER #210 OREGON JULY 9, 1976 ROBERT G. MARFELL

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
4	Addendum #4	11/13/84
5	Addendum #5	11/21/84
1	Proposal Request #1	03/01/85
2	Proposal Request #2	03/01/85
3	Proposal Request #3	03/01/85
4	Proposal Request #4	
5	Proposal Request #5	03/08/85
6	Proposal Request #6	03/01/85
7	Proposal Request #7	03/01/85
8	Proposal Request #8	03/01/85
9	Proposal Request #9	03/01/85
10	Proposal Request #10	03/01/85
11	Proposal Request #11	03/01/85
12	Proposal Request #12	03/01/85
13	Proposal Request #13	03/01/85
14	Proposal Request #14	03/01/85
A	Clarification Items	03/01/85
M	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

PLAN LEVEL 141'-0" HVAC

Date OCT 12, 1984
Scale 1/8"=1'-0"
Drawing No. **8.16**

C.W. **Timmer Associates** Inc
Consulting Engineers
1694 - 20

SCREEN VALUE			
COMPOSITE INSTRUCTIONS	10	124	816
BASE/OVERLAY NO.		69	816

CADCAM A. & E. SUPPLIES CO.

Portland Center for the Performing Arts

The City of Portland

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Architects

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Barton Myers

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Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4916 OREGON JULY 8, 1948 ROBERT E. MANFULL
Robert E. Manfull

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
4	Addendum #4	11/13/84
5	Addendum #5	11/21/84
1	Proposal Request #1	03/01/85
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3	Proposal Request #3	03/01/85
4	Proposal Request #4	-
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8	Proposal Request #8	03/01/85
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10	Proposal Request #10	03/01/85
11	Proposal Request #11	03/01/85
12	Proposal Request #12	03/01/85
13	Proposal Request #13	03/01/85
14	Proposal Request #14	03/01/85
15	Clarification Items	03/01/85
16	Miscellaneous Items	03/01/85

Revisions

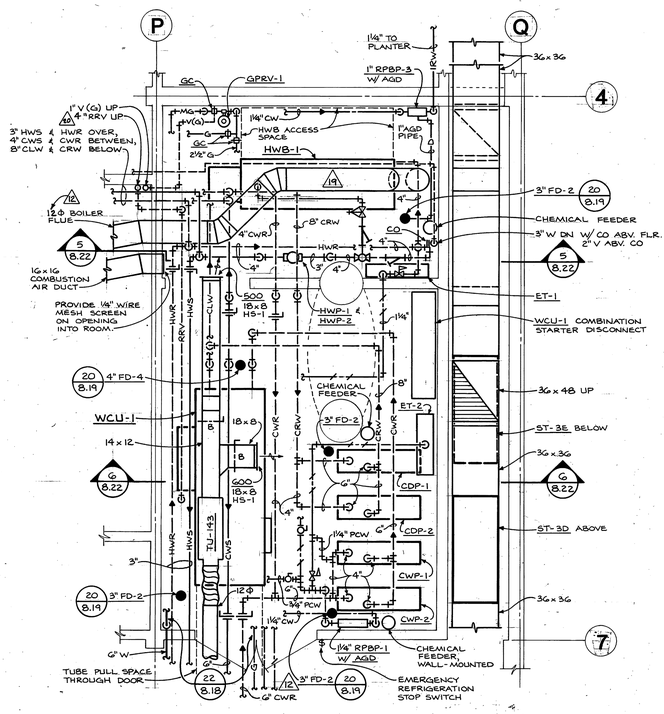
New Theatre Building

PLAN LEVEL 153'-0"/173'-0" HVAC

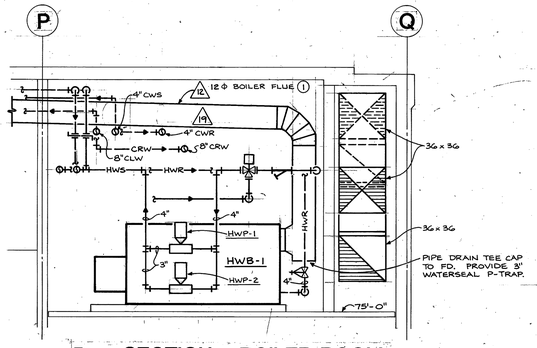
Date OCT 12, 1984
Scale 1/8"=1'-0"
Drawing No. **8.17**

C.W. **Timmer Associates** Inc
Consulting Engineers
1694-20

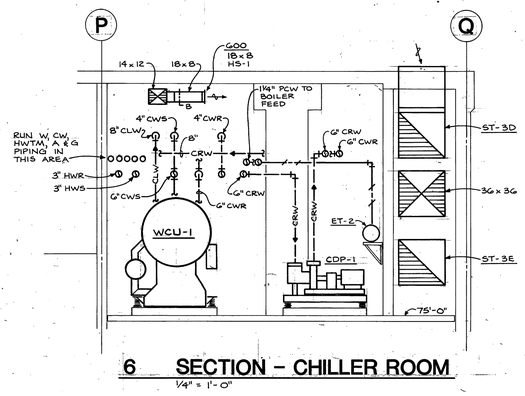
SCREEN VALUE
COMPOSITE INSTRUCTIONS 10 127 817
BASE/OVERLAY NO. 79 817
CASCADE A. & E. SUPPLIES CO.



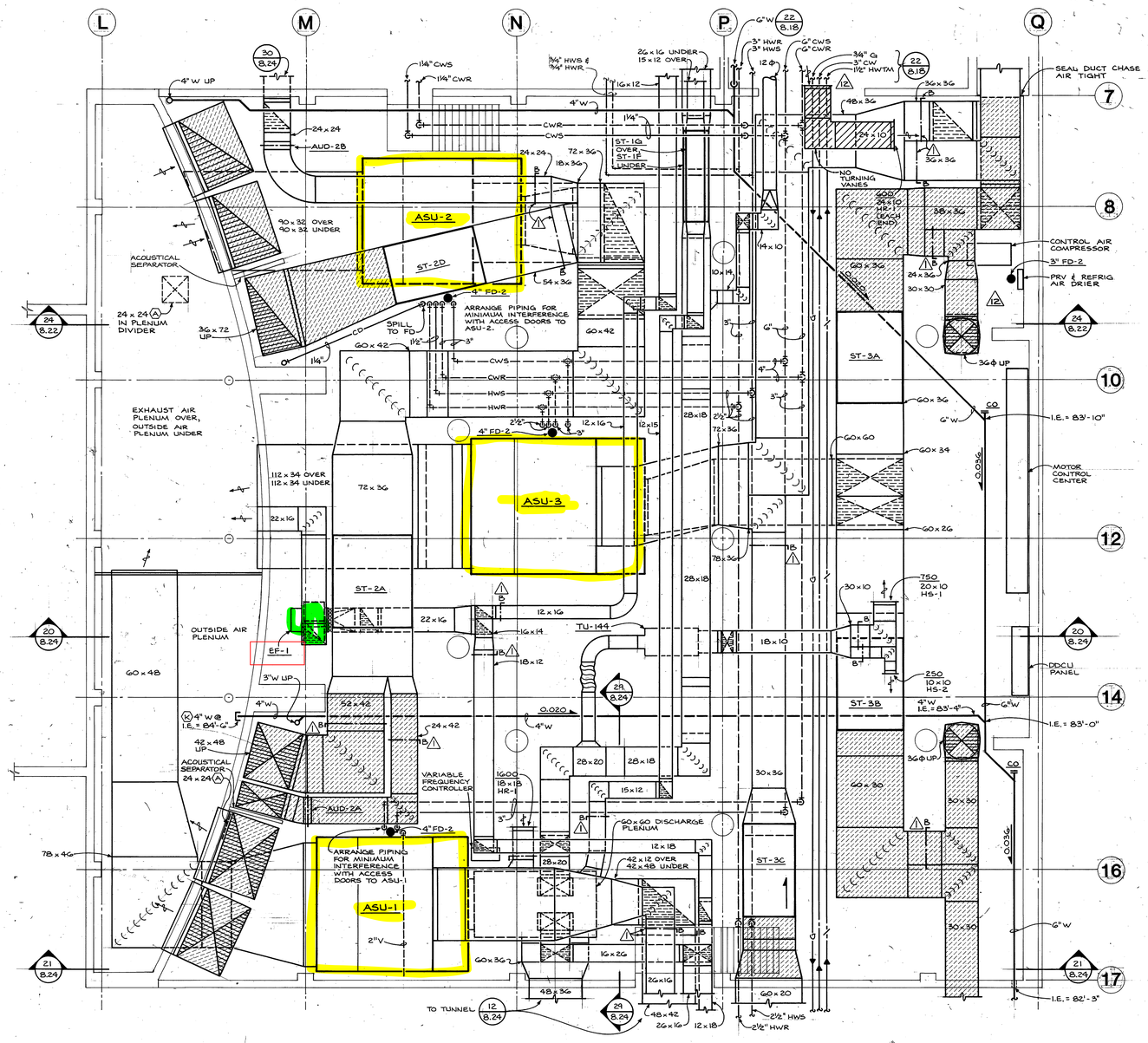
3 PLAN – BOILER/CHILLER ROOM
1/4" = 1'-0"



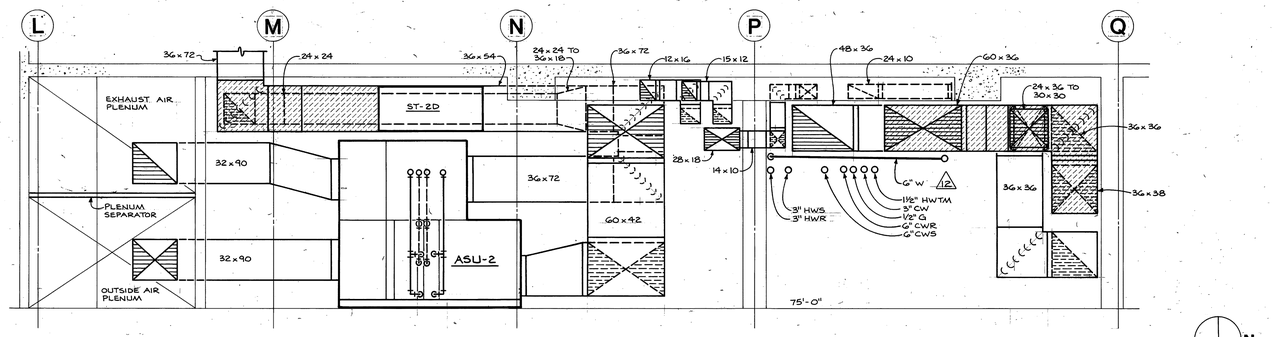
5 SECTION – BOILER ROOM
1/4" = 1'-0"
NOTES: (1) SLOPE BOILER FLUE MINIMUM ¼"/FOOT. ROUTE IN SEPARATE RATED SHAFT PER CODE. HOLD AS TIGHT TO SLAB ABOVE AS POSSIBLE.



6 SECTION – CHILLER ROOM
1/4" = 1'-0"



23 PLAN – MECHANICAL ROOM 29
1/4" = 1'-0"



24 SECTION AT ASU-2
1/4" = 1'-0"

N

C. W. Timmer Associates Inc.
Consulting Engineers
1699-20

Portland Center for the Performing Arts

The City of Portland

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Architects

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ELS Design Group
Barton Myers

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(503) 226-1575

Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1948 Robert E. Manfull ROBERT E. MANFULL

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
3	Addendum #4	11/13/84
4	Addendum #5	11/21/84
5	Proposal Request #1	03/01/85
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7	Proposal Request #3	03/01/85
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16	Proposal Request #12	03/01/85
17	Proposal Request #13	03/01/85
18	Proposal Request #14	03/01/85
19	Clarification Items	03/01/85
20	Miscellaneous Items	03/01/85

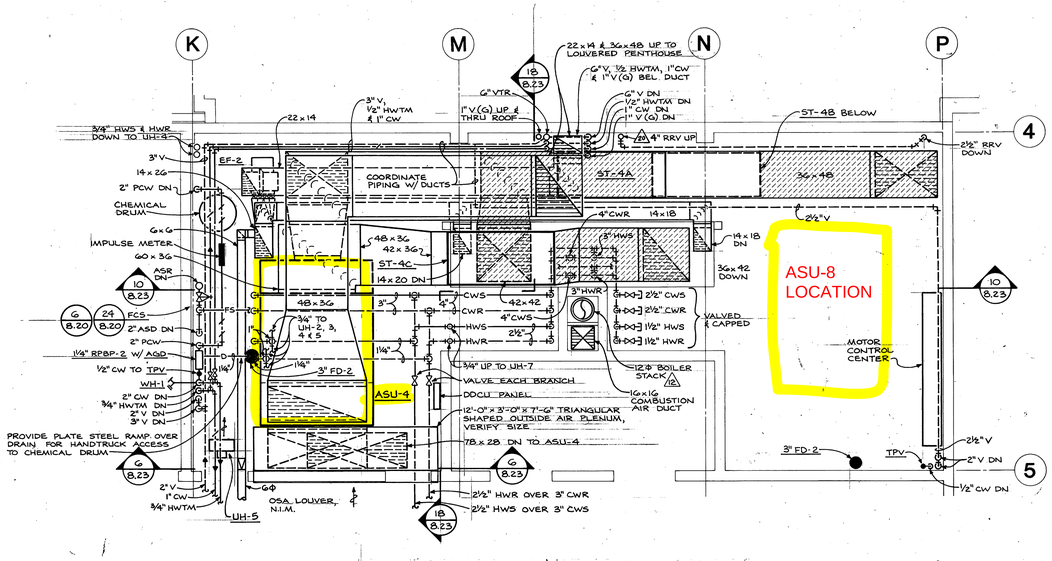
Revisions

New Theatre Building

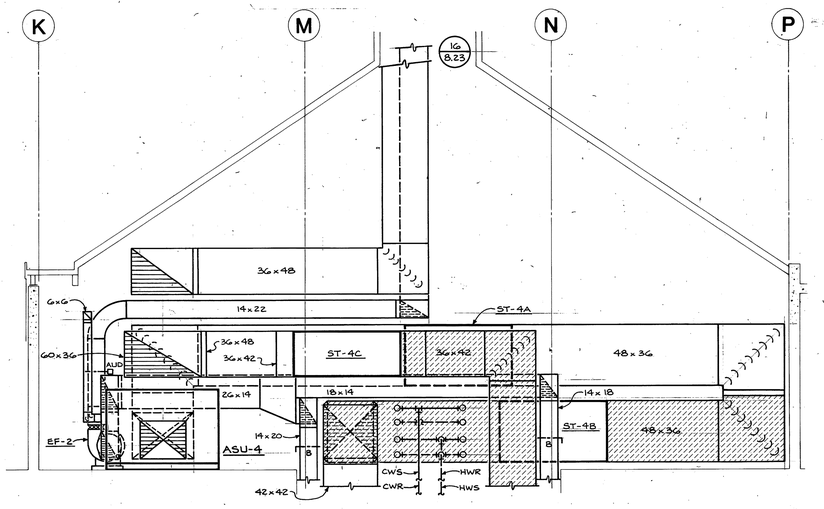
MECHANICAL RMS DETAILS

Date OCT. 12, 1984
Scale 1/4" = 1'-0"
Drawing No. **8.22**

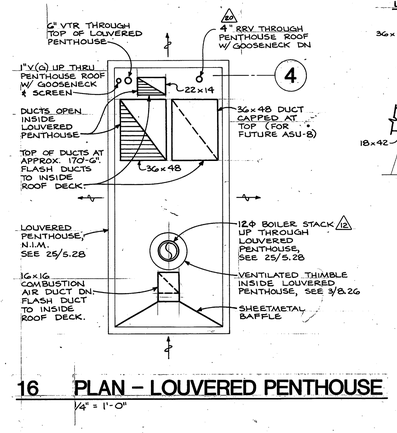
CASCADE A. & E. SUPPLIES CO.



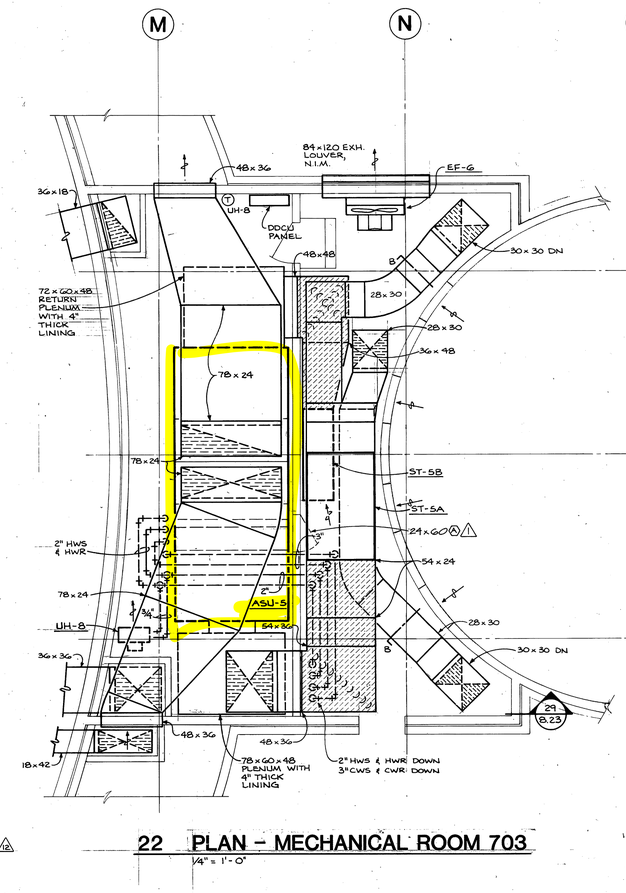
8 PLAN – MECHANICAL ROOM 603
1/4" = 1'-0"



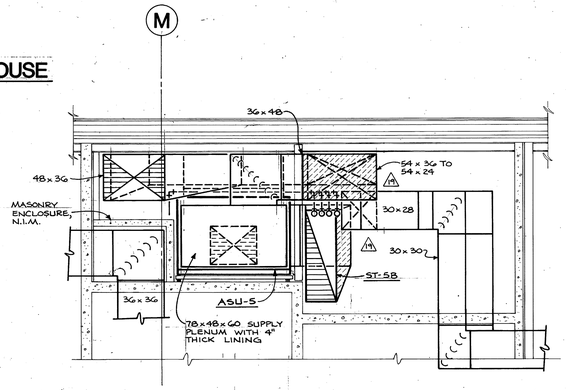
10 SECTION
1/4" = 1'-0"



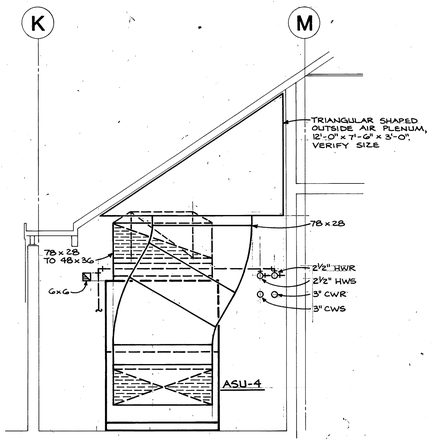
16 PLAN – LOUVERED PENTHOUSE
1/4" = 1'-0"



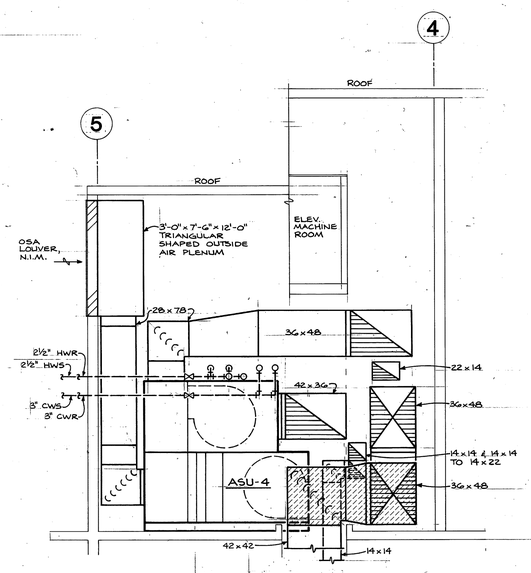
22 PLAN – MECHANICAL ROOM 703
1/4" = 1'-0"



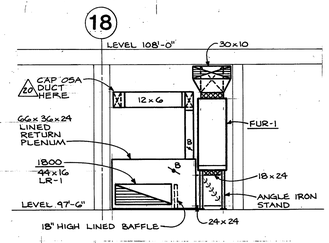
29 SECTION
1/4" = 1'-0"



6 SECTION
1/4" = 1'-0"



18 SECTION
1/4" = 1'-0"



30 SECTION AT FUR-1
1/4" = 1'-0"
NOTE: FUR-1 SYSTEM NOT IN THIS CONTRACT.

N

C. W. Timmer Associates Inc.
Consulting Engineers
1694-20

Portland Center for the Performing Arts

The City of Portland

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Commissioner in Charge

Ronald K. Ragen
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Performing Arts Center Committee

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REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1948 ROBERT E. MANFULL

Target	Revision Item	Revision Date
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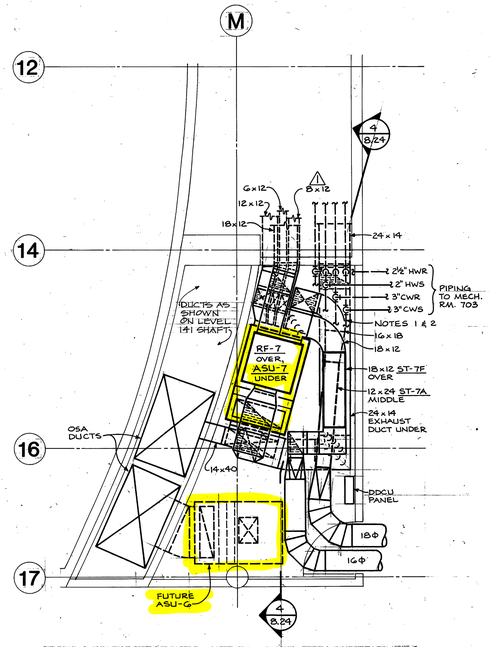
13	Proposal Request #13	03/01/85
14	Proposal Request #14	03/01/85
A	Clarification Items	03/01/85
M	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

DETAILS
MECHANICAL RMS

Date OCT. 12, 1984
Scale 1/4" = 1'-0"
Drawing No. **8.23**

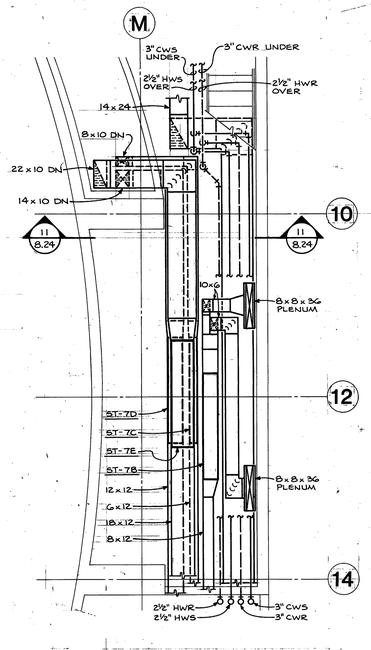


3 PLAN – MECHANICAL ROOM 629

1/4" = 1'-0"

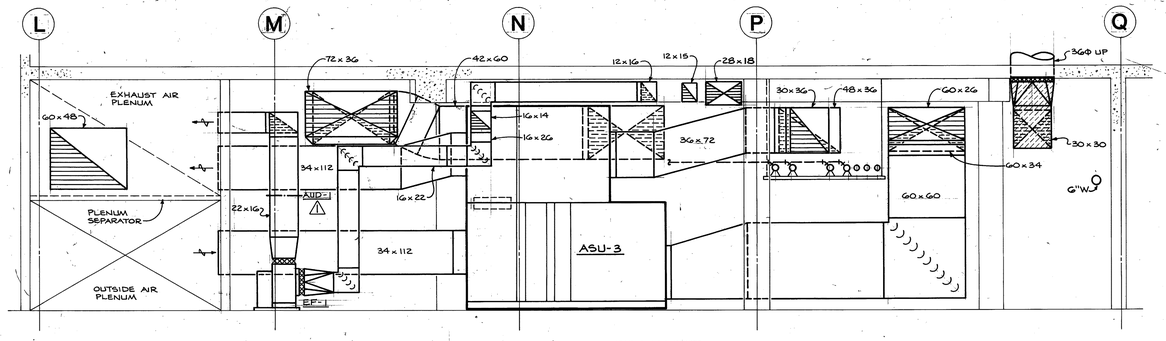
NOTES:

1. ¾" HWS & HWR. ¾" BRANCH LINES TO ASU-7. ¾" CAPPED BRANCH LINES TO FUTURE ASU-G.
2. 2" CWS & CWR. 1¼" BRANCH LINES TO ASU-7. 1¼" CAPPED BRANCH LINES TO FUTURE ASU-G.



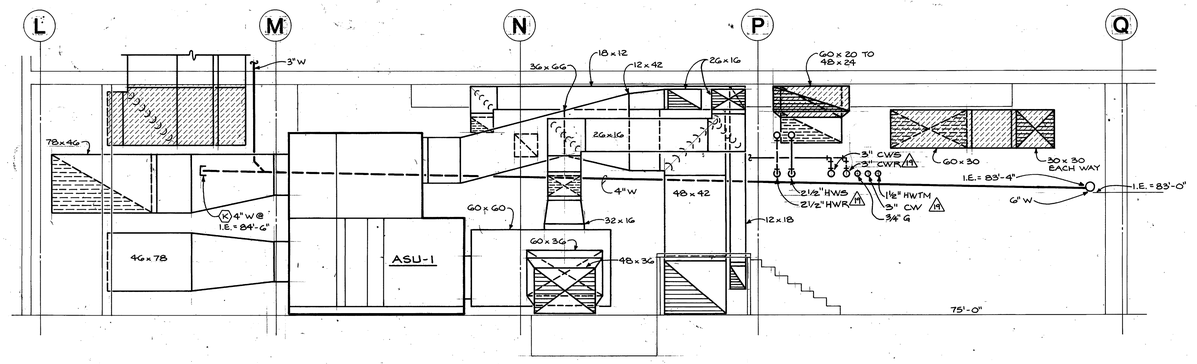
9 PLAN – SPACE BELOW CONTROL ROOM 618

1/4" = 1'-0"



20 SECTION AT ASU-3

1/4" = 1'-0"



21 SECTION AT ASU-1

1/4" = 1'-0"

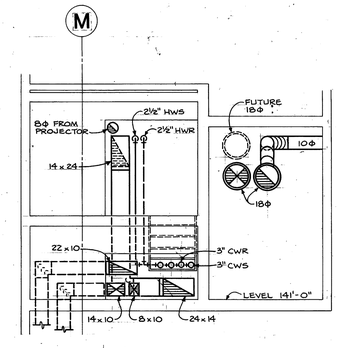
4 SECTION

1/4" = 1'-0"

MZ DAMPER SCHEDULE

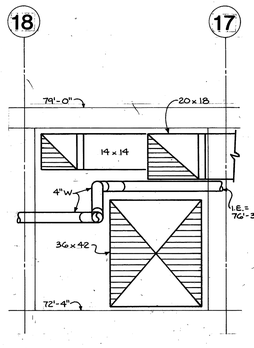
ZONE	SERVES	AIR VOLUME	DAMPER SIZE	DUCT SIZE
(701)	141, MISC.	2000	20x14	18x16
(702)	PROJECTOR	500	6x14	8x12
(703)	CONTROL BOOTHS	340	4x14	6x12
(704)	SOUND	800	8x14	12x12

MZ, ASU-7 BASED ON PACE A-15 WITH 1½" BETWEEN ZONES AT DAMPER SECTION.



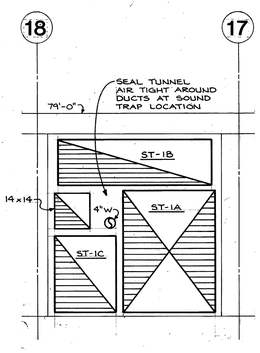
11 SECTION

1/4" = 1'-0"



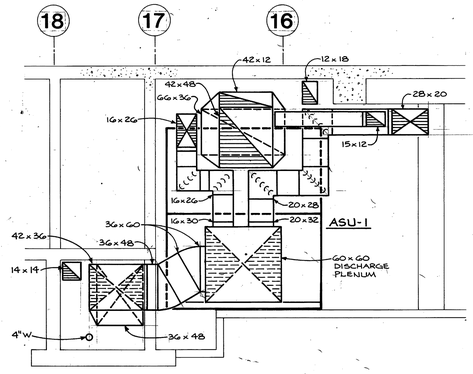
17 SECTION – TUNNEL AT J

1/2" = 1'-0"



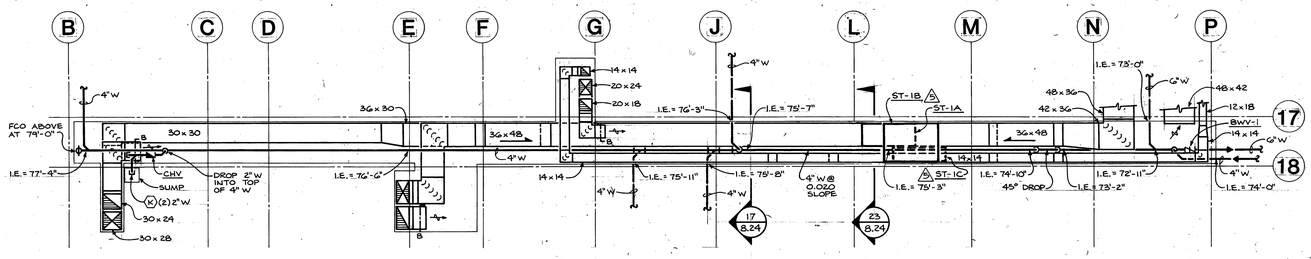
23 SECTION – TUNNEL AT L

1/2" = 1'-0"



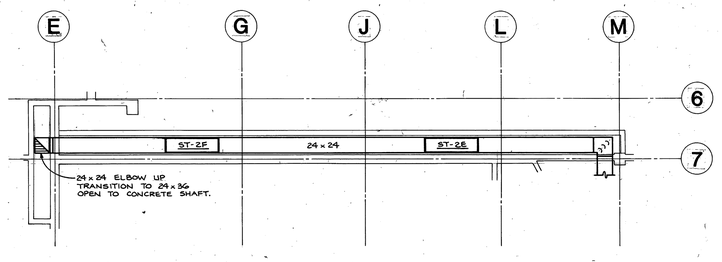
29 SECTION

1/4" = 1'-0"



12 TUNNEL PLAN

1/8" = 1'-0"



30 TUNNEL PLAN

1/8" = 1'-0"

N

C.W. Timmer Associates Inc.
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1699-20

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REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1948 ROBERT E. MANFULL

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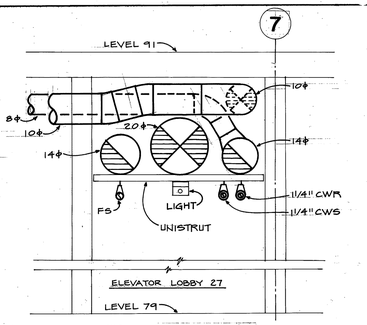
14	Proposal Request #14	03/01/85
C	Clarification Items	03/01/85
M	Miscellaneous Items	03/01/85

Revisions

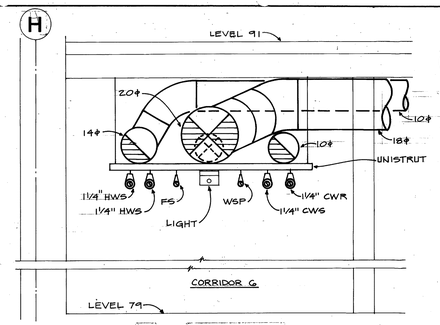
New Theatre Building

DETAILS 3
MECHANICAL RMS

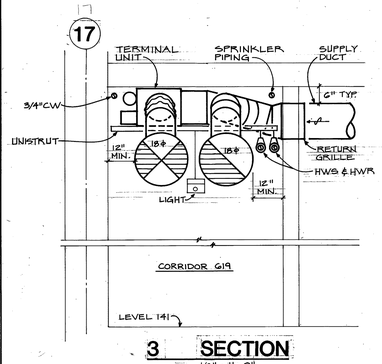
Date OCT. 12, 1984
Scale AS SHOWN
Drawing No. **8.24**



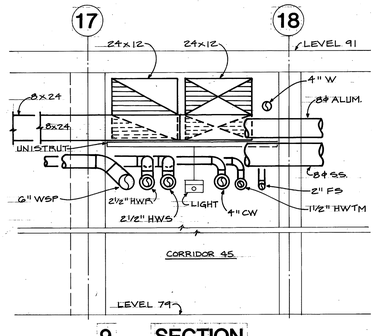
2 SECTION
1/2"=1'-0"



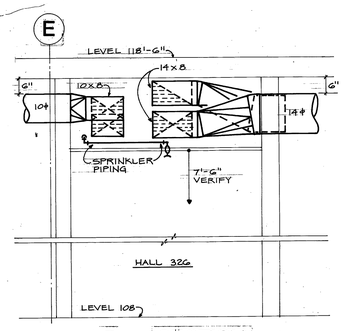
8 SECTION
1/2"=1'-0"



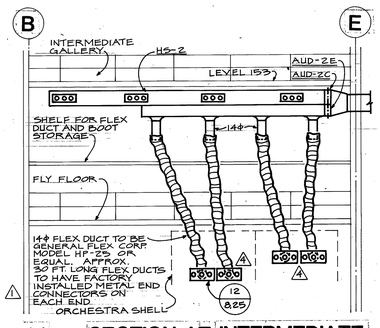
3 SECTION
1/2"=1'-0"



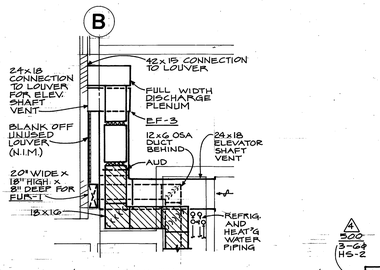
9 SECTION
1/2"=1'-0"



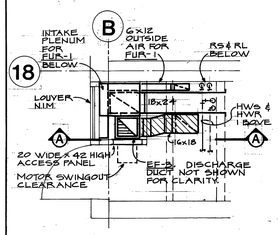
5 SECTION
1/2" = 1'-0"



11 SECTION AT INTERMEDIATE STAGE
1/8"=1'-0"

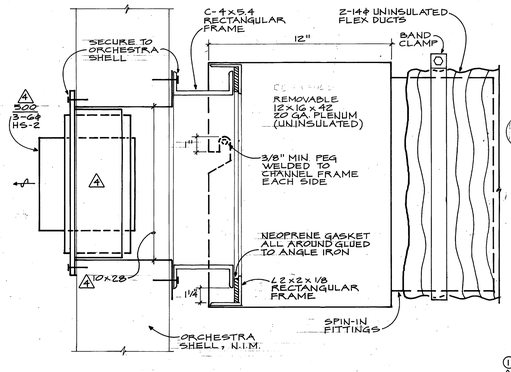


A-A SECTION

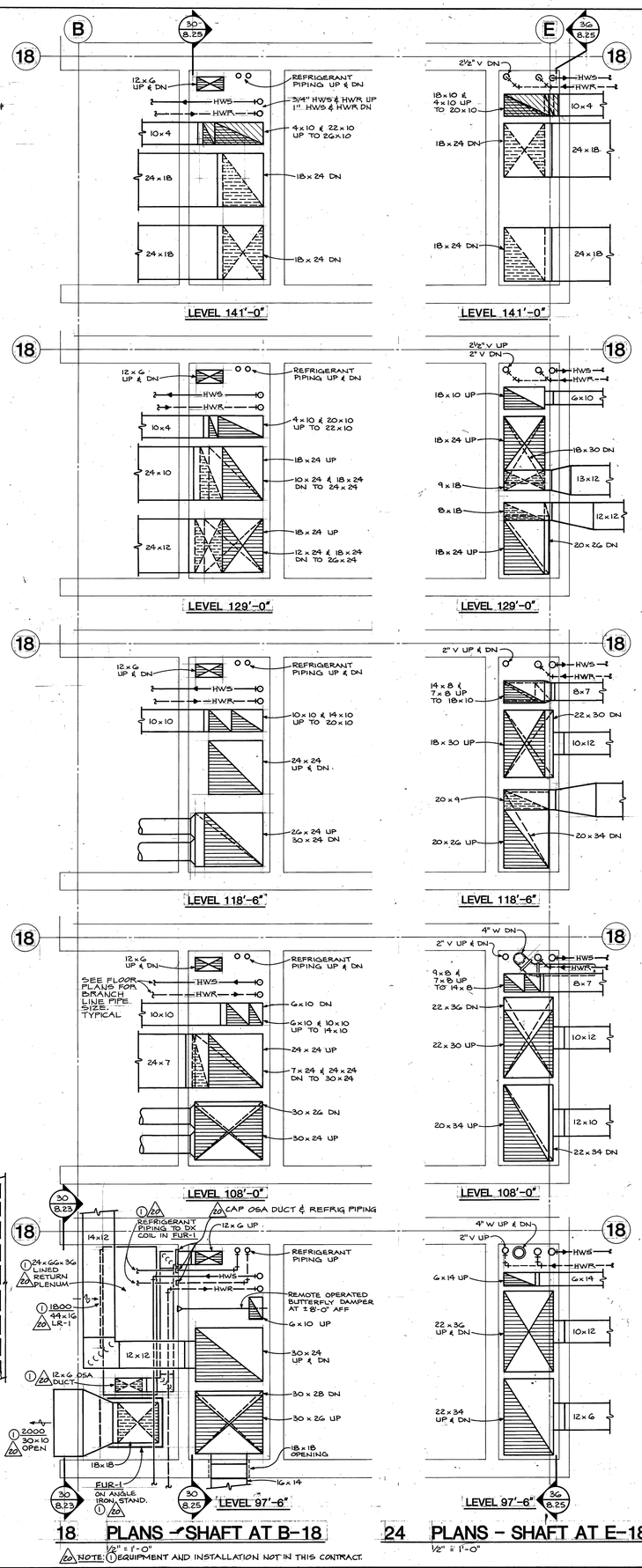


PARTIAL PLAN

6 DETAIL - ROOM 701
1/4"=1'-0"

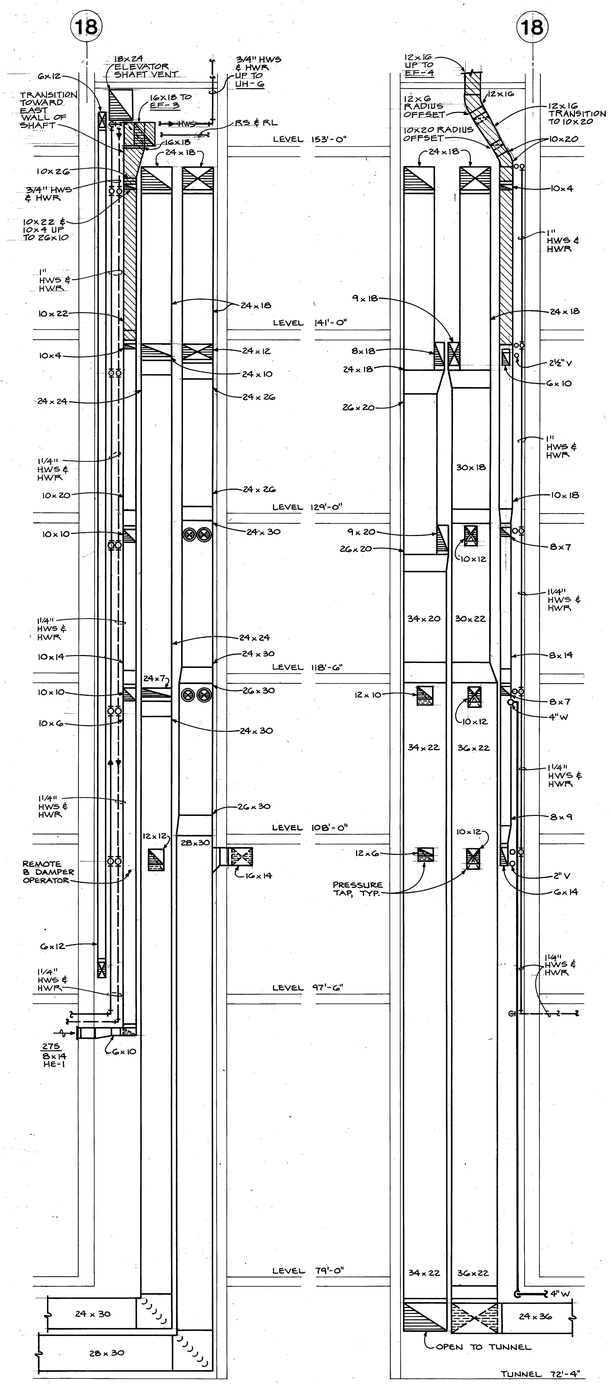


12 DETAIL - REMOVABLE DUCT CONNECTION FOR HS-5
NO SCALE
NOTE:
SUBMIT SHOP DRAWINGS PRIOR TO FABRICATION



18 PLANS - SHAFT AT B-18
1/2" = 1'-0"

24 PLANS - SHAFT AT E-18
1/2" = 1'-0"



30 SECTION AT SHAFT B-18
1/4" = 1'-0"

36 SECTION AT SHAFT E-18
1/4" = 1'-0"

C. W. Timmer Associates Inc.
Consulting Engineers
1694-20

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MI	Miscellaneous Items	03/01/85

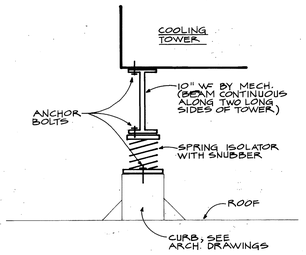
Revisions

New Theatre Building

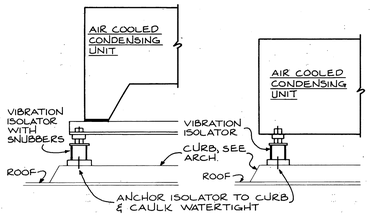
DETAILS
HVAC

Date OCT. 12, 1984
Scale AS SHOWN
Drawing No. **8.25**

CASCADE A. & B. SUPPLIES CO.

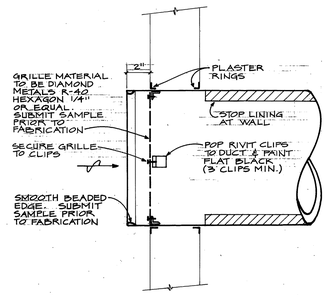


2 DETAIL - TOWER SUPPORT
NO SCALE

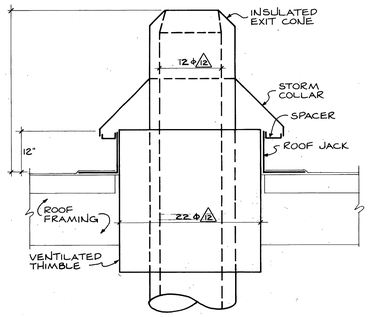


⚠2 NOT IN THIS CONTRACT.

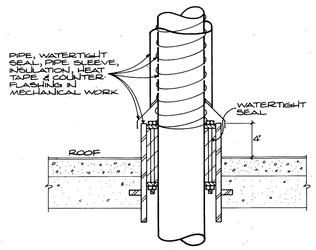
8 DETAIL - ACCU MOUNTING
NO SCALE



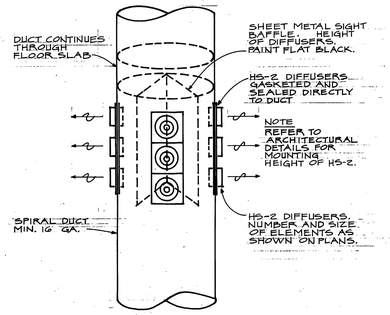
14 DETAIL - ROUND RETURN OR EXHAUST GRILLES
NO SCALE



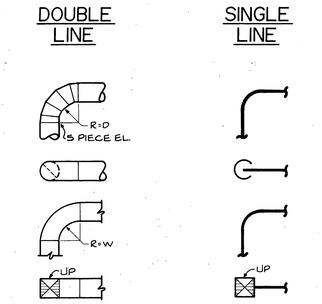
3 DETAIL - STACK THROUGH ROOF
NO SCALE

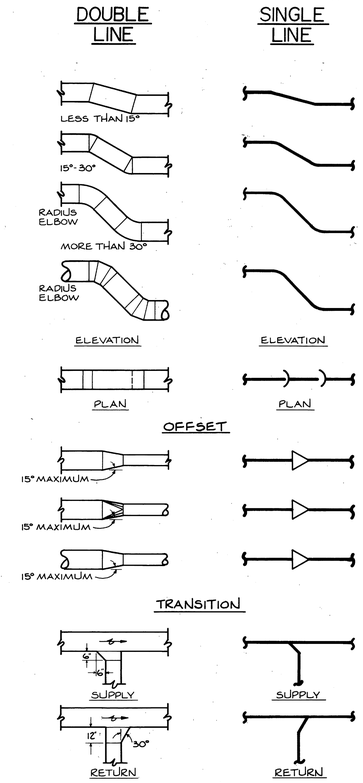


9 DETAIL - PIPE PENETRATION THROUGH ROOF
NO SCALE



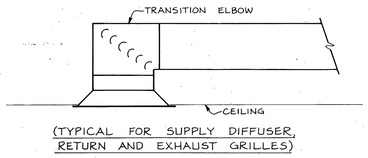
15 DETAIL - DUCT SUPPLY COLUMN



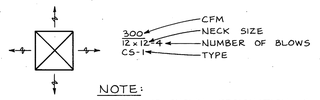


30 DETAILS - DUCT FITTINGS
NO SCALE

NOTES:
1. ADJUSTING DAMPER REQUIRED FOR EACH LOW PRESSURE SUPPLY, RETURN & EXH. BRANCH.
2. 32 x 14 - FIRST DIMENSION IS THE SIDE SEEN. IN SECTION THE FIRST DIMENSION IS THE HORIZONTAL SIDE.

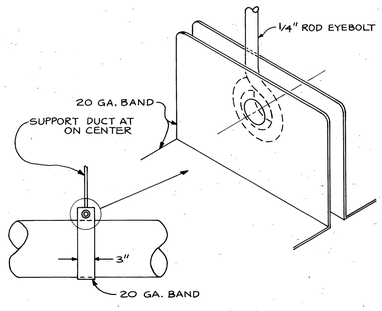


(TYPICAL FOR SUPPLY DIFFUSER, RETURN AND EXHAUST GRILLES)

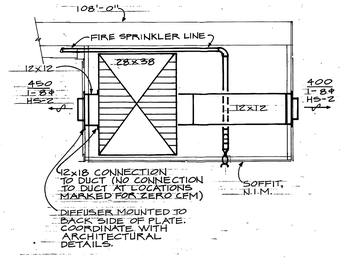


NOTE:
SUPPLY IS SHOWN, DESIGNATION IS SIMILAR FOR RETURN OR EXHAUST.

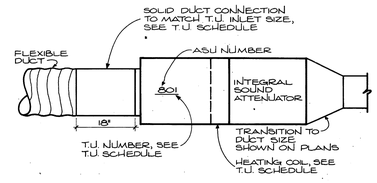
5 DETAIL - CEILING OUTLET
NO SCALE



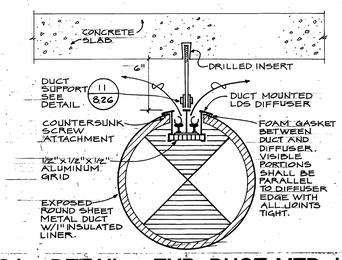
11 DETAIL - EXPOSED DUCT HANGER
NO SCALE



17 DETAIL - ATRIUM SOFFIT RING SUPPLY
1/2" = 1'-0"



6 DETAIL - TERMINAL UNIT
NO SCALE



24 DETAIL - TYP. DUCT MTD. LDS
NO SCALE

C. W. Timmer Associates Inc.
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1694-20

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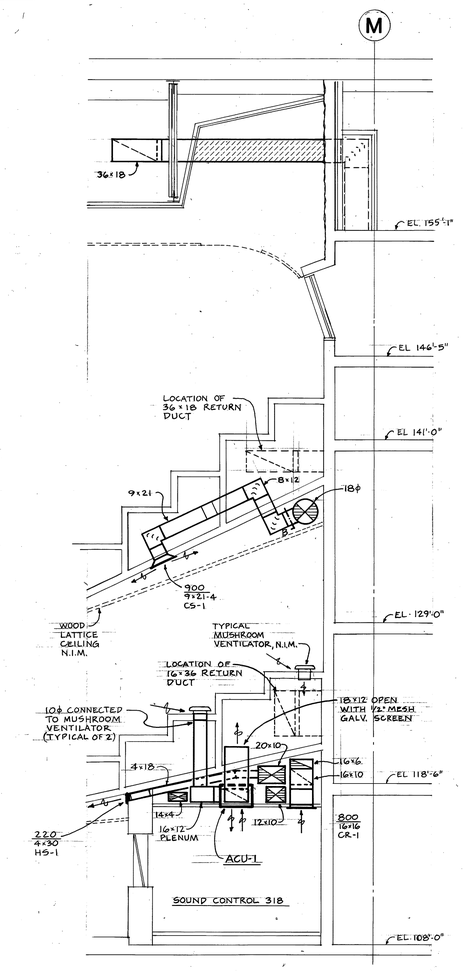
⚠1	-	Addendum #1	10/29/84
⚠2		Addendum #2	11/06/84
⚠4		Addendum #4	11/13/84
⚠5		Addendum #5	11/21/84
⚠A		Proposal Request #1	03/01/85
⚠B		Proposal Request #2	03/01/85
⚠C		Proposal Request #3	03/01/85
⚠D		Proposal Request #4	
⚠E		Proposal Request #5	03/08/85
⚠F		Proposal Request #6	03/01/85
⚠G		Proposal Request #7	03/01/85
⚠H		Proposal Request #8	03/01/85
⚠J		Proposal Request #9	03/01/85
⚠K		Proposal Request #10	03/01/85
⚠L		Proposal Request #11	03/01/85
⚠M		Proposal Request #12	03/01/85
⚠N		Proposal Request #13	03/01/85
⚠P		Proposal Request #14	03/01/85
⚠Q		Clarification Items	03/01/85
⚠R		Miscellaneous Items	03/01/85

Revisions

New Theatre Building

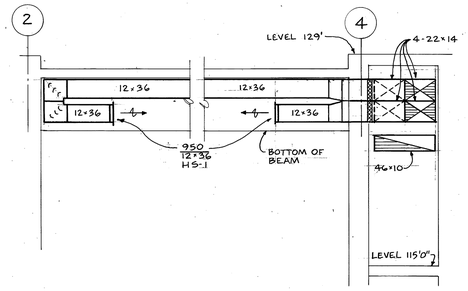
DETAILS
HVAC

Date OCT. 12, 1984
Scale NONE
Drawing No. **8.26**



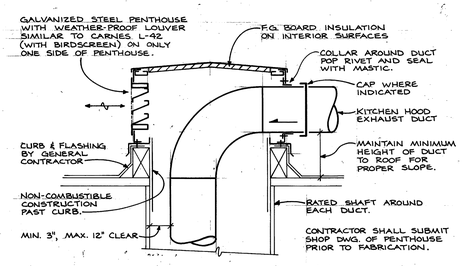
4 SECTION AT INTERMEDIATE BALCONIES

1/4" = 1'-0"



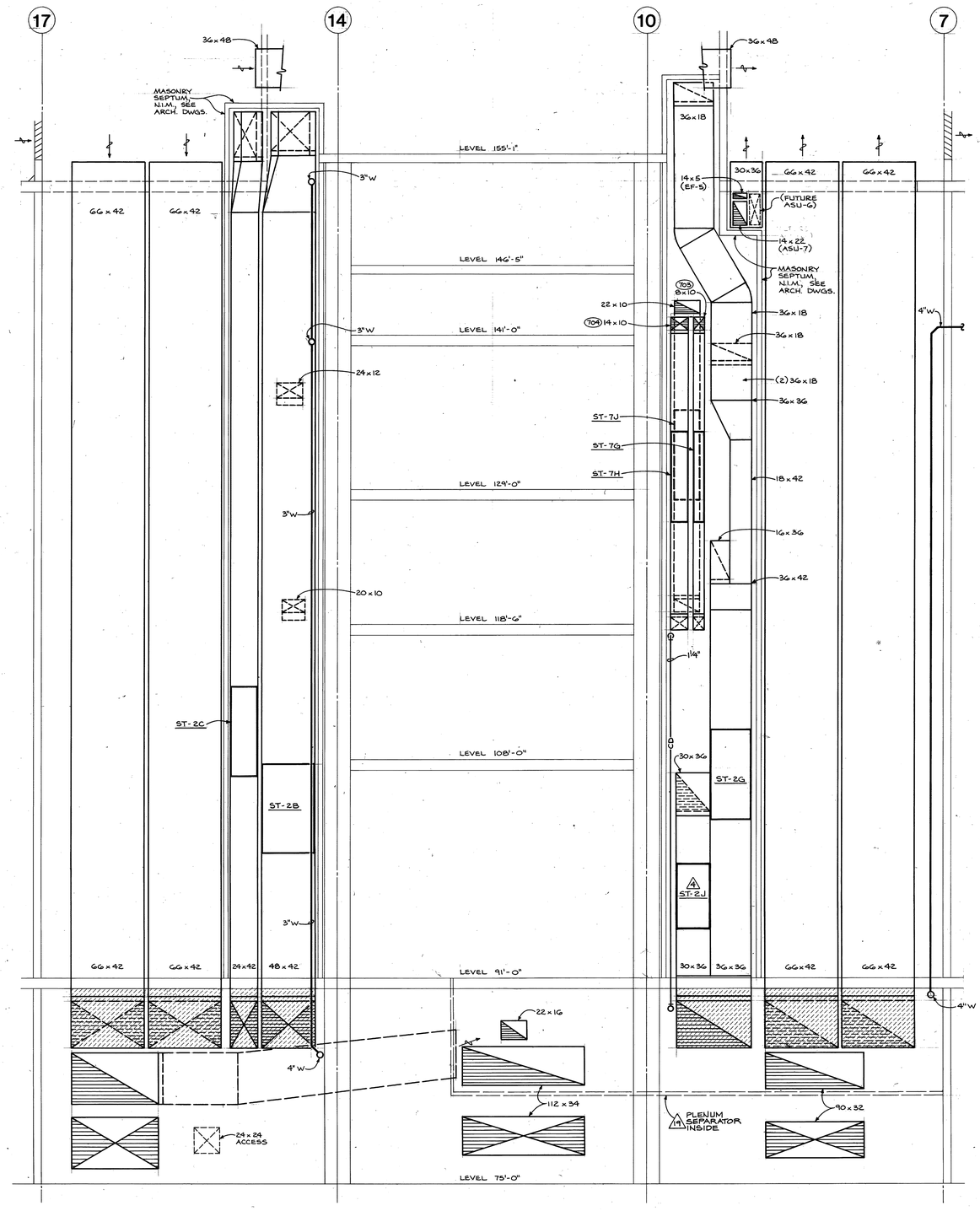
5 SECTION AT SHOWCASE STAGE

1/4" = 1'-0"



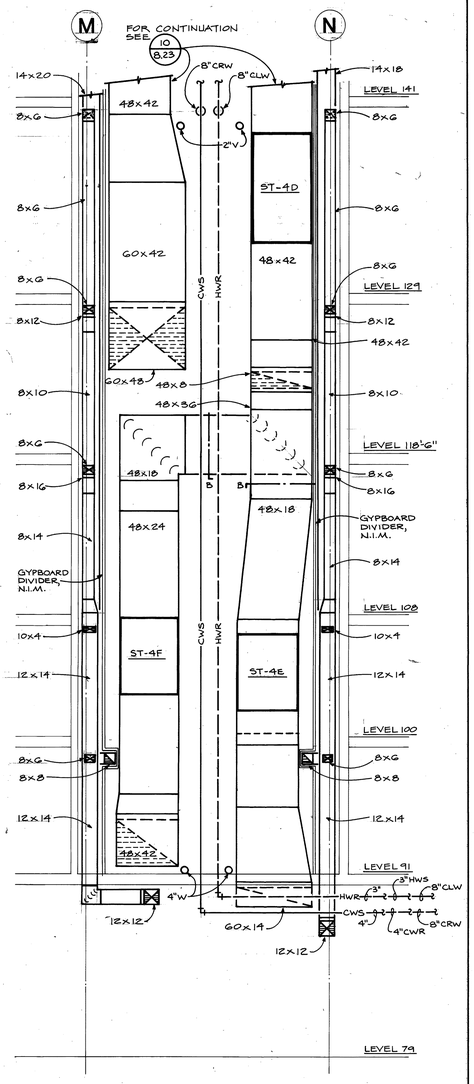
6 DETAIL – PENTHOUSE FOR VENTILATED SHAFT

NO SCALE



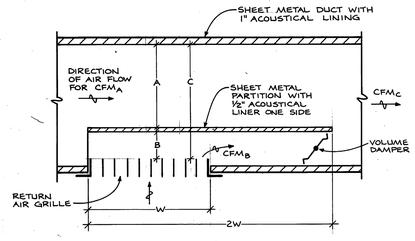
18 SECTION AT SHAFTS NEAR M

1/4" = 1'-0"



28 SECTION AT SHAFT M–N, & 4.5

1/4"=1'-0"



DIMENSIONAL RATIOS:

$A = \frac{(C-½)\ CFM_A}{CFM_C}$ $B = \frac{(C-½)\ CFM_B}{CFM_C}$ $C = A + B + ½$

30 DETAIL – RETURN AIR DAMPER

NO SCALE

Portland Center for the Performing Arts

The City of Portland

Honorable Mildred A. Schwab
Commissioner in Charge

Ronald K. Ragen
Chairman
Performing Arts Center Committee

Architects

Broome, Oringdulph, O'Toole, Rudolf & Associates pc
ELS Design Group
Barton Myers

Project Address
733 N.W. 20th Avenue
Portland, Oregon 97209
(503) 226-1575

Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4016 OREGON JULY 9, 1948 ROBERT G. MANFULL

Target	Revision Item	Revision Date
1	Addendum #1	10/29/84
2	Addendum #2	11/06/84
4	Addendum #4	11/13/84
5	Addendum #5	11/21/84
1	Proposal Request #1	03/01/85
2	Proposal Request #2	03/01/85
3	Proposal Request #3	03/01/85
4	Proposal Request #4	
5	Proposal Request #5	03/08/85
6	Proposal Request #6	03/01/85
7	Proposal Request #7	03/01/85
8	Proposal Request #8	03/01/85
9	Proposal Request #9	03/01/85
10	Proposal Request #10	03/01/85
11	Proposal Request #11	03/01/85
12	Proposal Request #12	03/01/85
13	Proposal Request #13	03/01/85
14	Proposal Request #14	03/01/85
CA	Clarification Items	03/01/85
CA	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

DETAILS - HVAC

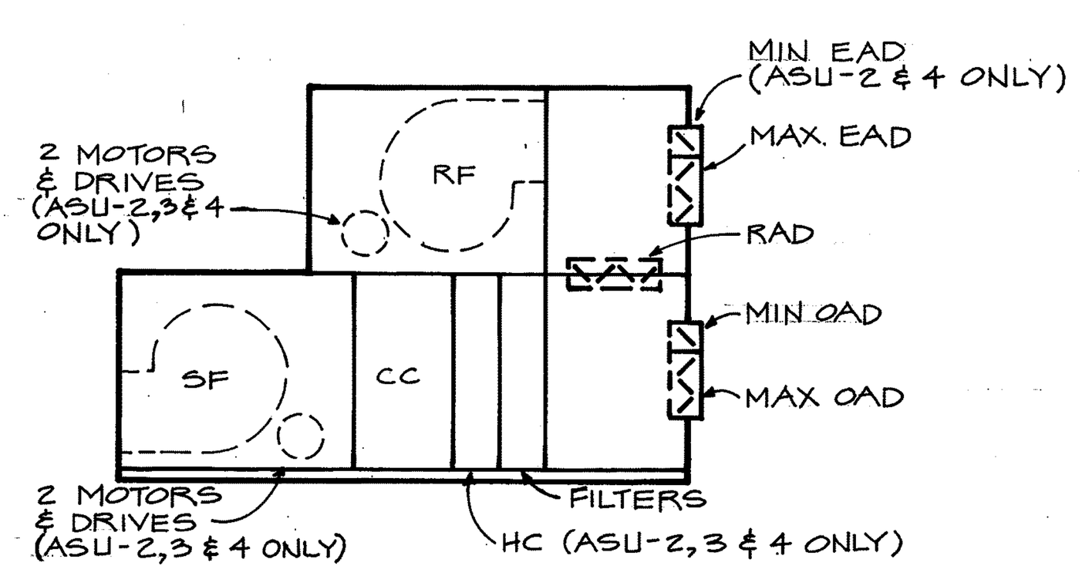
Date OCT. 12, 1984
Scale AS SHOWN
Drawing No. **8.27**

C.W. **Timmer Associates** Inc.
Consulting Engineers
1694-20

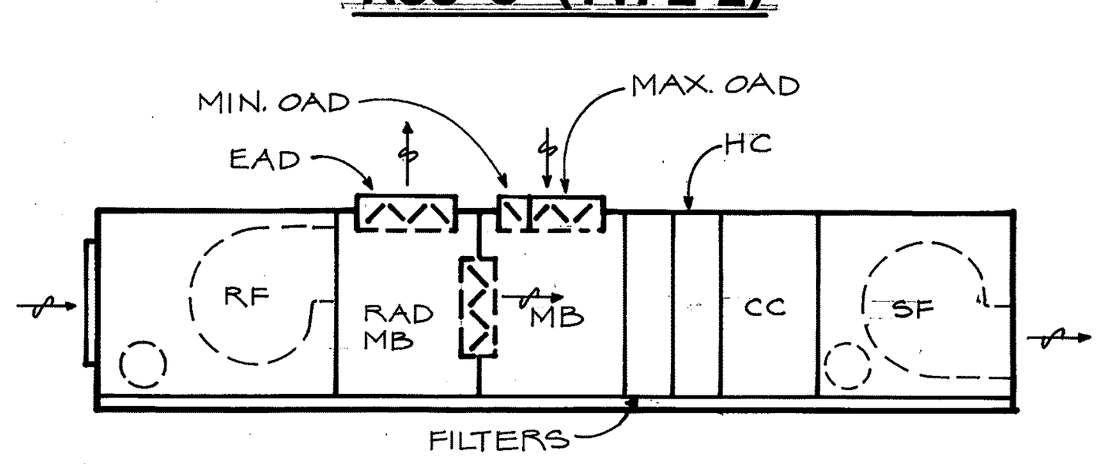
AIR SUPPLY UNIT SCHEDULE

UNIT	SERVICE	LOCATION	ARR. TYPE ①	CASING SIZE ③	SUPPLY FAN (SF) CFM	SF SP	SF WHEELS DIA.	SF WHEELS NO.	SF WHEELS TYPE	SF DISCH	SF RPM	SF HP	RETURN FAN (RF) CFM	RF SP	RF WHEELS DIA.	RF WHEELS NO.	RF WHEELS TYPE	RF DISCH	RF RPM	RF HP	COOLING COIL (CC) CFM	EDB	EWB	LDB	LWB	FV	GPM ④	CLG. MBH	AIR ΔP IN WG	H_2O ΔP FT. HD.	HEATING COILS (HC) CFM	EAT	LAT	FV	GPM ⑤	HTG. MBH	AIR ΔP IN WG.	H_2O ΔP FT. HD.	AIR FILTERS (F) ⑧ CFM	MAX ΔP CLEAN	MAX ΔP DIRTY	BASIS OF DESIGN	MIX BOX (MX) DAMPER CFM ② MIN. OAD	MAX. OAD	RAD	EAD	REMARKS
ASU-1	BACK OF HOUSE	MECH. RM. 29	1	A-33 EXTRA WIDE	26000	4.0	33	1	AF	BH	1100	25	23400	1.65	36	1	AF	TH	670	10	26000	76	63	54.5	54	530	116	697	.8	10	—	—	—	—	—	—	—	—	26000	.30	.90	4" THICK ⑨ FARR 30-30	2600	23400	23400	23400	TYPE II DRIVE ON BOTH SUPPLY AND RETURN FAN.
ASU-2	INT. THEATER	MECH. RM. 29	1	A-30 EXTRA WIDE	21600	3.0	30	1	AF	BH	1100	20/5	20600	1.3	30	1	AF	TH	875	10/3	21600	81	64.6	54.5	54	530	116	694	.8	10	21600	61	75	530	22	328	.25	3	21600	.30	.90	4" THICK ⑨ FARR 30-30	4750	16850	16850	16850	TYPE I DRIVE ON BOTH SUPPLY AND RETURN FAN. LOW CFM = 2/3 HIGH CFM. EAD MIN CFM = 3750 CFM.
ASU-3	LOWER LOBBY	MECH. RM. 29	1	A-36 EXTRA WIDE	29000	3.0	36	1	AF	BH	880	25/7½	26100	1.25	36	1	AF	TH	650	10/3	29000	76.5	63.2	54.5	53.2	520	143	858	.8	10	29000	67	92	520	52	787	.25	3	29000	.30	.90	4" THICK ⑨ FARR 30-30	2900	26100	26100	26100	TYPE I DRIVE ON BOTH SUPPLY AND RETURN FAN. LOW CFM = 2/3 HIGH CFM.
ASU-4	SHOWCASE THEATER	MECH. RM. 603	1	A-27	14200	2.75	27	1	AF	BH	1100	10/3	13000	1.0	27	1	AF	TH	800	5/1½	14200	79.6	64.4	54.5	53.5	505	78	466	.8	10	14200	64	74	515	10	154	.25	3	14200	.30	.90	4" THICK FARR 30-30	2270	11930	11930	11930	TYPE I DRIVE ON BOTH SUPPLY AND RETURN FAN. LOW CFM = 2/3 HIGH CFM. EAD MIN CFM = 1070 CFM.
ASU-5	UPPER LOBBY	MECH. RM. 703	2	A-27 EXTRA WIDE	16800	2.75	27	1	AF	BH	1170	15/5	15120	0.75	27	1	AF	—	810	5/1½	16800	80	64.5	54.5	53.5	525	93	557	.8	10	16800	67	99	510	39	583	.25	3	16800	.30	.90	4" THICK FARR 30-30	1680	15120	15120	15120	TYPE I DRIVE ON BOTH SUPPLY AND RETURN FAN. LOW CFM = 2/3 HIGH CFM.
ASU-6	FUTURE FOUNDERS ROOM	MECH. RM. 629																																													FUTURE UNIT
ASU-7	PROJ/CONTROL	MECH. RM. 629	3	A-11 EXTRA TALL	3200	2.5	11	1	FC	UB	1550	3	2900	1.0	9.75	2	FC	TH	1135	1½	3200	77	63.3	54.5	54	515	14	83	.8	10	3200	67	74	520	1.6	24.3	.25	3	3200	.30	.90	4" THICK FARR 30-30	300	2900	2900	2900 ⑦	VERTICAL CONFIGURATION
ASU-8	REHEARSAL	MECH. RM. 604																																													FUTURE UNIT
ASU-9	GALLERY	SHOWCASE STOR. 101	4	A-12 EXTRA WIDE	2800	2.25	11	1	FC	BH	1390	3	—	—	—	—	—	—	—	—	2800	76	63	54	53.5	430	14	81	.8	10	2800	67	96	425	6	88	.25	3	2800	.30	.90	4" THICK FARR 30-30	2800	2520	2520	—	

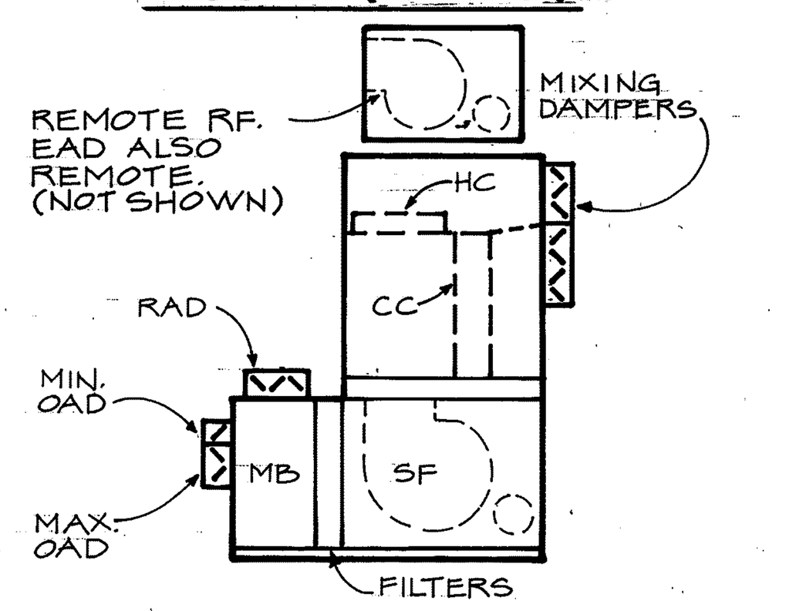
ASU-1,2,3 & 4 (TYPE 1)



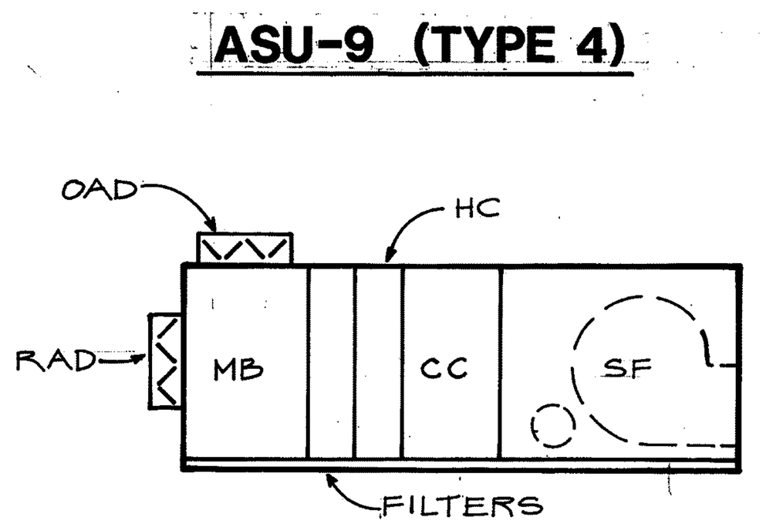
ASU-5 (TYPE 2)



ASU-7 (TYPE 3)



ASU-9 (TYPE 4)



LEGEND

DIA	NOMINAL FAN WHEEL DIAMETER, INCHES.
SP	TOTAL STATIC PRESSURE ON FAN, INCHES OF WATER.
HP	MINIMUM NOMINAL MOTOR HORSEPOWER.
RPM	APPROXIMATE REVOLUTIONS PER MINUTE.
EDB	ENTERING DRY BULB TEMPERATURE, DEGREES F.
EWB	ENTERING WET BULB TEMPERATURE, DEGREES F.
LDB	LEAVING DRY BULB TEMPERATURE, DEGREES F.
LWB	LEAVING WET BULB TEMPERATURE, DEGREES F.
FV	MAXIMUM FACE VELOCITY, FPM.
ΔP	MAXIMUM PRESSURE DROP.
MIN OAD	MINIMUM OUTSIDE AIR DAMPER.
MAX OAD	MAXIMUM OUTSIDE AIR DAMPER.
RAD	RETURN AIR DAMPER.
EAD	EXHAUST AIR DAMPER.

NOTES:

① SEE UNIT ARRANGEMENTS BELOW.
② PROVIDE 1 SQ. FT. FACE AREA PER 1,000 CFM.
③ BASIS OF DESIGN: PACE CO.
④ EWT = 42F, LWT = 52F.
⑤ EWT = 200F, LWT = 170F.
⑥ EXTRA HIGH CASING TO ACCEPT 31-1/2" x 28" C.C..
⑦ DAMPERS REMOTELY LOCATED.
⑧ MAXIMUM FACE VELOCITY 550 FPM.
⑨ PROVIDE FACE LOAD FILTERS.

VIBRATION ISOLATION SCHED.

ITEM	APPROX. RPM ①	TYPE ISOLATOR	MIN. DEFLECT (INCHES)	ISOLATOR LOCATION ②
CWP-1	1750	A-H	1-1/2	EXTERNAL
CWP-2	1750	A-H	1-1/2	EXTERNAL
CDP-1	1750	A-H	1-1/2	EXTERNAL
CDP-2	1750	A-H	1-1/2	EXTERNAL
HWP-1	1750	E	1-1/2	③
HWP-2	1750	E	1-1/2	③
UH-1	1070	E	0.3	EXTERNAL
UH-2	1550	E	0.3	EXTERNAL
UH-3	1550	E	0.3	EXTERNAL
UH-4	1550	E	0.3	EXTERNAL
UH-5	1550	E	0.3	EXTERNAL
UH-6	1550	E	0.3	EXTERNAL
UH-7	1550	E	0.3	EXTERNAL
UH-8	1550	E	0.3	EXTERNAL
CUH-1	525	-	-	INTERNAL
ASU-1	1100/670	A	1-1/2	EXTERNAL
ASU-2	1100/875	A	1-1/2	EXTERNAL
ASU-3	880/650	A	1-1/2	EXTERNAL
ASU-4	1100/800	A	1-1/2	EXTERNAL
ASU-5	1170/810	A	1-1/2	EXTERNAL
ASU-7 SF	1550	A	1-1/2	EXTERNAL
RF	1135	E	1-1/2	EXTERNAL
ASU-9	1390	E	1-1/2	EXTERNAL
HWB-1	3450	D	0.1	EXTERNAL
WCU-1	3600	B	1.0	EXTERNAL
CT-1	475	B-G	2.5	EXTERNAL
△20 FUR-1	1025	-	-	INTERNAL △20 NOT IN CONTRACT
△20 ACCU-1	1750/850	A	1.0	EXTERNAL △20 NOT IN CONTRACT
ACU-1	-	E	1	EXTERNAL
EF-1	1030	A	1-1/2	EXTERNAL
EF-2	425	A-H	1-1/2	EXTERNAL
EF-3	1725	E	1-1/2	EXTERNAL
EF-4	1000	A	1-1/2	EXTERNAL
EF-5	1435	-	-	INTERNAL
EF-6	870	-	-	NONE
EF-7	870	-	-	NONE
EF-8	1750	-	-	NONE
EF-9	1750	-	-	NONE
EF-10		FUTURE	UNIT	
EF-11		FUTURE	UNIT	
EF-12		FUTURE	UNIT	
EF-13	1600	-A-G	1-1/2	EXTERNAL
△12				

① VERIFY RPM WITH EQUIPMENT SUPPLIED PRIOR TO FINAL SELECTION.
② STANDARD INTERNAL ISOLATION FURNISHED BY EQUIPMENT MANUFACTURER. EXTERNAL ISOLATION FURNISHED BY SPECIFIED VIBRATION ISOLATION SUPPLIER.
③ ISOLATOR FOR PIPING CONNECTED TO PUMP.

TERMINAL UNIT SCHEDULE

	UNIT NUMBER	COOLING CFM	MIN. INLET DIA. (INCHES)	HEATING COIL DATA: HTG CFM	MBH	GPM	EWT/EAT DEG. F	REMARKS
△4	TU-101	400	7	200	8.8	0.6	200/55	
	TU-102	1240	12	620	23.9	1.6	200/55	RESET
△4	TU-103	450	7	225	9.9	0.7	200/55	
	TU-104	330	6	165	6.4	0.4	200/55	
	TU-105	675	8	335	15.5	1.0	200/55	
	TU-106	480	7	240	10.8	0.7	200/55	RESET
	TU-107	480	7	240	10.8	0.7	200/55	
	TU-108	850	9	425	16.8	1.1	200/55	RESET
△12	TU-109	1180	10	590	20.8	1.4	200/55	FUTURE UNIT △12
	TU-110	1340	12	670	23.6	1.6	200/55	
	TU-111	480	7	240	10.0	0.7	200/55	
	TU-112	500	7	250	10.2	0.7	200/55	
△12	TU-113	500	7	250	10.2	0.7	200/55	FUTURE UNIT △12
	TU-114	725	9	365	14.9	1.0	200/55	
	TU-115	750	9	375	15.7	1.0	200/55	
	TU-116	800	9	400	12.8	0.9	200/55	RESET
	TU-117	810	9	405	16.5	1.1	200/55	
	TU-118	310	6	160	7.6	0.5	200/55	
	TU-119	870	9	435	14.0	0.9	200/55	RESET
	TU-120	405	7	210	17.9	2.0	200/55	RESET
	TU-121	405	7	210	17.9	2.0	200/55	
	TU-122	300	6	150	7.4	0.5	200/55	
	TU-123	410	7	205	7.0	0.5	200/55	
△4	TU-124	460	7	230	18.6	2.0	200/55	
	TU-125	780	9	390	10.8	0.7	200/55	
	TU-126	630	8	315	8.7	0.6	200/55	
△4	TU-127	780	9	390	33.0	5	200/55	
	TU-128	655	8	325	9.0	0.6	200/55	
	TU-129	850	9	425	11.8	0.8	200/55	FUTURE RESET
	TU-130	1000	10	500	13.8	0.9	200/55	FUTURE RESET
△12	TU-131	850	9	425	11.8	0.8	200/55	FUTURE UNIT △12
	TU-132	NOT USED						
	TU-133	450	7	225	6.2	0.4	200/55	RESET
	TU-134	1900	12	950	26.3	1.8	200/55	
	TU-135	500	7	250	7.0	0.5	200/55	
	TU-136	1300	12	650	22.2	1.5	200/55	RESET
	TU-137	870	9	290	8.1	0.6	200/55	RESET
	TU-138	960	10	480	13.3	0.9	200/55	
△13	TU-139	1060 △13	12	530 △13	27.7	1.9	200/55	
	TU-140	950	10	475	14.2	1.0	200/55	
	TU-141	550	7	275	12.1	0.8	200/55	
	TU-142	830	9	415	16.4	1.1	200/55	
	TU-143	1100	10	CONSTANT VOLUME - NO COIL				
	TU-144	1000	10	CONSTANT VOLUME - NO COIL				
△13	TU-145	500	7	VARIABLE VOLUME - NO COIL				RESET

UNIT HEATER SCHEDULE

UNIT NUMBER	LOCATION	CFM	HTG COIL EAT	LAT	GPM	MOTOR HP	VOLTS	BASIS OF DESIGN
UH-1	BACKSTAGE	1750	70	93.7	3	1/8	120	TRANE MODEL 102PL
UH-2 & 3	FUTURE REHEARSAL	1100	60	85	2	1/8	120	TRANE MODEL 70S
UH-4	STORAGE 503	815	70	87	1	1/20	120	TRANE MODEL 60S
UH-5	MECH RM 603	815	60	77	1	1/20	120	TRANE MODEL 60S
UH-6	ELEV MACH RM 701	590	60	76	.67	1/20	120	TRANE MODEL 42S
UH-7	ELEV MACH RM 702	815	60	77	1	1/20	120	TRANE MODEL 60S
UH-8	MECH RM 703	590	60	76	.67	1/20	120	TRANE MODEL 42S
CUH-1	VESTIBULE 312	800	60	112	3	1/12	120	TRANE MODEL N, SIZE B, LOW SPEED

NOTE: SELECT COILS USING 200° F EWT.

SOUND TRAP SCHEDULE

	UNIT NUMBER	SERVICE	CFM	MAX SP	SIZE (INCHES) WxHxL	IAC NO.
	ST-1A	ASU-1 SUPPLY	18000	.15	36x48x84	7L
	ST-1B	ASU-1 RETURN	8400	.1	60x18x84	7L
	ST-1C	ASU-1 RETURN	5600	.1	24x30x84	7L
	ST-1D	ASU-1 SUPPLY	4200	.12	24x18x84	7L
	ST-1E	ASU-1 RETURN	4000	.12	24x18x84	7L
	ST-1F	ASU-1 SUPPLY	4200	.12	24x18x84	7L
	ST-1G	ASU-1 RETURN	1200	.06	18x12x84	7L
	ST-1H	ASU-1 SUPPLY	750	.06	12x12x60	5L
	ST-2A	ASU-2 SUPPLY	21600	.12	72x36x84	7L
	ST-2B	ASU-2 SUPPLY	15600	.12	48x36x84	7L
	ST-2C	ASU-2 SUPPLY	6000	.06	24x36x84	7L
	ST-2D	ASU-2 RETURN	15300	.12	48x36x84	7L
	ST-2E	ASU-2 RETURN	5300	.12	24x24x84	7L
	ST-2F	ASU-2 RETURN	5300	.12	24x24x84	7L
	ST-2G	ASU-2 RETURN	8700	.06	36x36x84	7L
	ST-2H	ASU-2 RETURN	6600	.06	30x36x84	7L
△4	ST-2J	ASU-2 RETURN	6600	.06	30x36x60	5L
	ST-3A	ASU-3 SUPPLY	16800	.1	60x36x84	7L
	ST-3B	ASU-3 SUPPLY	12200	.1	60x30x84	7L
	ST-3C	ASU-3 RETURN	8000	.06	48x24x84	7L
	ST-3D	ASU-3 RETURN	8000	.06	36x36x84	7L
	ST-3E	ASU-3 RETURN	8000	.06	36x36x84	7L
	ST-4A	ASU-4 SUPPLY	14200	.1	36x48x84	7L
	ST-4B	ASU-4 SUPPLY	14200	.1	36x48x84	7L
	ST-4C	ASU-4 RETURN	14200	.12	42x36x84	7L
	ST-4D	ASU-4 RETURN	14200	.06	48x42x84	7L
	ST-4E	ASU-4 RETURN	7000	.1	48x18x60	5L
	ST-4F	ASU-4 RETURN	5000	.06	48x24x60	5L
	ST-4G	ASU-4 SUPPLY	375	.06	12x06x84	7L
	ST-4H	ASU-4 RETURN	375	.06	12x06x84	7L
	ST-5A	ASU-5 SUPPLY	16000	.2	54x24x84	7L
	ST-5B	ASU-5 RETURN	15120	.12	24x72x84	7L
	ST-7A	ASU-7 SUPPLY	2000	.06	12x24x84	7L
	ST-7B	ASU-7 SUPPLY	500	.06	12x06x84	7L
	ST-7C	ASU-7 SUPPLY	340	.06	12x06x84	7L
	ST-7D	ASU-7 SUPPLY	800	.06	12x12x84	7L
	ST-7E	ASU-7 RETURN	1140	.06	18x12x84	7L
	ST-7F	ASU-7 RETURN	1680	.1	18x12x60	5L
	ST-7G	ASU-7 SUPPLY	340	.06	12x06x84	7L
	ST-7H	ASU-7 SUPPLY	800	.06	12x12x84	7L
	ST-7J	ASU-7 RETURN	1140	.06	24x12x84	7L
	ST-9A	ASU-9 SUPPLY	2800	.15	48x06x84	7L
	ST-9B	ASU-9 RETURN	2500	.06	36x12x84	7L

PUMP SCHEDULE

PUMP NUMBER	SERVICE	LOCATION	TYPE	GPM	HEAD (FT)	MOTOR HP	BASIS OF DESIGN	
CWP-1	CHILLED WATER	CHILLER RM 17	BM	295	70	10	B&G 1510 3BB	△4
CWP-2	CHILLED WATER	CHILLER RM 17	BM	295	70	10	B&G 1510 3BB	△4
CDP-1	CONDENSER WATER	CHILLER RM 17	BM	445	60	10	B&G 1510 4BC	
CDP-2	CONDENSER WATER	CHILLER RM 17	BM	445	60	10	B&G 1510 4BC	
HWP-1	HEATING WATER	BOILER RM 16	IL	110	55	5	B&G 80 2½×2½×9½B	
HWP-2	HEATING WATER	BOILER RM 16	IL	110	55	5	B&G 80 2½×2½×9½B	
TP-1	DELETE △1							

EXHAUST FAN SCHEDULE

UNIT	UNIT LOCATION	SERVICE	CFM	SP	RPM	WHEEL DIA.	MOTOR HP	TYPE	BASIS OF DESIGN	REMARKS
EF-1	MECH RM 29	GENERAL EXH	2730	1.35	1020	20	1	UTILITY	PACE U-20BI-UB DISCH	
EF-2	SHOWCASE MECH RM 603	LOBBY TOILETS	3000	.50	425	18	3/4	UTILITY	PACE U-18FC-UB DISCH	
EF-3	ELEV MACH RM 701	GENERAL EXH.	1345	.50	1725	12	1/2	IN-LINE	GREENHECK SQD-12A	DIRECT DRIVE
EF-4	STAIR #2	GENERAL EXH.	1000	.50	1000	9-3/4	1/2	UTILITY	PACE U-9FC-TH DISCH	GRAV. BD DPR
EF-5	STAIR #25	PROJECTOR EXH.	300	.375	1435	6	1/4	CABINET	PACE SCF-57A	GRAV. BD DPR
EF-6	MECH EQ RM 703	ATRIUM SMOKE EXH.	40,000	.25	870	48	10	PNL MT AXIAL	PACE PM48D	DIRECT DRIVE
EF-7	REHEARSAL HALL LOBBY	ATRIUM SMOKE EXH.	20,000	.25	870	40	5	TUBE AXIAL	PACE TA40D	DIRECT DRIVE ①
EF-8	ELEV MACH RM 701	MACH RM EXH	2125	.375	1750	18	1	PNL MT AXIAL	PACE PM-18D	BELT DRIVE
EF-9	ELEV MACH RM 702	MACH RM EXH	3000	.25	1750	18	1	PNL MT AXIAL	PACE PM-18D	BELT DRIVE
EF-10	LEVEL 153 ROOF	DRYER EXH	-	-	-	-	-	-	-	FUTURE UNIT
EF-11	LEVEL 153 ROOF	RANGE HOOD EXH	-	-	-	-	-	-	-	FUTURE UNIT
EF-12	LEVEL 153 ROOF	DYE ROOM HOOD	-	-	-	-	-	-	-	FUTURE UNIT
EF-13	LEVEL 153 ROOF	CHURCH HOOD EXH.	2600	2.0	1600	16 BI	1-1/2	UTILITY	PACE U-16BI-UB DISCH	RANGE HOOD DUTY

NOTE ①: AUTOMATIC DAMPER PROVIDED UNDER SECTION 15F- CONTROLS.

MISCELLANEOUS EQUIPMENT SCHEDULE

ITEM	DESCRIPTION
HOT WATER BOILER HWB-1	3100 MBH GROSS IBR OUTPUT, 3900 SCFH NAT GAS INPUT AT 2 PSIG, 80 PSIG WORKING PRESSURE. BURNER - 3 HP, 3 PHASE. BASIS OF DESIGN: WEIL McLAIN PG1586WF.
WATER CHILLER WCU-1	EVAP: 295 TONS, 590 GPM, 54 F/42 F, 2 PASS, 12 FT. PRESSURE DROP, 0.0005 FOULING FACTOR. COND: 890 GPM, 85 F/95 F, 2 PASS, 17 FT. P, 0.0005 FOULING FACTOR. COMPR: 210 KW, 3 PHASE. BASIS OF DESIGN: TRANE CVHE-32F-AA-2K*248ECI**12CA
COOLING TOWER CT-1	890 GPM WATER FROM 95 F TO 85 F AT 67 DEG. AMBIENT W.B. 30 HP FAN MOTOR ON HIGH SPEED, 10 HP MOTOR ON LOW SPEED, DUAL MOTOR DRIVE, 7 KW SUMP HEATER, 120V CONTROL. BASIS OF DESIGN: BAC VXT-N215.
EXPANSION TANKS ET-1 (HEATING) ET-2 (COOLING)	TOTAL VOLUME, ACCEPTANCE VOLUME 80 GAL, 33 GAL, 35 PSI INITIAL CHARGE, AMTROL EXTROL #AX-180. 10 GAL, 4 GAL, 35 PSI INITIAL CHARGE, AMTROL EXTROL #AX-40.
ELECTRIC FURNACE FUR-1 △20 NOT IN THIS CONTRACT	FAN: 2000 CFM @ 0.6" WG EXTERNAL TO UNIT WITH COOLING COIL AND CLEAN FILTERS, 3/4 HP EVAP FAN MOTOR, 1 PHASE. HEATING: 15.0 KW, 2 STAGE (2 @ 7-1/2 KW), 208V, 1 PHASE (VERIFY WITH DIV. 16). COOLING: 2000 CFM FROM 76.1 F DB/62 F WB EAT TO 52.5 F WB LAT, MATCHES WITH ACCU-1. BASIS OF DESIGN: CARRIER 40QB060-300BL WITH DX COOLING COIL.
AIR-COOLED CONDENSING UNIT ACCU-1 NOT IN THIS CONTRACT △20	56 MBH TOTAL COOLING CAPACITY, MATCHES WITH FUR-1 COOLING COIL. 95 F ENTERING AIR TO CONDENSER: COMPRESSOR, 8.1 KW AND CONDENSER FAN, 1/3 HP. 3 PHASE ELECTRICAL SERVICE. BASIS OF DESIGN: CARRIER 38ER060.
AIR-CONDITIONING UNIT ACU-1	EVAPORATOR: 700 CFM, 15250 BTUH TOTAL, 13500 BTUH SENSIBLE COOLING WITH 72 F DB, 60 F WB ENTERING AIR. CONDENSER: 80 F ENTERING AIR, 1/2" WG EXP, 60 F MINIMUM AMBIENT. 208V, 1 PHASE ELECTRICAL SERVICE (VERIFY WITH DIVISION 16) BASIS OF DESIGN: LIEBERT "MINI-MATE" MODEL MM18A.
ELECTRIC WATER HEATERS EWH-1 & EWH-2	119 GALLON STORAGE TYPE. 123 GAL. PER HOUR RECOVERY @ 80 F TEMP. RISE. 24 KW INPUT. 208V, 3 PHASE. SET @ 120 F. MAX. HOT WATER OUT. (VERIFY VOLTAGE WITH DIV. 16) BASIS OF DESIGN: A. O. SMITH DVE-120-24
HOT WATER TEMPERATURE MAINTENANCE SYSTEM HWTM-1	COMPLETE COMPONENT PACKAGE AS REQUIRED TO MAINTAIN DOMESTIC HOT WATER PIPING SYSTEM FROM EWH TO ALL HOT WATER OUTLETS AT 120 F. 208 V. 120 F TEMPERATURE SYSTEM. (VERIFY VOLTAGE WITH DIVISION 16) BASIS OF DESIGN: RAYCHEM HWAT-D
AIR COMPRESSOR AC-1 DELETE △12	TANK MOUNTED, TWO-STAGE. TO BE OPERATED AT LOW SPEED (540 RPM) FOR QUIET OPERATION. MINIMUM 9 CFM @ 100 PSIG. MOUNT ON 80 GALLON RECEIVER. 3 HORSEPOWER MOTOR. BASIS OF DESIGN: QUINCY FT325

C. W. Timmer Associates Inc.
Consulting Engineers
1694-20

CASCADE A. & E. SUPPLIES CO.

Portland Center for the Performing Arts

The City of Portland

Honorable Mildred A. Schwab
Commissioner in Charge

Ronald K. Ragen
Chairman
Performing Arts Center Committee

Architects

Broome, Oringdulph, O'Toole, Rudolf & Associates pc
ELS Design Group
Barton Myers

Project Address
733 N.W. 20th Avenue
Portland, Oregon 97209
(503) 226-1575

Consultants

Theatre Projects Inc.
Theatre Consultants

R. Lawrence Kirkegaard & Associates
Acoustician

CH2M Hill
Structural Engineers

C.W. Timmer Associates
Mechanical Engineers

Interface Engineering Inc.
Electrical Engineers

REGISTERED PROFESSIONAL ENGINEER 4916 OREGON — Robert G. Manfull — JULY 9, 1982 — ROBERT G. MANFULL

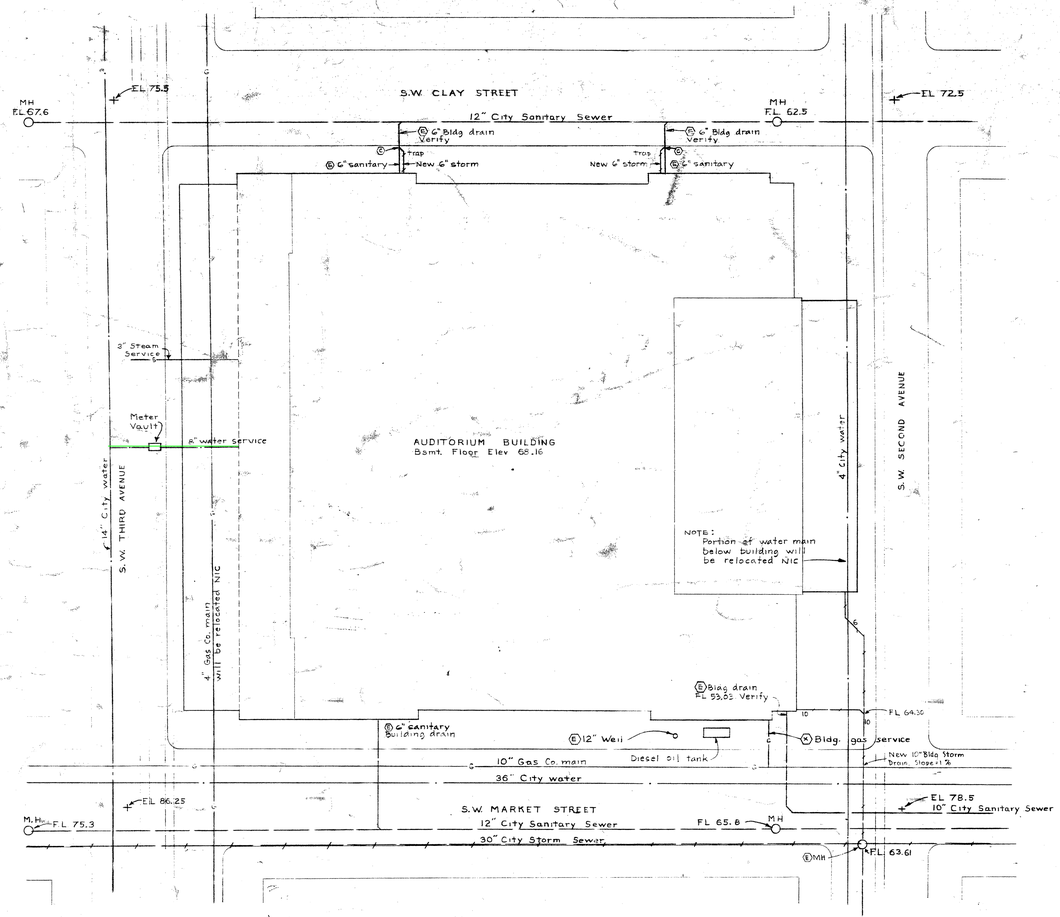
Target	Revision Item	Revision Date
△1	Addendum #1	10/29/84
△2	Addendum #2	11/06/84
△3	Addendum #4	11/13/84
△4	Addendum #5	11/21/84
△5	Proposal Request #1	03/01/85
△6	Proposal Request #2	03/01/85
△7	Proposal Request #3	03/01/85
△8	Proposal Request #4	
△9	Proposal Request #5	03/08/85
△10	Proposal Request #6	03/01/85
△11	Proposal Request #7	03/01/85
△12	Proposal Request #8	03/01/85
△13	Proposal Request #9	03/01/85
△14	Proposal Request #10	03/01/85
△15	Proposal Request #11	03/01/85
△16	Proposal Request #12	03/01/85
△17	Proposal Request #13	03/01/85
△18	Proposal Request #14	03/01/85
△19	Clarification Items	03/01/85
△20	Miscellaneous Items	03/01/85

Revisions

New Theatre Building

SCHEDULES

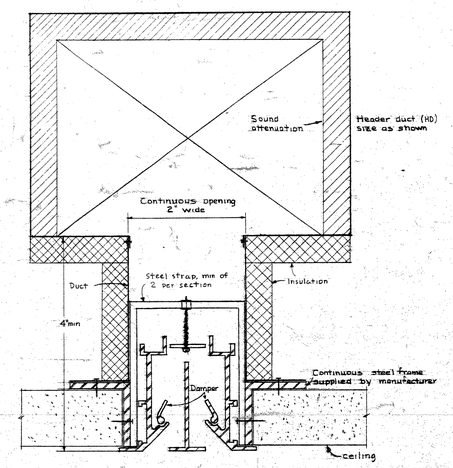
Date Oct. 12, 1984
Scale None
Drawing No. **8.29**



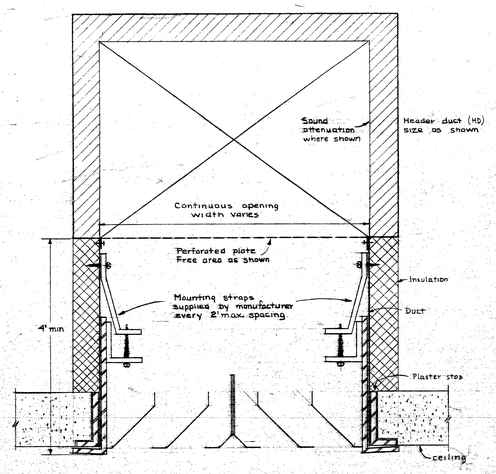
PLOT PLAN

1" = 20' Approx.

Note: All elevations are approximate. Verify



LD-1



LD-2, 3, 4

TYPICAL LINEAR DIFFUSER MOUNTING DETAILS

No Scale

MECHANICAL DRAWING SYMBOLS

——S——	Steam	200	Air volume, cfm
——R——	Condensate return	LD-2	Linear diffuser
——C—— CS	Cooling supply	14%FP	Perforated plate, 14% free area
——C—— CR	Cooling return	S	Splitter damper
——H—— HS	Heating supply	B	Butterfly damper
——H—— HR	Heating return	OAD	Outside air automatic damper
——W—— WS	Well water supply	EAD	Exhaust air automatic damper
——W—— WR	Well water return	RAD	Return air automatic damper
——CW—— CW	Cold water	IVD	Inlet vane damper
——HWR—— HWR	Hot water recirculated	MD	Mixing damper
——HW—— HW	Hot water	SPD	Static pressure damper
——SPR—— SPR	Sprinkler supply	(2)	Riser number - heating & cooling pipes
——WSP—— WSP	Wet standpipe	(X)	Existing removed or abandoned, as applicable
——W—— W	Waste, soil, drainage	(B)	Below floor
——RD—— RD	Roof drain	(E)	Existing to remain
——V—— V	Plumbing vent	(J)	Between joists
——G——	Gas	(R)	Rough-in
	Gate valve	(2)	Air supply zone number
	Check valve	402	Room number
	Adjusting valve	(2)	Column line number
AV	Automatic valve	AAV	Automatic air vent valve
	Strainer	SAV	Semi-automatic air vent valve
	Union	SU	Supply air unit
	Globe valve	EF	Exhaust fan
CO	Cleanout	FC-2	Fan-coil unit
	Pitch down	EH	Entry heater
FS	Flow measuring station	HP	Heating pump
D	Drain pan piping	BO	Blank-off top of diffuser
	Relief valve	FD	Floor drain
	Drain valve	WH	Wall hydrant
	Sprinkler heads; pendant, upright	HC	Heating coil
TSS	Tube service space	CC	Cooling coil
	Thermometer	ASV	Automatic sequencing valve
	Pipe capped	PRV	Pressure reducing valve
	Offset in duct; see details Drwg M-13	BT	Bucket trap
	Supply or intake duct	FT	Float and thermostatic trap
	Return or exhaust duct	CP	Ceiling plenum supply
	Sound attenuated duct	MH	Manhole
	Wall supply grille	EL	Elevation
F	Wall return grille at floor	FL	Flow-line elevation
	Wall return grille at ceiling	VTR	Vent through roof
FC	Wall return grille at floor and ceiling	DD	Deflection damper
R40	Ceiling diffuser, Agitair pattern no.	MCC	Motor control center NIM
	Ceiling return grille	NIM	Not in mechanical work
FLD	Fire damper	FHC	Fire hose cabinet
FSD	Fire sub duct	HD	Header duct
DSP	Dry standpipe	IM	Ice machine (NIM)
CD	Canopy drain	CM	Coffee machine (NIM)
	Access door	ST	Sound trap
T	Thermostat	DEC	Duct encased in concrete; see detail Drwg M-6
P	Pressure gage	BB	Special baseboard return grille; see specifications

REGISTERED ARCHITECT KEITH MAGUIRE PORTLAND, OREGON STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER 3124 STATE OF OREGON

J. DONALD KROEKER AND ASSOCIATES

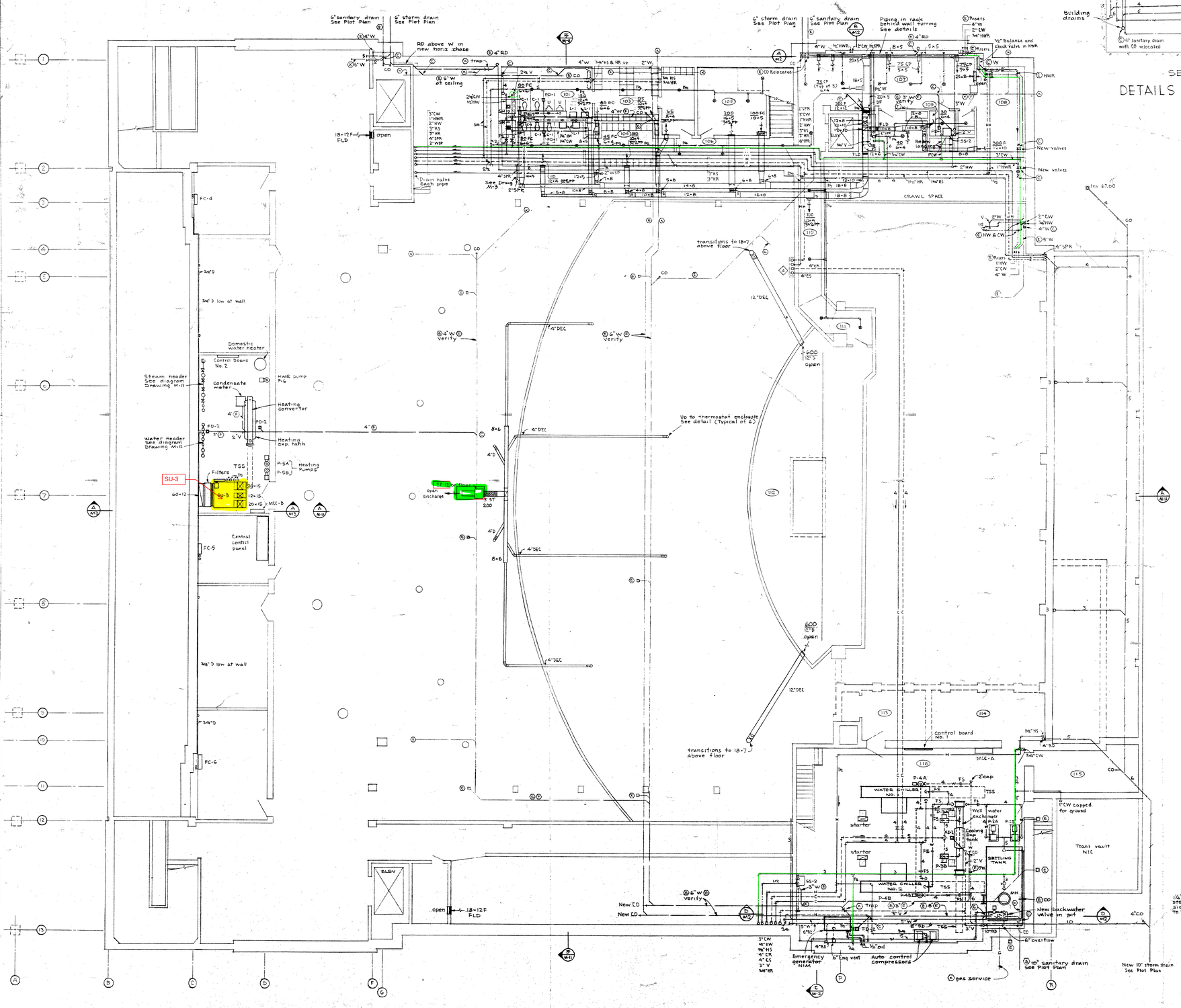
MECHANICAL
PLOT PLAN AND DETAILS

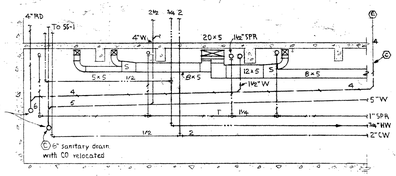
B. MARCUS SPRITECA ARCHITECT THEATER CONSULTANT
PAUL VENKLASEN & ASSOCIATES ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES ELECTRICAL ENGINEERS
LILA COLWELL A.I.D. INTERIOR DECORATION CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S.W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

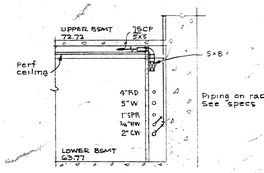
DRAWING M-1

STANTON BOLES MAGUIRE & CHURCH ARCHITECTS
208 S.W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 5323 DRAWN
DATE NOV 2 & 1955 CHECKED





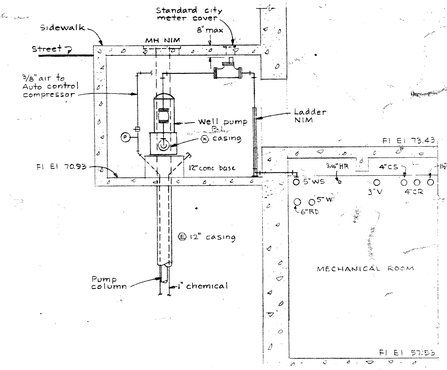
SECTION A M2



SECTION B M2

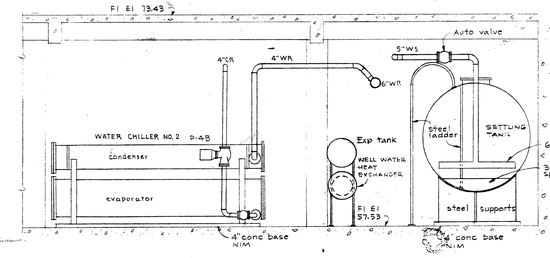
DETAILS OF PIPING AT WALL IN ROOM 107

1/4"=1'-0"



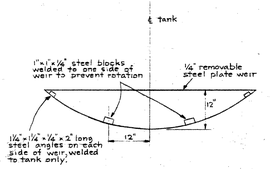
SECTION C M2

1/4"=1'-0"

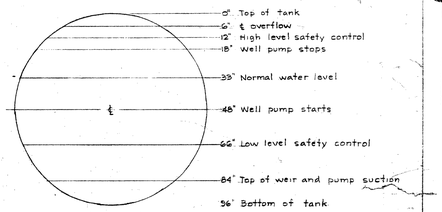


SECTION D M2

1/4"=1'-0"



TYPICAL WEIR



WATER LEVELS

SETTLING TANK DETAILS

No scale

FLOOR PLAN - LOWER BASEMENT LEVEL

1/8"=1'-0"

REGISTERED ARCHITECT KEITH MAGUIRE PORTLAND, OREGON STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER 3124 OREGON Robert E. Selberg ROBERT E. SELBERG

MECHANICAL
LOWER BASEMENT FLOOR PLAN AND DETAILS

B. MARCUS PRITECA ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES ACOUSTICAL CONSULTANTS
COOPER & ROSÉ & ASSOCIATES STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES ELECTRICAL ENGINEERS
LILA COLWELL A.I.D. INTERIOR CONSULTANT

REBUILDING OF
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S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING M-2

STANTON, BOLES, MAGUIRE & CHURCH ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE: MAY 24 1966
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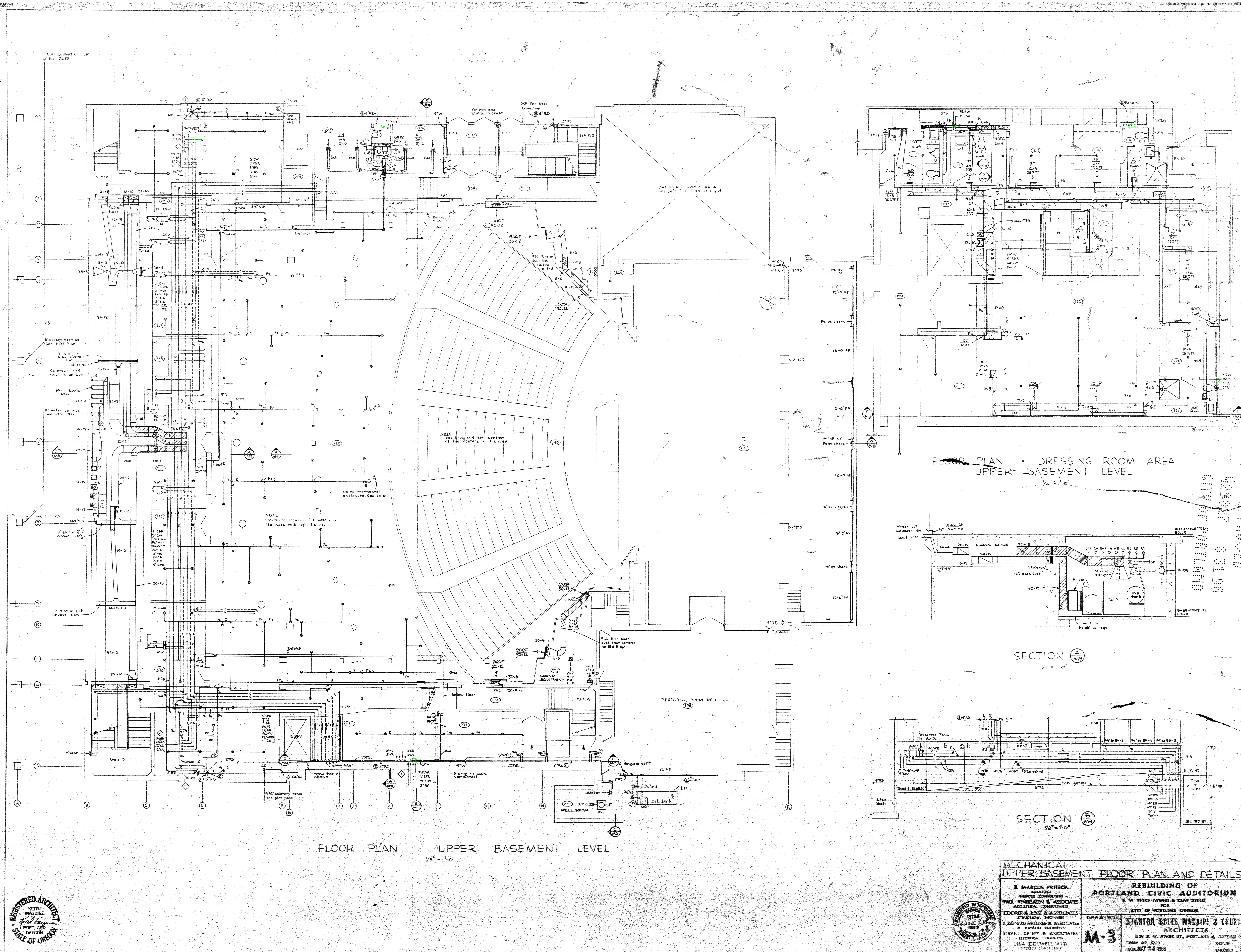
FLOOR PLAN - UPPER BASEMENT LEVEL
1/8" = 1'-0"
FLOOR PLAN - DRESSING ROOM AREA
UPPER BASEMENT LEVEL
1/4" = 1'-0"
SECTION A/M3
1/4" = 1'-0"
SECTION B/M3
1/8" = 1'-0"
DRESSING ROOM AREA
See 1/4" = 1'-0" Plan at right
REHEARSAL ROOM NO. 1
SOUND EQUIPMENT
WELL ROOM
STAIR 1
STAIR 2
STAIR 3
STAIR 4
NOTE: See Drwg M-4 for location of thermostats in this area
NOTE: Coordinate location of sprinklers in this area with light fixtures
MECHANICAL
UPPER BASEMENT FLOOR PLAN AND DETAILS
B. MARCUS PRITECA
ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL A.I.D.
INTERIOR CONSULTANT
REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON
DRAWING
M-3
STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE: MAY 24 1966
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REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND, OREGON
STATE OF OREGON

FLOOR PLAN - ORCHESTRA LEVEL

1/8"=1-0"

SECTION B / M-4

1/8"=1-0"

FLOOR PLAN - DRESSING ROOM AREA ORCHESTRA LEVEL

1/4"=1-0"

WET STANDPIPE DIAGRAM

No scale

MECHANICAL
ORCHESTRA LEVEL FLOOR PLAN AND DETAILS

B. MARCUS PRITECA
ARCHITECT
THEATER CONSULTANT
PAUL VENECLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & RODE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LISA COLWELL A.I.D.
INTERIOR CONSULTANT

REBUILDING OF PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING **M-4**

STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE: MAY 24 1966
DRAWN
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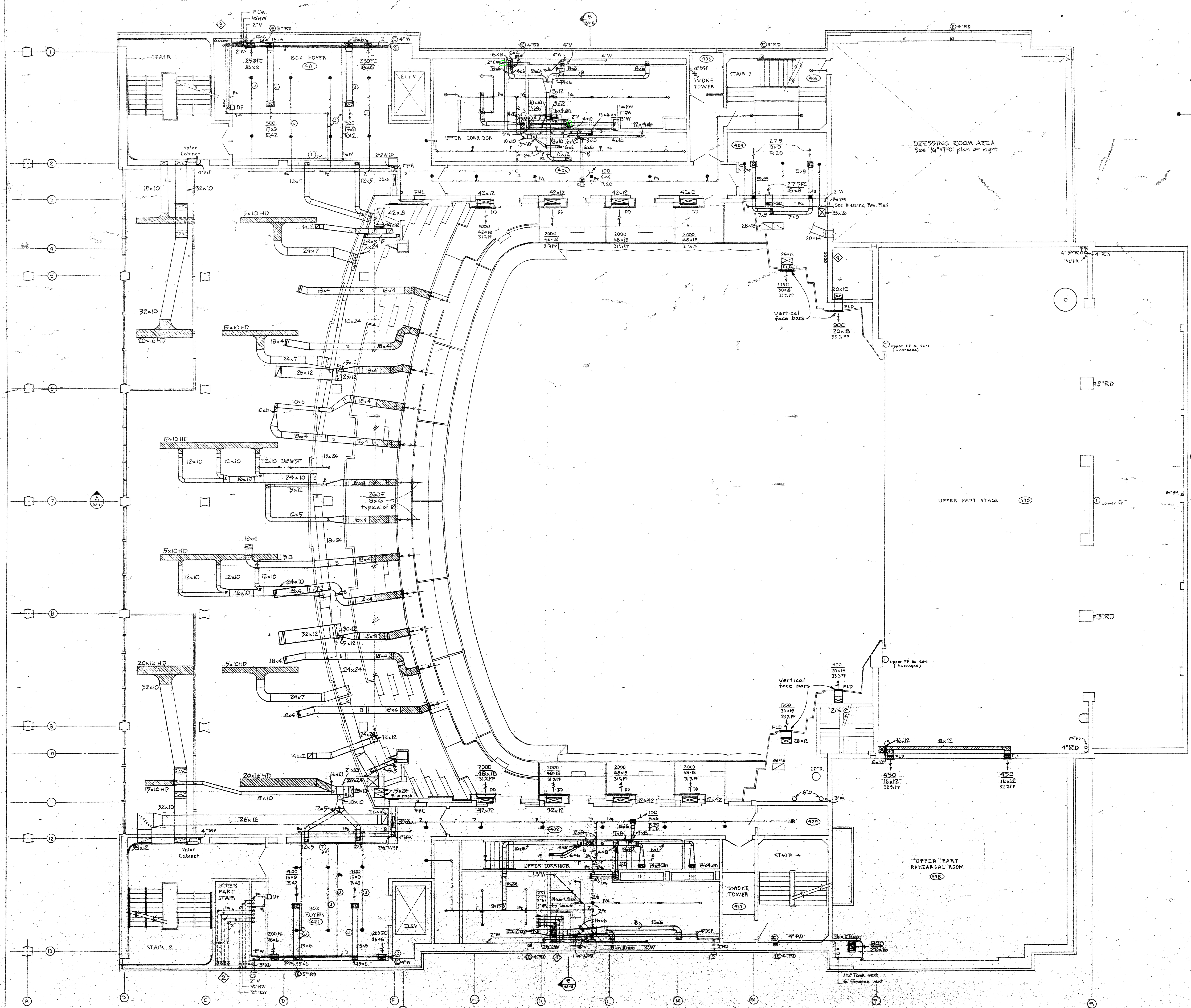
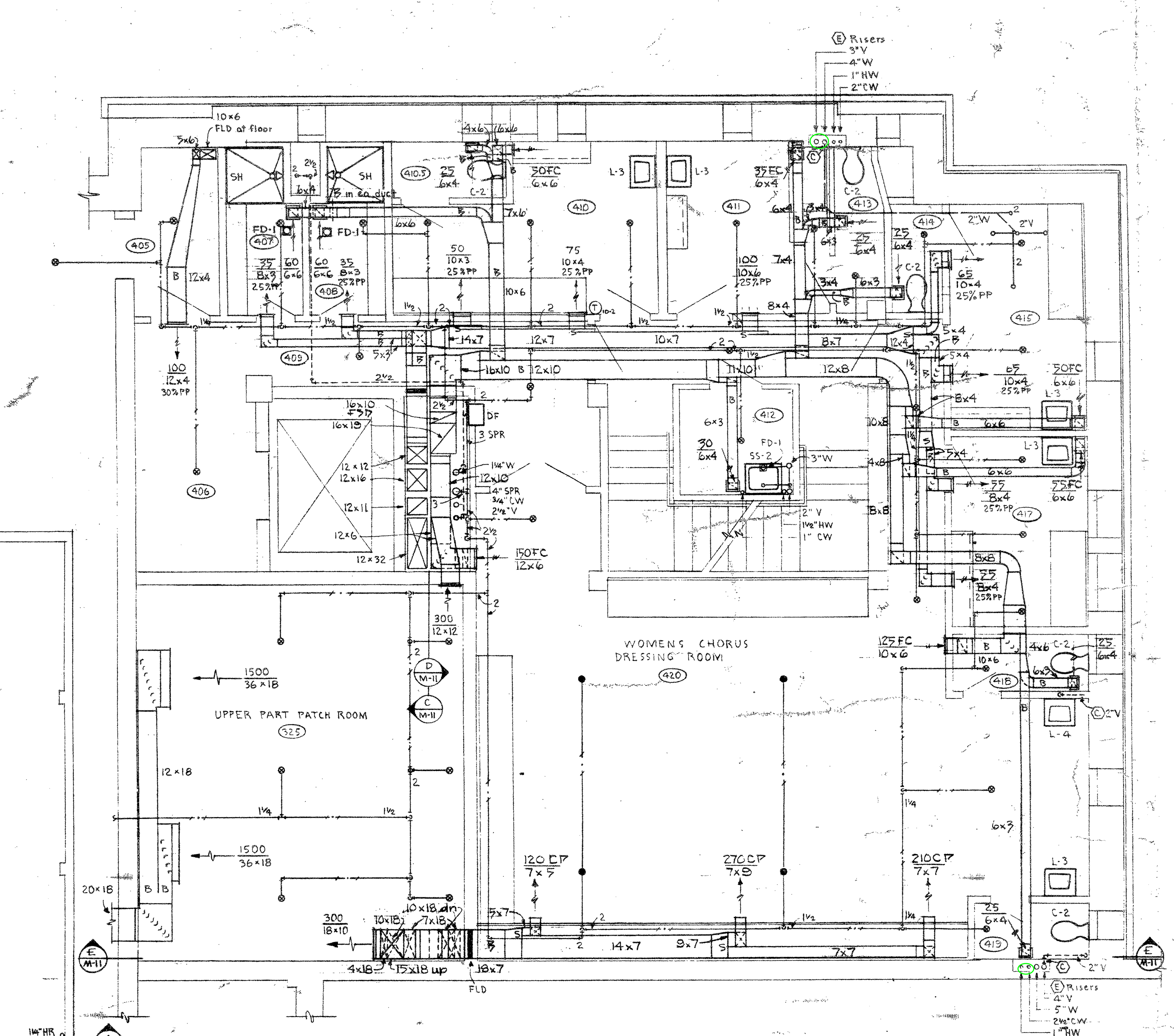
REGISTERED ARCHITECT KEITH MAGUIRE PORTLAND OREGON STATE OF OREGON

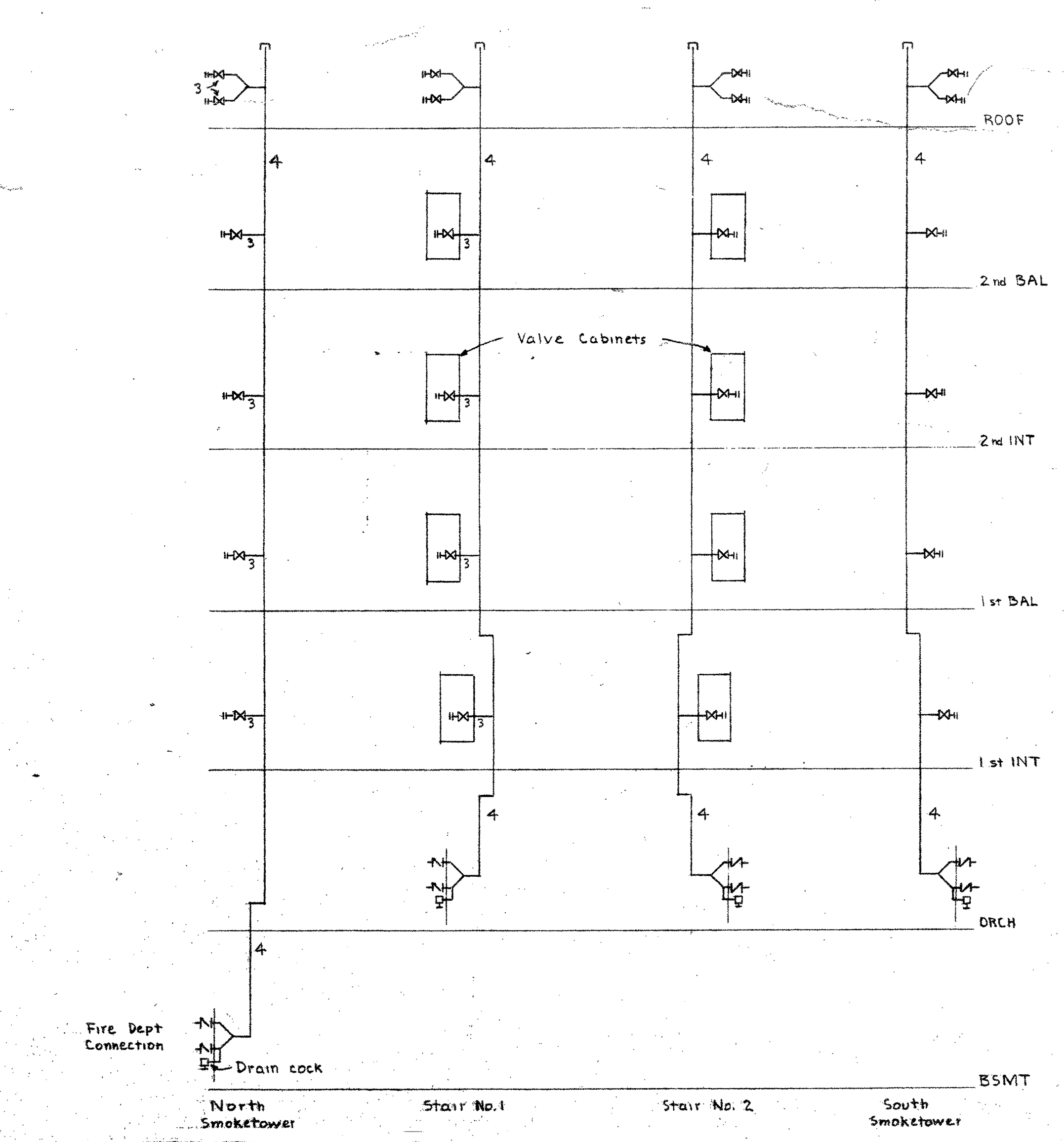
REGISTERED PROFESSIONAL ENGINEER 3128 STATE OF OREGON



FLOOR PLAN - INTERMEDIATE LEVEL NO. 1
1/8"=1'-0"



FLOOR PLAN • DRESSING ROOM AREA
INTERMEDIATE LEVEL NO. 1
1/4"=1'-0"



DRY STANDPIPE DIAGRAM
No scale

REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND, OREGON
STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER
3124
OREGON
ROBERT E. SELBERG

MECHANICAL
INTERMEDIATE LEVEL NO. 1 PLAN AND DETAILS

B. MARCUS PRITECA
ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL A.I.D.
INTERIOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND, OREGON

DRAWING
M-5

STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE: MAY 24 1966
DRAWN
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FLOOR PLAN - FIRST BALCONY LEVEL

1/8"=1'-0"

FLOOR PLAN - DRESSING ROOM AREA FIRST BALCONY LEVEL

1/4"=1'-0"

TYPICAL DEC DETAIL

No scale

SECTION (A/MG) TYPICAL PIPE RACK

1/2"=1'-0"

THERMOSTAT ENCLOSURES FOR ZONES 9-5 AND 9-8

1½"=1'-0"

DETAIL OF TYPICAL DSP VALVE CABINET

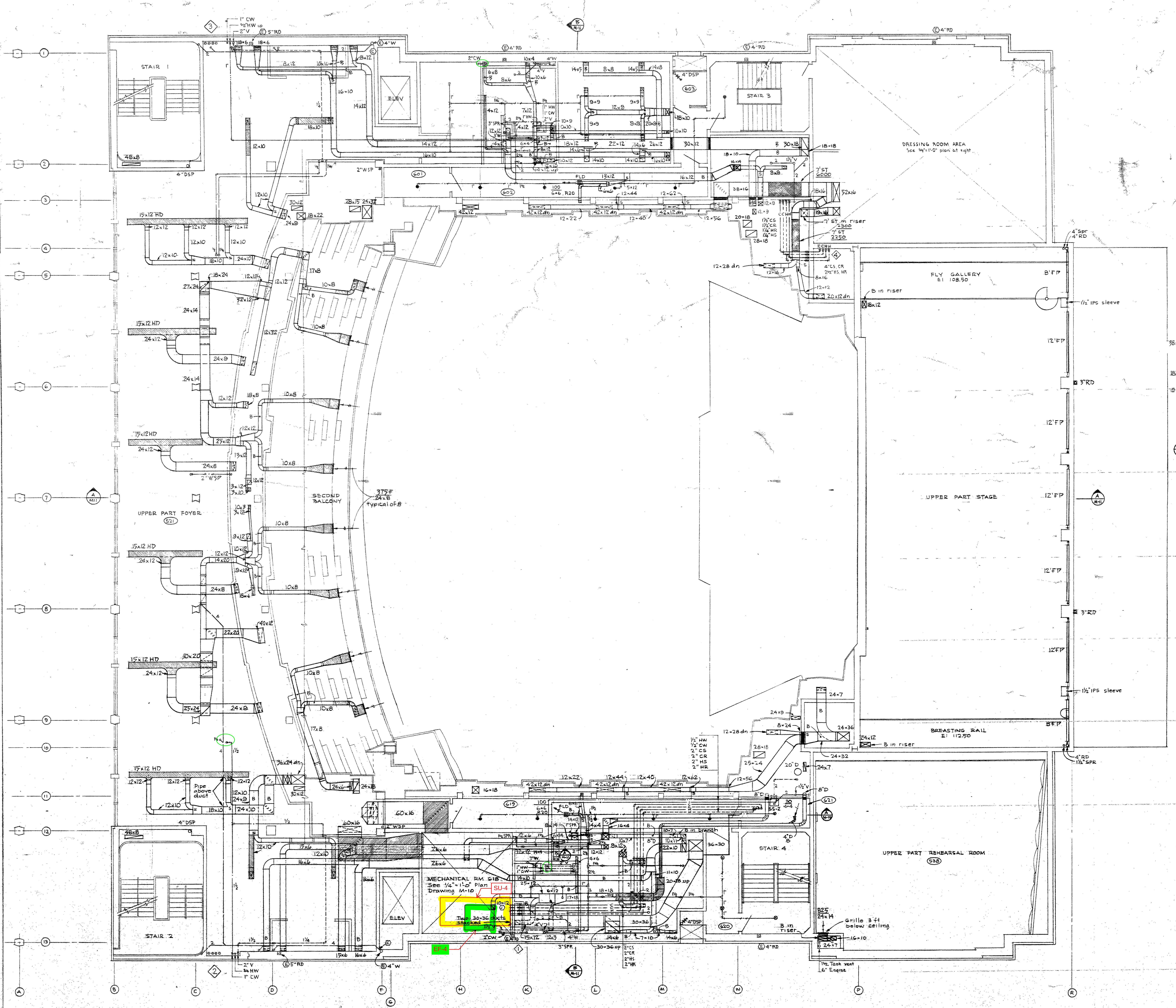
1½"=1'-0"

MECHANICAL FIRST BALCONY FLOOR PLAN AND DETAILS

B. MARCUS PRITECA ARCHITECT THEATER CONSULTANT PAUL VENECLASEN & ASSOCIATES ACOUSTICAL CONSULTANTS COOPER & ROSE & ASSOCIATES STRUCTURAL ENGINEERS J. DONALD KROEKER & ASSOCIATES MECHANICAL ENGINEERS GRANT KELLEY & ASSOCIATES ELECTRICAL ENGINEERS LILA COLWELL A.I.D. INTERIOR CONSULTANT	REBUILDING OF PORTLAND CIVIC AUDITORIUM S. W. THIRD AVENUE & CLAY STREET FOR CITY OF PORTLAND OREGON STANTON, BOLES, MAGUIRE & CHURCH ARCHITECTS 208 S. W. STARK ST., PORTLAND 4, OREGON COMM. NO. 6323 DRAWN DATE: MAY 24 1966 CHECKED
DRAWING M-6	

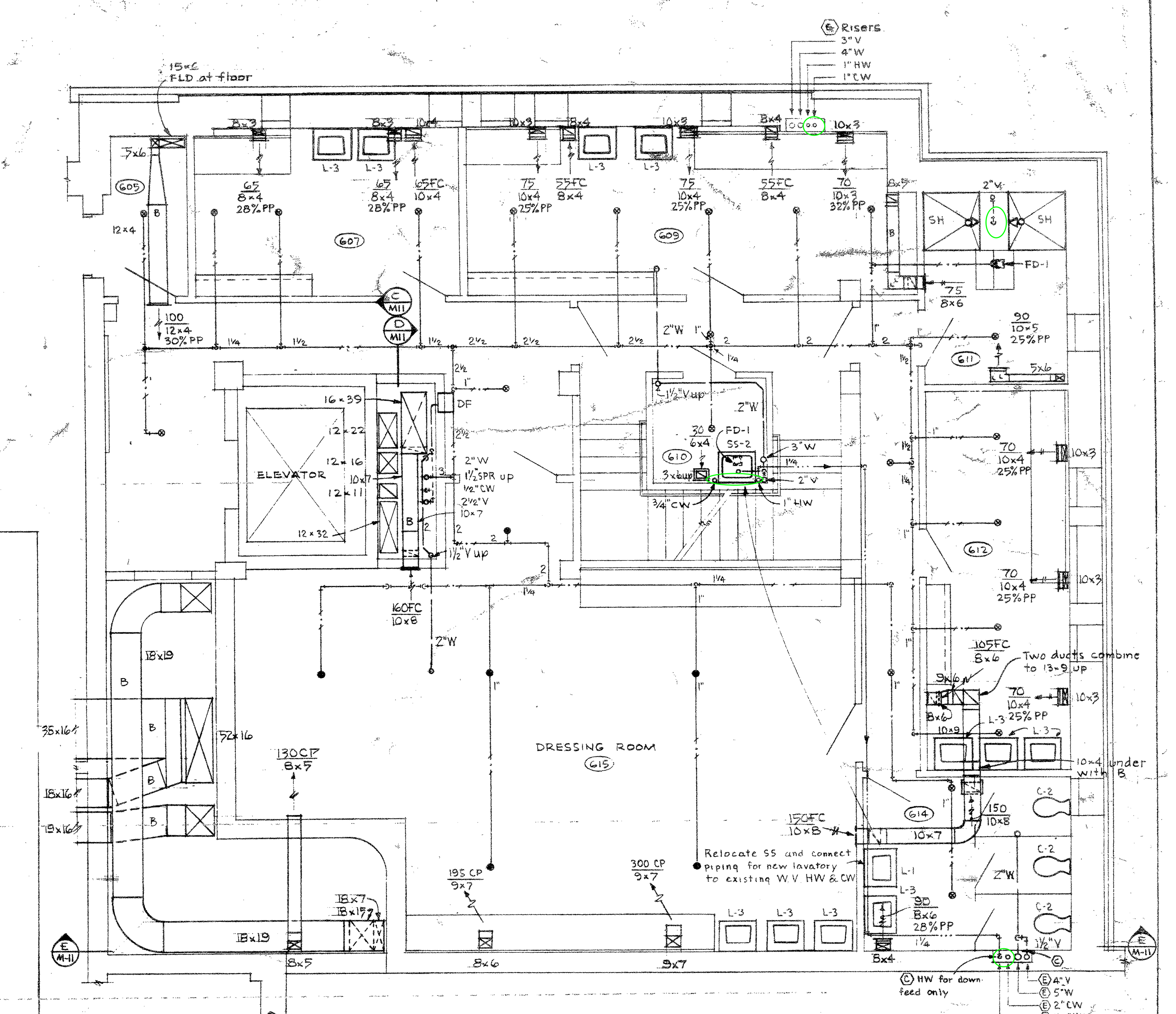
REGISTERED ARCHITECT KEITH MAGUIRE PORTLAND, OREGON STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER 3124 ROBERT L. SHELTON



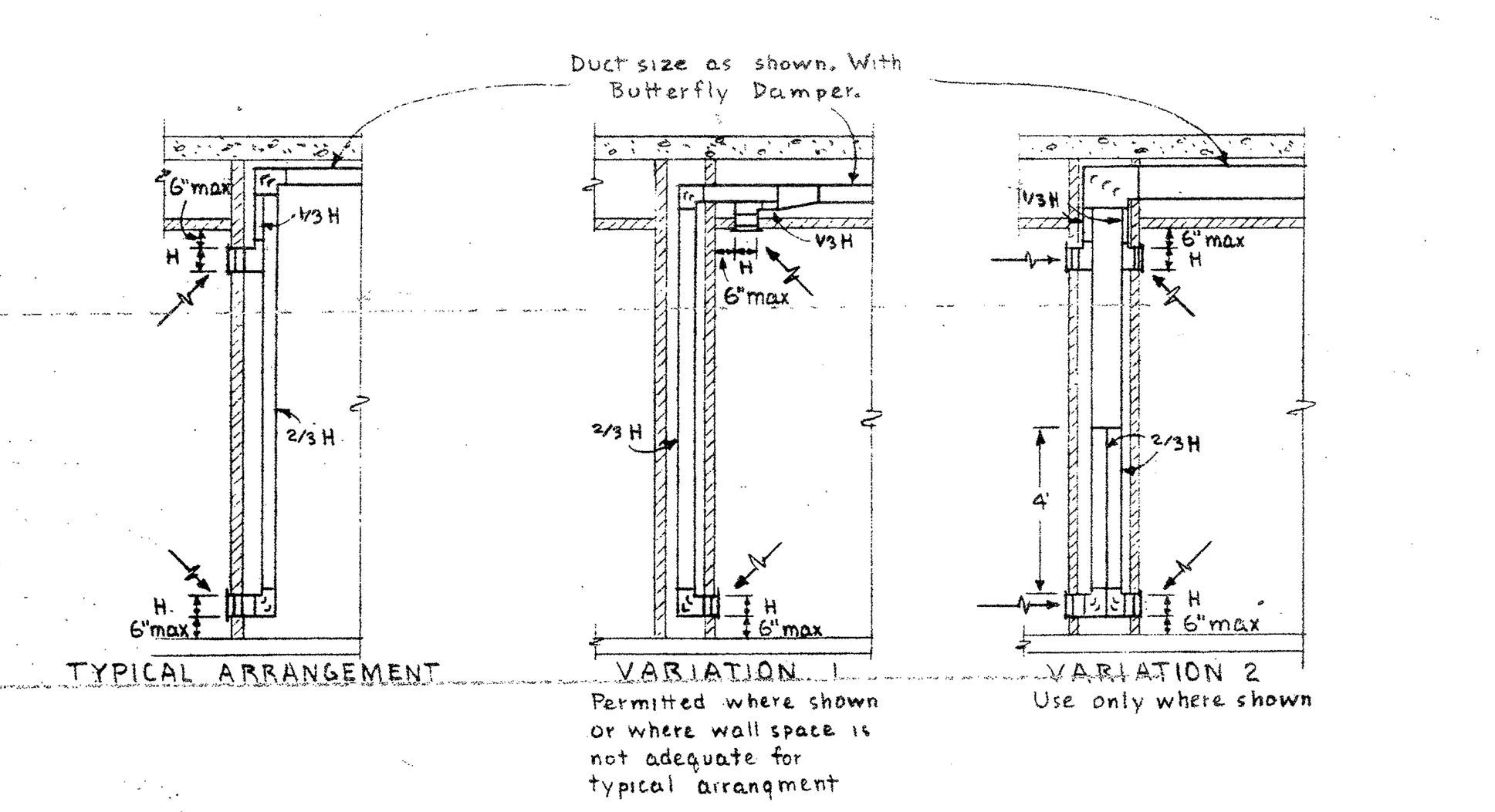
FLOOR PLAN - INTERMEDIATE LEVEL NO. 2

1/8" = 1'-0"



FLOOR PLAN - DRESSING ROOM AREA
INTERMEDIATE LEVEL NO. 2

¼" = 1'-0"



TYPICAL FC RETURN GRILLE DETAILS

No scale

Note: All FC grilles with integral key-operated backblade damper.

REGISTERED ARCHITECT KEITH MAGUIRE PORTLAND, OREGON STATE OF OREGON

MECHANICAL
INTERMEDIATE LEVEL NO. 2 PLAN AND DETAILS

B. MARCUS PRITECA
ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSÉ & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL A.I.D.
INTERIOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

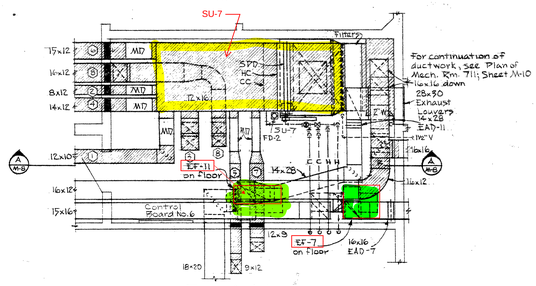
DRAWING
M-7

STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE: MAY 24 1966
DRAWN
CHECKED

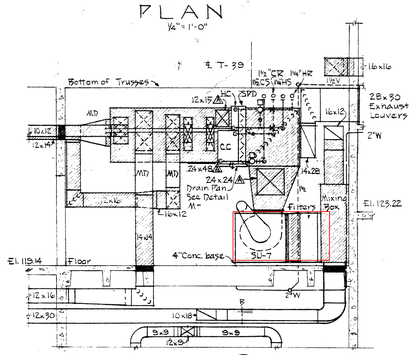
SU-10
SU-7
SU-9
EF-11
EF-7
See Plan Mechanical Room 711 Sheet M-10
See Plan Mechanical Room 709 This Sheet
See Plan Mechanical Room 727 This Sheet
SU-1
SU-2
SU-8
Note: First 5'-ft of all ductwork from return grilles in Auditorium sound attenuated

FLOOR PLAN - SECOND BALCONY LEVEL
1/8"=1'-0"

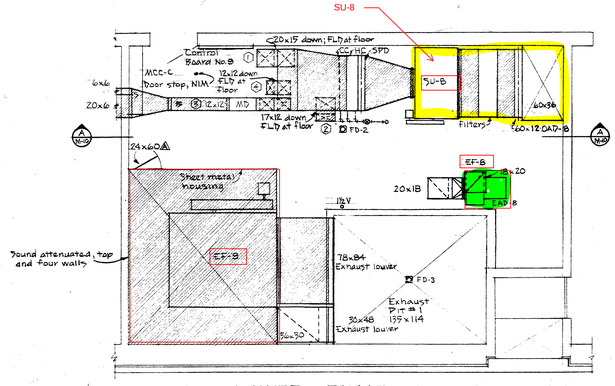
SU-7



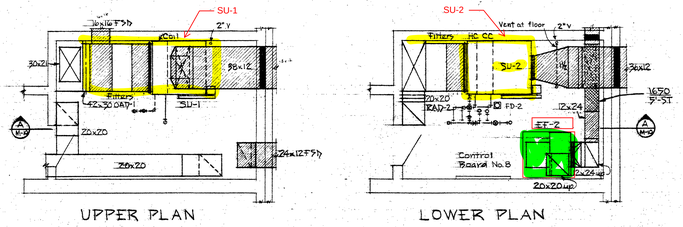
PLAN
1/4"=1'-0"



SECTION A M-8
MECHANICAL ROOM 709



LOWER PLAN
MECHANICAL ROOM 725



UPPER PLAN
LOWER PLAN
MECHANICAL ROOM 727
1/4"=1'-0"

MECHANICAL
SECOND BALCONY FLOOR PLAN AND DETAILS

b. MARCUS PRITEKA
ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL A.I.D.
(INTERIOR CONSULTANT)

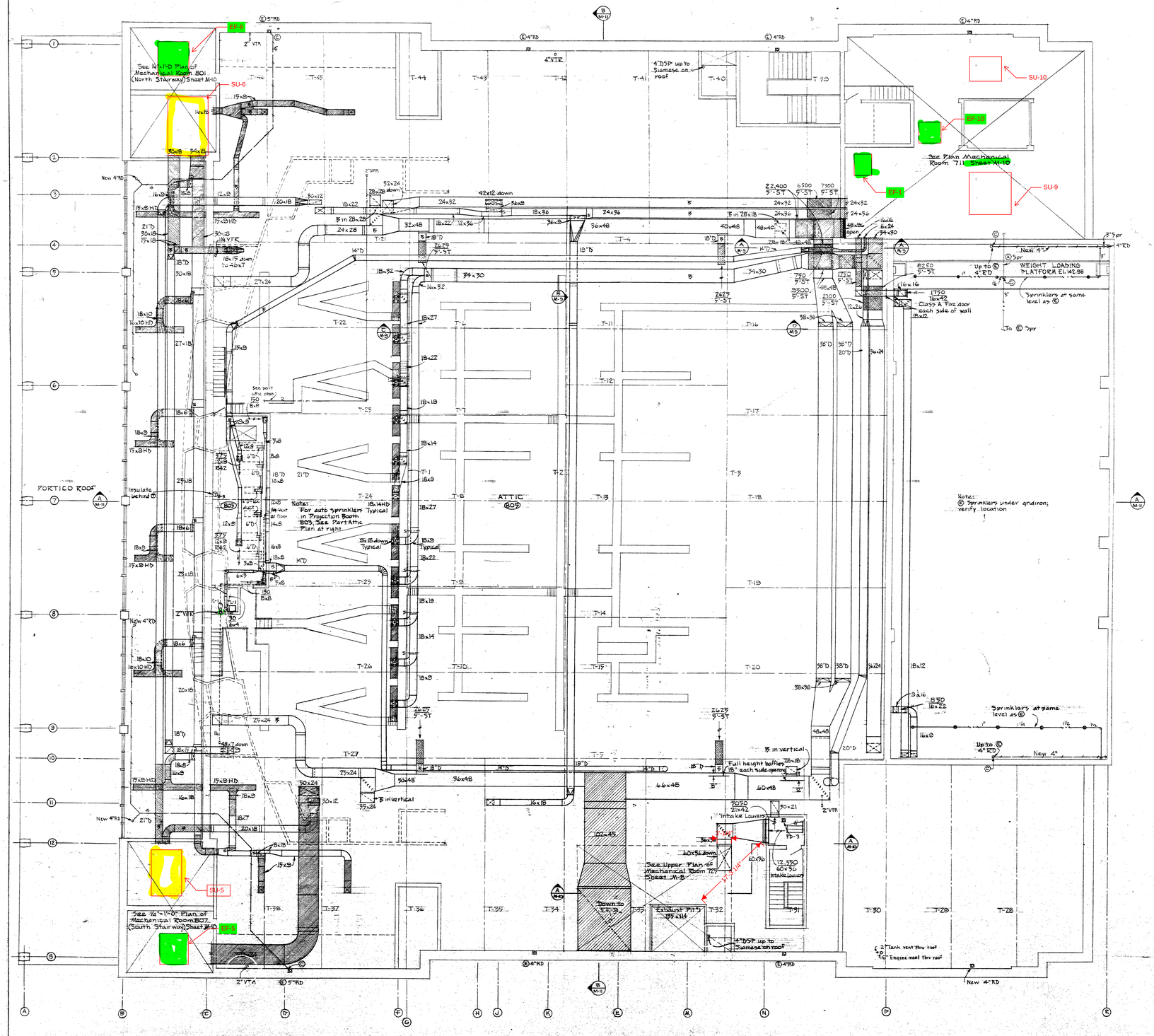
REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING M-8

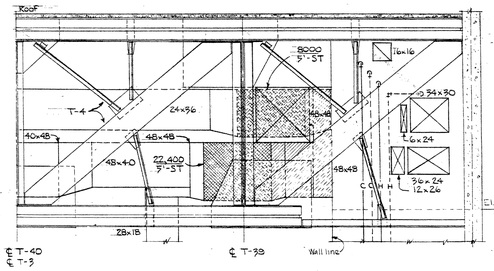
STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
208 S. W. STARK ST., PORTLAND-4, OREGON
COMM NO. 6323
DATE: MAY 24 1966
DRAWN
CHECKED

REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND, OREGON
STATE OF OREGON

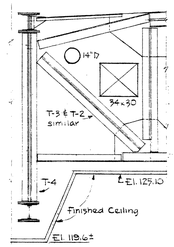
REGISTERED PROFESSIONAL ENGINEER
3124
ROBERT E. SELLERS



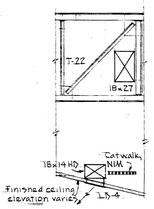
ATTIC PLAN
⅛"=1'-0"



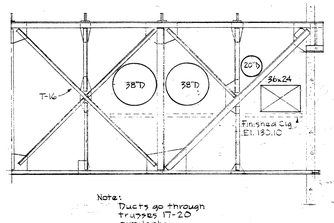
SECTION (A M-9)
¼"=1'-0"



SECTION (B M-9)
¼"=1'-0"

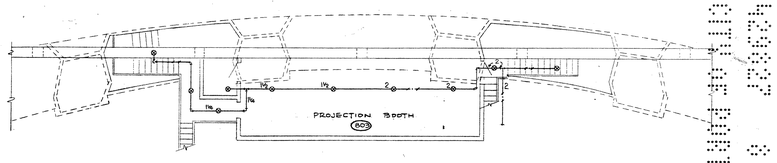


SECTION (C M-9)
¼"=1'-0"

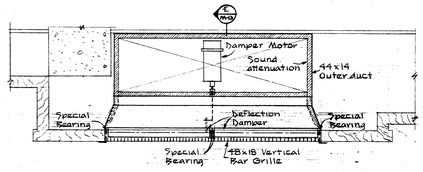


Notes: Ducts go through trusses T-20 similarly

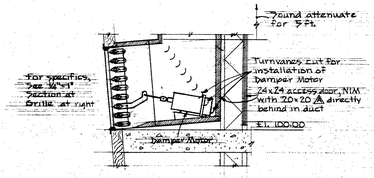
SECTION (D M-9)
¼"=1'-0"



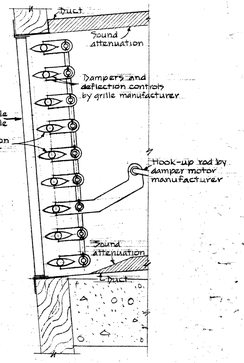
PART ATTIC PLAN - SPRINKLERS IN PROJECTION BOOTH
1/6"=1'-0"



PLAN
1"=1'-0"



SECTION (E M-9)
1"=1'-0"



SECTION AT GRILLE
¼"=1"

DETAILS OF TYPICAL HIGH SIDEWALL SUPPLY GRILLES IN AUDITORIUM WITH DD

REGISTERED ARCHITECT
KEITH MAGUIRE
PORTLAND, OREGON
STATE OF OREGON

REGISTERED PROFESSIONAL ENGINEER
3124
Robert E. Kellogg
OREGON

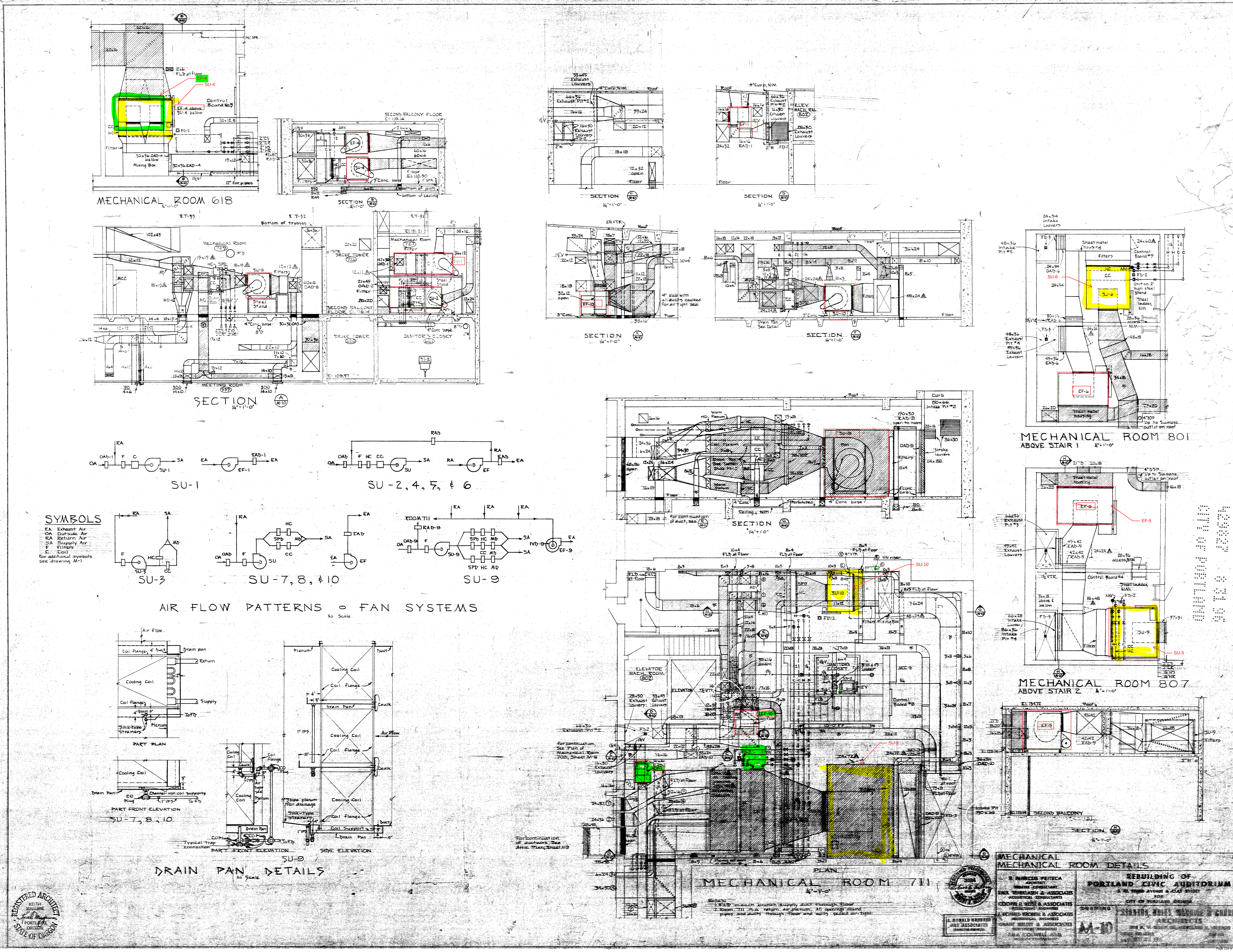
MECHANICAL
ATTIC PLAN AND DETAILS

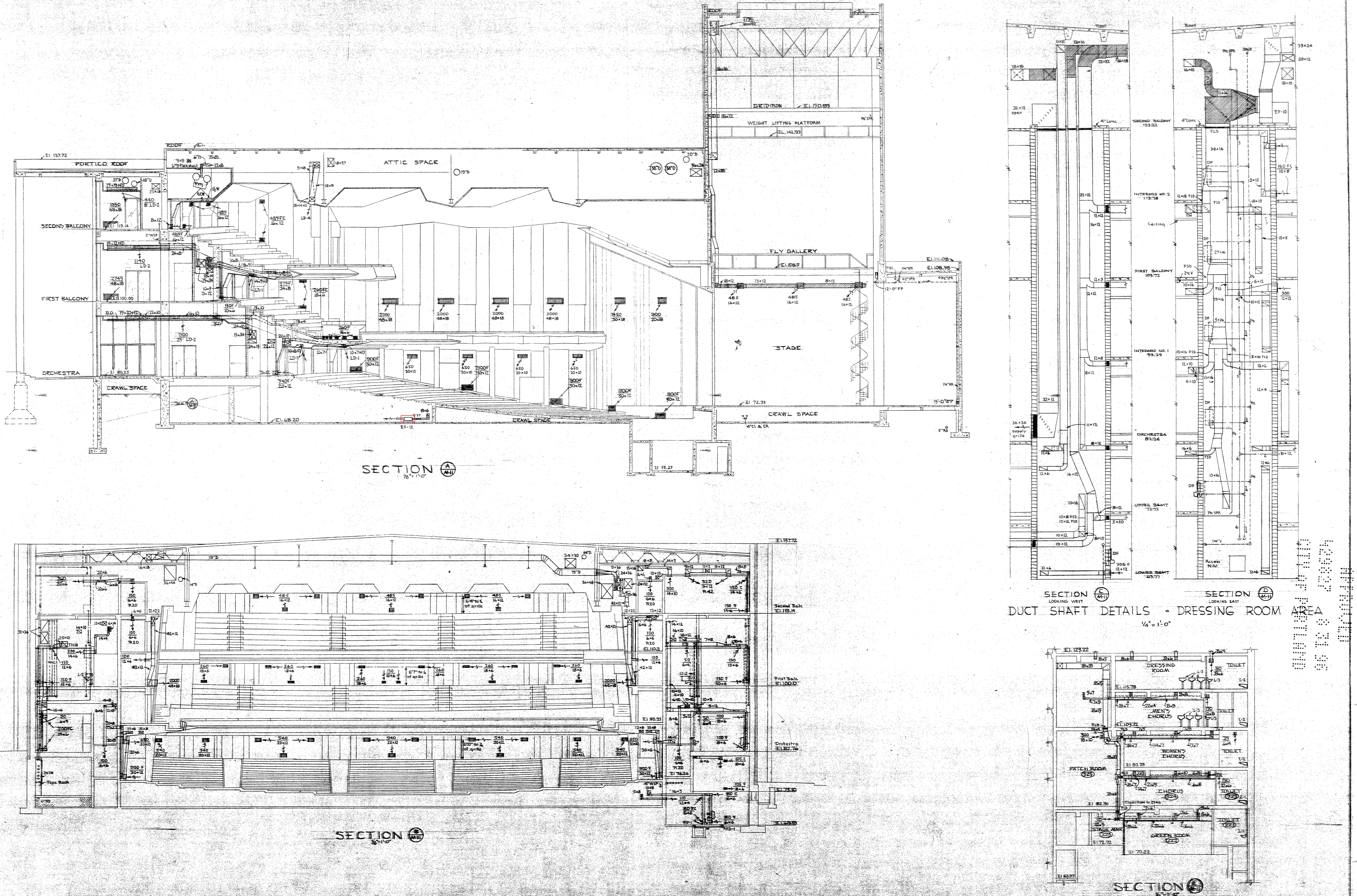
B. MARCUS PRITECA
ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
I. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL A.I.D.
INTERIOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING
M-9

STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE: MAY 24 1966
DRAWN
CHECKED


MECHANICAL ROOM 618
SECTION
AIR FLOW PATTERNS ◦ FAN SYSTEMS
SU-1
SU-2, 4, 5, & 6
SU-3
SU-7, 8, & 10
SU-9
SYMBOLS
EA Exhaust Air
OA Outside Air
RA Return Air
SA Supply Air
F Filters
C Coil
For additional symbols see drawing M-1
DRAIN PAN DETAILS
PART PLAN
PART FRONT ELEVATION
SIDE ELEVATION
MECHANICAL ROOM 801
ABOVE STAIR 1
MECHANICAL ROOM 807
ABOVE STAIR 2
PLAN
MECHANICAL ROOM 711
MECHANICAL ROOM DETAILS
REBUILDING OF PORTLAND CIVIC AUDITORIUM
CITY OF PORTLAND, OREGON
STANTON, BOLES, MAGUIRE & CHURCH ARCHITECTS
M-10



MECHANICAL
BUILDING SECTIONS AND DETAILS

B. MARCUS PRITECA
ARCHITECT
THEATER CONSULTANT
PAUL VENEKLASEN & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEKER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT-KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL A.I.D.
INTERIOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING
M-11

STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
1208 S. W. STARK ST., PORTLAND 4, OREGON
COMM. NO. 6323
DATE MAY 24 1966
DRAWN
CHECKED

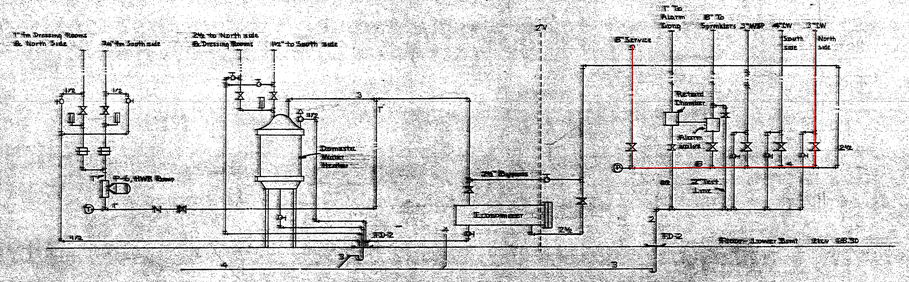
SOUTH SIDE

NORTH SIDE

DRESSING ROOM AREA

PART PLUMBING RISER DIAGRAMS

No scale



PIPING DIAGRAM - WATER SERVICE CONNECTIONS

No scale

Note
See Floor Plan of Room 228, Drawings M-2 & M-3

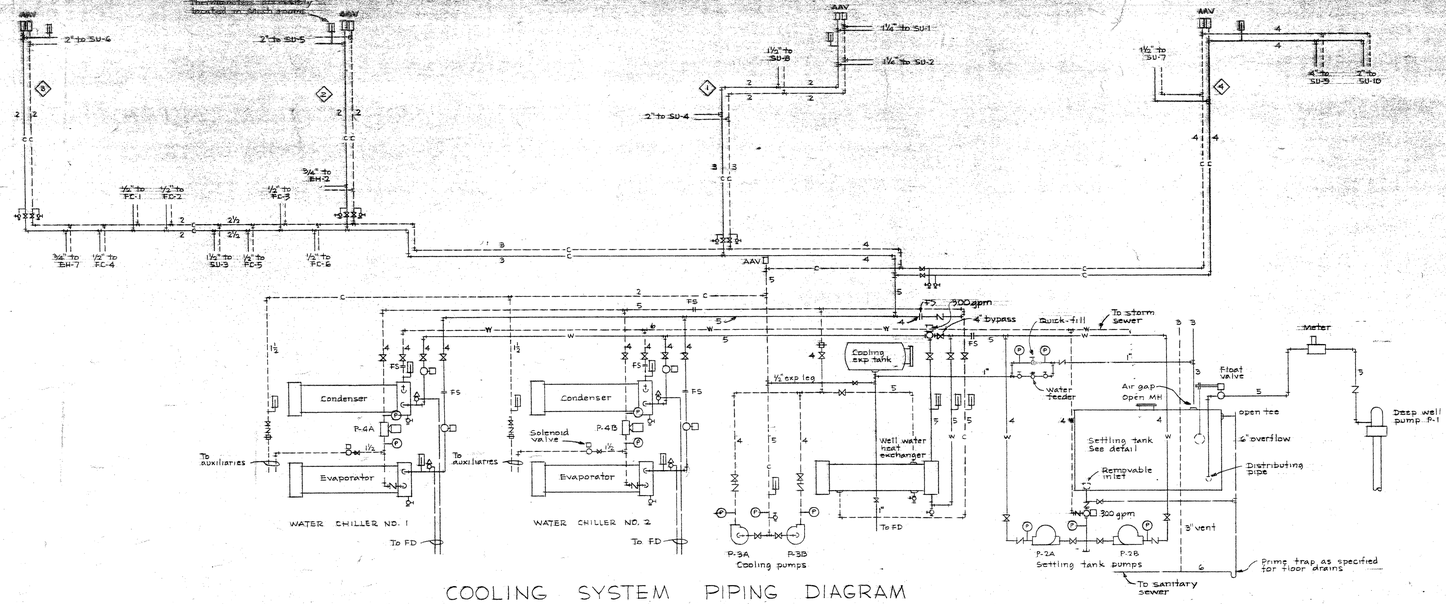
MECHANICAL
PLUMBING PIPING DIAGRAMS

B. MARCUS PRITEKA
ARCHITECT
MASTER CONSULTANT
PAUL WESTLAKE & ASSOCIATES
ACOUSTICAL CONSULTANTS
COOPER & ROSE & ASSOCIATES
STRUCTURAL ENGINEERS
J. DONALD KROEGER & ASSOCIATES
MECHANICAL ENGINEERS
GRANT KELLEY & ASSOCIATES
ELECTRICAL ENGINEERS
LILA COLWELL, A.I.I.D.
INTERIOR CONSULTANT

REBUILDING OF
PORTLAND CIVIC AUDITORIUM
S. W. THIRD AVENUE & CLAY STREET
FOR
CITY OF PORTLAND OREGON

DRAWING
M-12

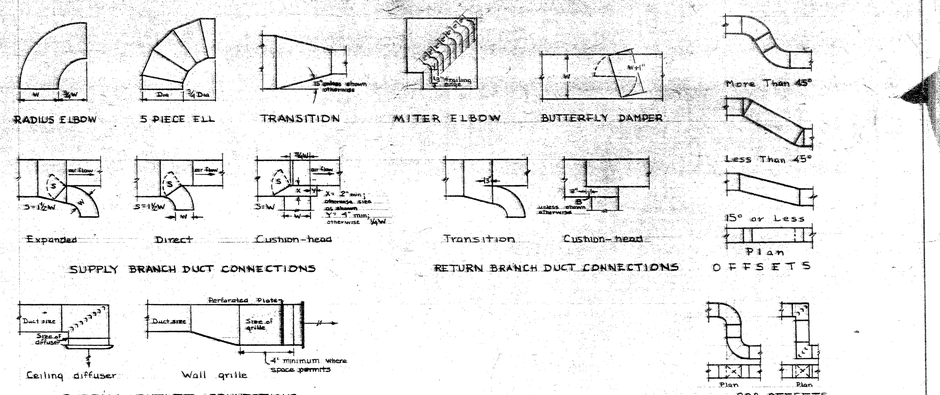
STANTON, BOLES, MAGUIRE & CHURCH
ARCHITECTS
228 S. W. STARK ST., PORTLAND 4, OREGON
CONTR. NO. 5323
DATE: MAY 24 1956
DRAWN
TRACED



COOLING SYSTEM PIPING DIAGRAM

No scale

Note: Pipe sizes shown for branch piping to equipment are for both supply and return.

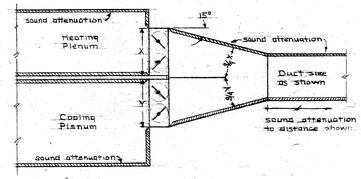


TYPICAL DUCT CONSTRUCTION DETAILS

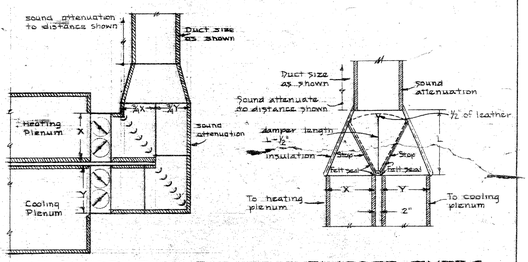
No Scale

MIXING DAMPER SCHEDULE

UNIT ZONE	CFM	Damper Width	Damper dimensions (inches) Depth X (warm)	Depth Y (cool)	Length L	TYPE	Room Thermostat Location
SU-7							
1	610	14	12	12	22	C	708
2	900	10	14	14	22	C	702
3	1200	16	16	16	22	C	806
4	1000	16	14	14	22	C	401
5	950	9	18	18	22	C	404
6	1100	17	14	14	22	C	906
7	980	9	18	18	22	C	908
8	1280	14	18	18	22	C	708
SU-8							
1	1860	22	17	14	22	C	846
2	1250	18	14	14	22	C	939
3	720	14	14	14	22	C	721
4	800	14	14	14	22	C	421
SU-9							
1	6900	32	18	32		A	940
2	7200	38	18	32		A	926
3	750	8	18	26		A	803
4	5900	44	18	32		A	715
5	8290	34	18	32		A	340
6	2400	19	18	32		A	940
7	8290	19	18	32		A	940
8	2500	34	18	32		A	940
SU-10		–					
1	1330	14	12	16		B	107
2	2995	29	17	90		B	410
3	9300	20	30	30		B	222



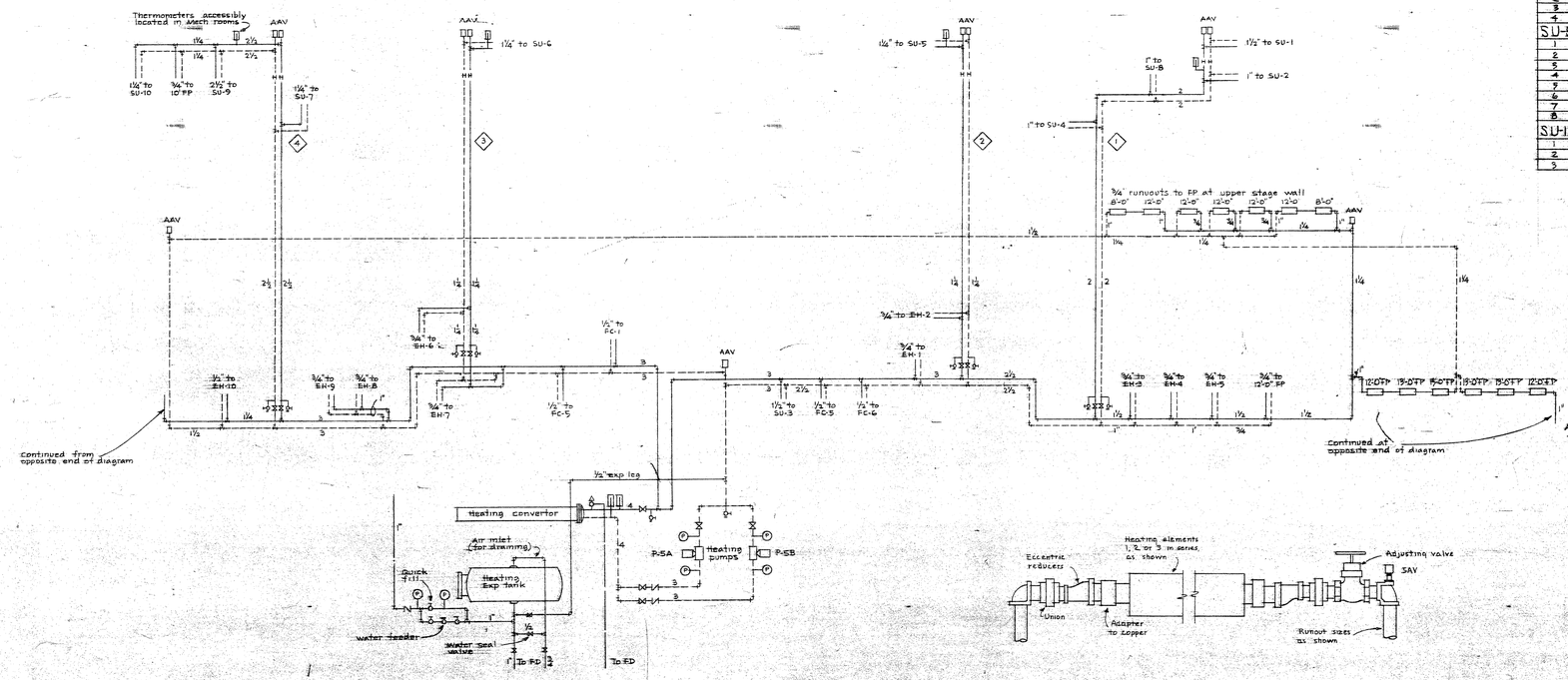
MULTI-BLADE TYPE A



MULTI-BLADE TYPE B FLAPPER TYPE C

MIXING DAMPERS

No Scale



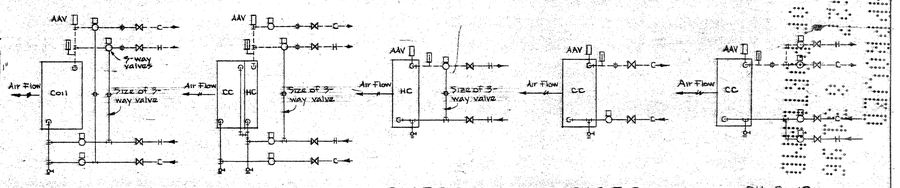
HEATING SYSTEM PIPING DIAGRAM

No scale

Notes: Pipe sizes shown for branch piping to equipment are for both supply and return.

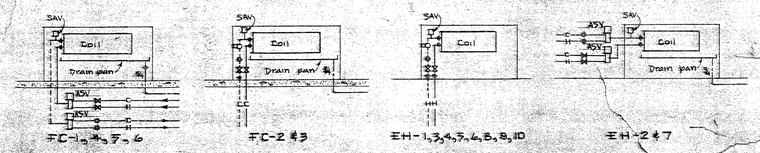
TYPICAL FP CONNECTIONS

No scale



COIL PIPING DIAGRAMS

No Scale

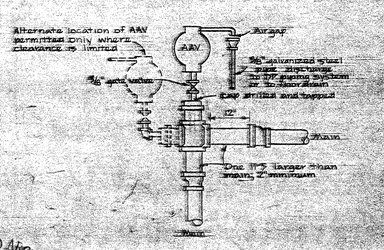


FAN COIL UNIT PIPING DIAGRAMS

No Scale

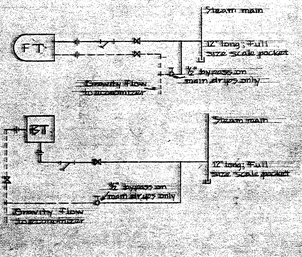
ENTRY HEATER PIPING DIAGRAMS

No Scale



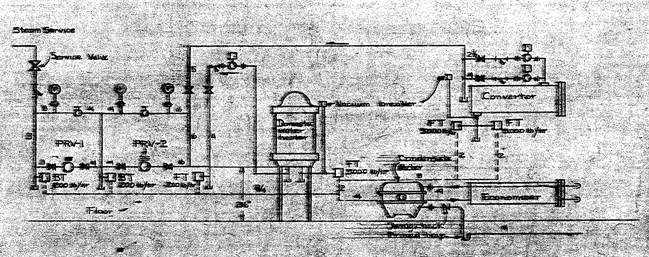
TYPICAL AAV DETAIL

No Scale



TYPICAL STEAM TRAP PIPING DIAGRAMS

No Scale



STEAM AND CONDENSATE SYSTEM PIPING DIAGRAM

No Scale

Notes: All condensate piping to flow by condensate meter by gravity

REGISTERED ARCHITECT KEITH MACHINE PORTLAND OREGON STATE OF OREGON

MECHANICAL
HEATING AND COOLING PIPING DIAGRAMS & DUCT DETAILS

B. MARCUS FREDERICK ARCHITECT
PAUL TREITLER & ASSOCIATES MECHANICAL CONSULTANTS
CLINE & BELLE & ASSOCIATES STRUCTURAL ENGINEERS
R. RICHARD HOUSTON & ASSOCIATES ELECTRICAL CONSULTANTS
GRANT WESTBY & ASSOCIATES SPECIFICATION WRITERS
JOHN CHANDLER AND ASSOCIATES LANDSCAPE ARCHITECTS

REBUILDING OF PORTLAND CIVIC AUDITORIUM
S.W. THIRD AVENUE & CLAY STREET
FOR THE CITY OF PORTLAND OREGON

DRAWING M-12

STANTON, BOLLES, MACKENZIE & CHURCH ARCHITECTS
320 S.W. STARK ST., PORTLAND 4, OREGON
DATE MAY 24 1955

Job #6821