

THE CITY OF CAMAS CITY HALL & FIRE STATION 41

Facilities Improvements Project

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1.0 PROJECT TEAM

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2.0 INTRODUCTION

2.1 Executive Summary

The City of Camas owns and operates the Camas City Hall and Fire Station 41 at 616 NE 4th Ave. The building consists of approximately 26,400 square feet of conditioned space. Of this total 26,400 square feet, approximately 2700 square feet is heated and ventilated parking on the lower level, and 3,800 square feet is heated and ventilated fire department storage and truck parking. The building mechanical systems were completely updated in 1985 from the original 1966 systems, and the dormitory for Fire Station 41 was last updated in 2008. Based on the current conditions and life span of the existing equipment, a complete remodel of all heating, ventilation, and air conditioning (HVAC) systems is in order, including source equipment (boilers and chiller) and distribution equipment (heat pumps, ductwork, and piping). The building electrical system mostly dates back to 1966. A couple of panels were added recently, but most of the system is due for an upgrade as it approaches or has surpassed its end of life. The building is lit with fluorescent lighting. There's a backup generator that serves the fire station in the event of an emergency as well.

The purpose of this report is to provide Windsor Engineers' (Windsor) professional recommendations, as well as the process taken to inform the decisions.

2.2 Process

Windsor used the following steps to assess and collect all necessary information pertaining to the mechanical, plumbing, and electrical systems serving the Camas City Hall and Fire Station 41.

- 2022 Facility Conditions Assessment by MENG Analysis.
- Detailed review of existing drawings and systems prior to going on-site.
- Site visit and tour of the inside and outside of the building
 - o Existing equipment was inspected.
 - o Occupants were consulted to determine areas of dissatisfaction and need.



3.0 MECHANICAL

3.1 Current System Assessment

3.1.1 Systems Observed

The current mechanical system consists of a heat pump loop served by a 70-ton closed circuit, cooling tower, and a 325 MBH (one thousand British Thermal Unit [BTU] per hour) heating water boiler. This source equipment feeds a heat pump piping loop that operates between 80-100 degrees Fahrenheit (°F) year-round. This heat pump loop water is pumped throughout the building to water source heat pumps that serve as the building conditioning for each zone. These heat pumps are located in the ceiling space and ducted to each area served. Ventilation and exhaust is provided via air-to-air heat exchangers and exhaust fans. The 2008 remodel for Fire Station 41 replaced the 1985 air-to-air heat exchanger with exhaust fans and ducted fresh air to the replaced heat pumps.

The heating and ventilation only spaces, Fire Station 41 truck parking and storage are served by gas fired unit heaters. The lower-level parking does not appear to be heated, but further investigation is necessary.

3.1.2 Existing Equipment Condition

Based on the age, lifespan, and site verification of the existing HVAC equipment, all existing equipment should be replaced with new high efficiency, code compliant equipment. The 2022 Facility Conditions Assessment from MENG Analysis was provided by City staff to help verify and understand the scope of the remodel required. From this assessment, meetings with City staff, and site observations, the entire mechanical system will be replaced.

3.1.3 Temperature Sensors and Zoning

Existing zoning largely divides the spaces by building exposure and some usage type. However, the zoning should be improved and narrowed down to provide better individual zoning and optimum occupant comfort.

3.1.4 Existing Controls System

The existing HVAC controls system is obsolete. Per the 2022 Facility Conditions Assessment from MENG Analysis and site observations, the controls are stand-alone per equipment and not networked.

3.2 Recommendation Summary

3.2.1 Overview

The existing HVAC equipment shall be replaced in its entirety, including the cooling tower, boiler, heat pumps, exhaust fans, air-to-air heat exchangers, ductwork, diffusers, grilles, piping, accessories and controls.

Three different options were discussed and evaluated to replace the existing equipment including variable refrigerant flow (VRF), air-to water heat pumps, and a traditional boiler with cooling tower, heat



pump system. Considering cost, equipment familiarity, durability, and Washington energy code changes, a boiler and cooling tower, heat pump system was recommended and chosen for the replacement.

The HVAC system will operate similarly to the existing system, incorporating a closed circuit cooling tower and natural gas boiler to maintain the heat pump water loop temperature (60°F-90°F). However, the new natural gas boiler will be a high efficiency condensing boiler, capable of operating near 98 percent (%) efficiency. Also, the new closed circuit cooling tower will be capable of modulating capacity from 60-100%. The heat pump loop will operate as a variable primary, variable secondary system. The boiler and cooling tower will operate to maintain the heat pump loop water temperature. When cooling is needed in the loop, the cooling tower shall run and an electronically commutated motor (ECM) pump shall inject cooled water into the loop to satisfy the heat pump loop set point. When heating is required for the loop, the boiler shall fire and its own ECM pump shall operate to add heat into the loop to satisfy the heat pump loop set point. Two inline variable speed system pumps will control flow for the heat pump loop. As zone heat pumps open and close to allow water flow and operate, the system differential pressure will rise and fall. The system pumps will run and vary speed to maintain the system differential pressure set point. The heat pump loop will be routed throughout the building near each heat pump. Each heat pump will be connected to the heat pump loop by a minimum of 3/4-inch pipe and hose kit (including shutoff valves, strainer, and balancing valves).

Downstream of the heat pump loop, water-to-air (water source) heat pumps will serve each zone. Approximately 40 heat pumps will serve the conditioned spaces. The heat pumps will range from 12 MBH to 42 MBH, depending on the cooling load of each zone. Each heat pump will be located in the ceiling space near the zone it serves and will be fully ducted (supply and return) to diffusers and grilles in each zone.

Fire Station 41, connected to City Hall, will be served with ceiling hung, gas fired radiant heaters. The fire station is heated and ventilated only. The ventilation and exhaust will be provided by a small indoor energy recovery ventilator (ERV) continuously running at rate of 0.05 cubic feet per minute (CFM) per square foot (200 CFM). A larger roof mounted ERV will serve as the 'purge' unit and provide ventilation and exhaust at a rate of .75 CFM per square foot (3000 CFM). These two ERVs will be controlled by carbon monoxide (CO) and nitrogen dioxide (NO₂) sensors located on the wall of the fire station. When CO and/or NO₂ levels reach above 25 / 3 parts per million (ppm), the large ERV shall turn on and operate until levels fall below the set point for 15 minutes.

The lower level parking garage will be conditioned, ventilated, and exhausted similar to the fire station. Because of its lower level location and vicinity to. One small ERV will be operated continuously at 0.05 CFM per square foot (150 CFM). A larger indoor ERV shall operate as the 'purge' unit when CO and NO₂ levels rise above set point and continue to run until the set point is reached for 15 mins.

3.2.2 Major Equipment Replacement

All major HVAC equipment will be replaced and upgraded, including:

- Boiler, High Efficiency Gas Fired – 98% Efficiency
- Cooling Tower



- Pumps, Variable Speed
- Water-Source Heat Pumps – 40 total, 1-1/2 to 4 ton each
- Hydronic Piping
- Energy Recovery Ventilators (ERVS) for ventilation and exhaust
- Ductwork
- Diffusers, Grilles, and Dampers
- Direct Digital Control (DDC) Controls

3.2.3 Controls System Upgrade

A Building Automation System (BAS) will be installed and control all mechanical equipment in the building. The new DDC control system shall be Reliable Controls equipment and interface with the existing city-wide system per the existing City of Camas control architecture. All sensors, equipment controllers, wiring, low voltage transformers, actuators, front end graphic, interfaces, and accessories shall be provided and installed by the controls contractor for a complete, operating system.



4.0 ELECTRICAL

4.1 Current System Assessment

4.1.1 Systems Observed

Based on our site visit and as-builds provided, an electrical riser diagram is provided below for reference, showing the existing electrical system.

City Hall and Fire Station 41 electrical system consists of the following:

Building Power Source

Normal building power is provided by a 208Y/120V, 600A, 3 phase (PH), 4 wire (W), main distribution panel (MDP). The MDP is located in the main Electrical Room 12 in the basement of the building. All branch panels for lighting, receptacles, devices, plumbing, and mechanical equipment are served out of the MDP.

Back-up building power is provided by a 45KW, 208Y/120V, 3 phase, 4W generator. The generator is located inside the parking garage. A 208Y/120V, 200A, 4P manual transfer switch (MTS) provides the switching between normal and backup power. The MTS is located in the main electrical room in the basement of the building. Dedicated back up power distribution equipment is not currently used.

Building Power Distribution

- Panel A → 208Y/120V, 225A, 3PH, 4W. Fed from MDP.
- Panel B → 208Y/120V, 225A, 3PH, 4W. Fed from MDP.
- Panel C → 208Y/120V, 225A, 3PH, 4W. Fed from MDP.
- Panel D → 208Y/120V, 225A, 3PH, 4W. Fed from MDP.
- Panel E → 208Y/120V, 100A, 3PH, 4W. Fed from back-up power bus (see one-line).
- Panel G → 208Y/120V, 100A, 3PH, 4W. Fed from MDP.
- Panel H → 208Y/120V, 125A, 3PH, 4W. Fed from back-up power bus (see one-line).
- Panel heating, ventilation, and air conditioning (HVAC) -1 → 208Y/120V, 200A, 3PH, 4W. Fed from MDP.
- Panel HVAC-2 → 208Y/120V, 200A, 3PH, 4W. Fed from MDP.
- Panel F → 208Y/120V, 225A, 3PH, 4W. Fed from back-up power bus (see one-line).
- Panel F2 → 208Y/120V, 100A, 3PH, 4W. Fed Panel F.
- Panel Computer/UPS → 208Y/120V, 225A, 3PH, 4W. Fed from MDP.
- Panel P → 208Y/120V, 225A, 3PH, 4W. Fed from back-up power bus (see one-line).
- MTS → 208Y/120V, 200A, 3PH, 4W. Fed from generator and MDP.



Windsor was also provided with one year of utility bills from Clark Public Utilities District (PUD). As seen below, across a 12-month average, City Hall/Fire Station 41 uses about 56KW of power each month. This translates to about 150A of power every month. While the highest amperage usage is around 206A as seen in September.

Table 1: 12-Month Utility Billing

Month/Year	Demand Amount (KW)	Demand Amount (A)	Account No
Feb-24	53	147.22	7200314
Jan-24	50	138.89	7200314
Dec-23	49	136.11	7200314
Nov-23	53	147.22	7200314
Oct-23	58	161.11	7200314
Sep-23	74	205.56	7200314
Aug-23	60	166.67	7200314
Jul-23	58	161.11	7200314
Jun-23	59	163.89	7200314
May-23	50	138.89	7200314
Apr-23	52	144.44	7200314
Mar-23	52	144.44	7200314
Average	55.67	154.63	-
Maximum	74	205.56	

Abbreviations

A – Amperage
KW – Kilowatt
No – Number

4.1.2 Existing Equipment Condition

Lighting lighting control system critical for energy credits.

The lighting in this building appears outdated, though in good working condition. Various areas do not have adequate lighting while other areas have ample lighting. All lighting is fluorescent. Lighting controls are provided by manual switches for every space. Occupancy sensors, daylight sensors, and dimming controls are not present. A time clock controller is utilized for exterior lighting, located in the main electrical room.

Normal Power

The majority of the normal power distribution system appears to be aged and nearing end of life; most of the equipment is the original, installed when the building was first constructed. Some panels were installed more recently and in good working condition. In some areas, three feet of clearance is not provided for equipment. Nonelectrical systems routed above electrical equipment.



Emergency Power

The emergency power system is nearing its end of life and is no longer code compliant. Generator primarily backs up lighting, receptacles and other devices in the fire station spaces. Most of the city hall spaces are not backed up by the generator. The manual transfer switch is at the end of its life. No additional dedicated distribution for the back-up system is provided.

4.2 Recommendation Summary

4.2.1 Overview

After a thorough review of issues and observations at City Hall/Fire Station 41, below are recommended improvements to the facility to update the electrical and lighting systems, along with bringing the electrical system to the current code requirements.

4.2.2 New System Replacement

Lighting

Windsor proposes a full lighting redesign. Installing all new LED lights to replace the fluorescent lighting currently used, along with all new lighting controls. The lighting redesign will provide an elevated comfort experience and meet or go above WSEC 2021 requirements. A thorough photometric model will be run to provide adequate and uniform lighting across all spaces. Based on the annual electric utility bills, there's enough capacity to add additional lighting, however switching to all LED lighting will likely result in a net decrease in load on the system.

Electrical Distribution

Normal Power Distribution

Windsor proposes replacing the main switchboard and all panels, except for panels HVAC-1, HVAC-2, and PANEL-H. All existing loads will be transferred over to new panels and sorted into dedicated panels for lighting, power and mechanical equipment to meet energy metering requirements. Existing conduits and feeders will be verified and tested for re-use; any feeders at the end of their life or not in good condition will be replaced.

Emergency Power Distribution

Windsor proposes replacing the manual transfer switch with two new automatic transfer switches (ATS) as well as a new dedicated back-up power distribution board. One ATS will feed emergency loads to comply with National Electrical Code (NEC) 700 and the second ATS will feed optional standby loads to comply with NEC 702. The emergency power system is also reaching end of life and is no longer compliant with the current codes. To bring this system up to date, Windsor recommends that the existing manual transfer switch be replaced with an automatic transfer switch to connect to all standby loads and to add an automatic transfer switch to connect to all loads required to be connected to backup power by NEC 702 like heating and cooling equipment systems, plumbing systems and network system among others.



5.0 PLUMBING

5.1 Current System Assessment

5.1.1 Systems Observed

Camas City Hall and Fire Station 41 plumbing consists of multiple bathrooms and locker/shower rooms, two kitchenettes, a full kitchen/break room, two 50-gallon electric water heaters, multiple trench drains, and exterior hose bibs.

5.1.2 Sanitary Sewer

Based on onsite observations, it appears that the original cast iron plumbing system is still in use. Based on the expected useful life of cast iron plumbing, it would be assumed that the sanitary sewer system will need to be replaced. This observation is in conjunction with information provided by staff that there have been issues with sanitary sewer backups. In addition to the aging piping system, the roots of a mature tree are reported to be breaking and otherwise hindering the sanitary flow.

Reviewing as built drawings, combined with onsite observations, it appears that the sanitary sewer civil connection is in the south corner of the building. From there it splits into two lines, with one routing to the lower basement on the east end of the building serving the lower basement bathroom, building department restrooms, kitchenette, and Fire Station 41 plumbing fixtures. The second line routes to the basement serving the locker rooms, break room and level 1 city hall bathrooms. Both lines are installed below grade up to riser locations throughout the basement and lower basement. Most sanitary sewer piping in the basement and lower basement is routed exposed through the ceiling.

Currently existing trench drain on the northeast side of the building, in front of the building department entrance off NE Franklin, is routed to the sanitary sewer system despite most of what it receives is storm water. This is also true for the trench in front of the parking garage door of NE Everett.

Fire Station 41 was remodeled in 2008 with the sanitary sewer piping being replaced with Acrylonitrile-Butadiene-Styrene (ABS).

5.1.3 Storm Sewer

From onsite observations, it appears that the original cast iron plumbing system is still in use in certain areas. Roof drains were eliminated and all roof drainage is directed to full surround gutters with downspout that daylight to grade. Several downspouts are positioned around the exterior of the building with most on the north side of the building, routing to the civil storm system and the south draining to grade.

5.1.4 Domestic Water

Based on onsite observations, it appears that the original galvanized plumbing system is still in use in most areas. Based on the expected useful life of galvanized plumbing, it would be assumed that the domestic water system will need to be replaced. The water service is located on the northeast side of the building entering from NE 4th Ave. It looks to be a 2-inch water service from the street with a pressure reducing valve in the basement. There does not appear to be any backflow protection installed



for the domestic water or for the fire truck wash down area. It also appears that several of the existing cold-water lines are routed underground in the basement floor.

5.1.5 Domestic Hot Water

Based on the site observations and as built drawings, it appears that two 50-gallon electric resistance heaters are serving the domestic hot water. It is difficult to determine if the two heaters supply a single hot water system or if two systems exist. No recirculation pump is in use for the building. It was noted that it takes a significant amount of time to receive hot water to the building department kitchenette faucet. The water heater, located in the basement women's locker room, is stored in a makeshift closet accessible by opening a hinged wall. The second water heater, located in the lower basement restroom, is exposed and accessible only through the bathroom.

5.1.6 Gas Piping

The gas meter is located on the southeast side of the building and supplies gas to the unit heaters in the fire station garage and hose tower, Fire Station 41 hot water heating, and the City Hall HVAC equipment. It is assumed that the gas meter is original and nearing the end of its service life. No issues were reported with the gas piping system.

5.1.7 Radon

A radon system was recently installed for the building. It appears to be working properly and no further investigation was required.

5.1.8 Fire Station 41 Plumbing

Fire Station 41 was remodeled in 2008 with new plumbing fixtures and heating equipment. At this time, there are no issues to report.

5.1.9 Fire Station 41 – Garage Plumbing

Fire Station 41 garage has a washing machine and a stainless steel freestanding sink. Both are in good condition. Plumbing lines serving this equipment appear to be original waste, vent, and water. Water and waste are routed underground to the basement exercise room according to onsite observations and as built. It appears that the sink is used for condensate drainage from HVAC equipment. The hose tower room has a floor drain connected to the sanitary sewer through the basement exercise room. Four trench drains, serving the garage door entrances, are routed to the city storm system through the northwest edge of the garage. No oil water separator is present for this system.

5.1.10 Building Department Plumbing

The building department plumbing consists of two single user restrooms and a kitchenette with a single bowl stainless steel sink. All fixtures are manual with both water closets utilizing flush valves. No issues were reported with the restrooms with the only request being that automatic fixtures should be considered. It was reported that the kitchen sink hot water takes a significant amount of time to get warm. All fixtures appear to be supplied by the original plumbing lines, except for the kitchenette waste, which connects to original piping in the lower basement ceiling. The existing trench drain installed outside the northeast building department exterior door is original to the building and connects to the



sanitary sewer system. The trench drain catches a portion of the building department parking area and a single roof gutter downspout. A single water cooler is in use in this area.

5.1.11 City Hall Plumbing

The city hall plumbing consists of two restrooms, a drinking fountain, and a kitchenette. All fixtures are manual with no reported issues. There was a request that the fixtures be switched to manual in the restrooms. Kitchenette is a single bowl stainless steel sink with a wall mounted faucet. All piping appears to be original and is routed to the exercise room in the basement ceiling. All water closets and urinals are served with a flush valve. A single level drinking fountain is installed in the city hall entrance near the restrooms. A single water cooler is in use in this area.

5.1.12 Finance Plumbing

No plumbing present in this area.

5.1.13 Parking Garage Plumbing

Parking garage plumbing is a single hose bib and a trench drain in front of the garage door. The hose bib doesn't appear to have freeze protection and is installed just inside the garage door. The trench drain is routed to the sanitary sewer and collects roof storm water from the roof gutter downspout in the area and the sheet flow from the parking garage ramp.

5.1.14 Basement Plumbing Fixtures

In the basement, there are two locker room/restrooms, the building mechanical room, break room, and exercise room. In the exercise room, the building main water supply is exposed on the wall. A pressure-reducing valve and bypass are installed. No deduct meter is noted for the HVAC system. No backflow device is currently serving the building water supply. The mechanical room doesn't currently house any plumbing specific equipment. A sump pump, installed in the corner of the mechanical room, receives drainage from the HVAC equipment located in the alley on the southeast side of the building. The sump pump discharges to the sanitary sewer system located in the ceiling of the lower basement.

The locker room/restrooms appear to be mostly original with the only difference being the added shower area in the women's restroom. In the women's restroom, a single 36-inch by 36-inch fiberglass shower insert is installed along with the original water closets and lavatory sink. All fixtures are manual, with the toilets served by flush valves. The second water heater is installed in a hidden corner of the shower room accessible by a portion of a hinged wall. The men's restroom area has an original concrete shower stall with a 3-inch floor drain. The water closet, urinal, and lavatory are all manual fixtures served by flush valves. All piping is encased in the concrete masonry unit (CMU) walls.

5.1.15 Lower Basement Plumbing

There is an additional restroom in the lower basement not shown on the as builts. A fire sprinkler water service was installed with backflow protection and fire zone control valves, all located on the northeast end of the lower basement. It was noted that buckets of water are hauled out of the lower basement when annual testing is performed on the fire sprinkler system. Most of the sanitary sewer piping serving the north end of the building is routed through the lower basement ceiling.



5.2 Recommendation Summary

5.2.1 Overview

After thoroughly reviewing issues and observations at the City Hall/Fire Station 41, below is a summary of the recommendations. These recommendations are based on the City of Camas' desire to address outstanding plumbing issues and, as much as is reasonable, to bring the building up to current codes in a cost effective manner.

5.2.2 Sanitary Sewer

It appears that the original cast iron plumbing system is still in use. As referenced in the MENG Analysis, the sanitary sewer is in good condition currently but is expected to need to be replaced in five to ten years. This observation is in conjunction with information provided by staff that there have been issues with sanitary sewer backups. In addition to the aging piping system, the roots of a mature tree are reported to be breaking and otherwise hindering the sanitary flow. It is recommended that the waste piping be replaced.

As part of this recommendation, new sanitary waste lines should be routed to the building from the civil main connection. Within the basement and lower basement, a significant portion of the plumbing is below grade, covered by concrete. Therefore, to replace the plumbing, it will require concrete cutting and removal and pour back. In many cases the plumbing walls are concrete filled CMU. It is not recommended to remove and replace the piping that is encased in concrete. The alternate solution that will be pursued is adding plumbing fur walls that will be used for routing the new piping; abandon piping in place, when reasonable. In general, since this will be a complete re-pipe, the pipe routing will be reconsidered for the most cost-effective solution.

The lower basement is currently fed from the civil connection on the south corner of the building. The difference between final grade at the civil connection and the finish floor elevation of the lower basement is roughly 9 feet. This would require at least a 10 foot deep trench from NE Everett Street to catch the single restroom in the lower basement. It would be our recommendation to consider installing a grinder pump to catch the water closet and lavatory in the lower basement and pump it up to the ceiling of the lower basement. By making this change, the trenching depth for the new sanitary line along the southeast side of the building will be greatly reduced. Eliminating the restroom is another possibility to consider.

Routing the second sanitary sewer line to the building will also need to be considered. The original routing is not feasible as it is located directly beneath the exterior concrete stairs on the southwest side of the building. It is recommended that the line be routed below grade through the parking garage floor.

5.2.3 Storm Sewer

Based on the expected useful life of cast iron plumbing, it would be assumed that the storm sewer system will need to be replaced. With the roof drains eliminated, the internal storm piping can be eliminated which leaves the trench drains serving the fire station garage doors. These will need to be routed through an oil water separator and then to the storm system.



All downspouts along 4th Avenue, and the single downspout in front the fire station garage, should be routed to the civil storm system located in the street. This solution will require concrete saw cutting to complete.

All downspouts along NE Everett should be routed to the street to sheet drain to the street storm system. The single downspout on the east corner of the building will need to be routed to NE Franklin and piped out a curb weep hole.

By collecting and directing storm water to the city storm system, this should correct the water intrusion issues noted in the MENG Analysis. It should be noted that these solutions will need further investigation and coordination to ensure these options are feasible. It should be noted that if gravity storm piping will not work, a storm sump pump will be installed, where necessary.

5.2.4 Domestic Water

The domestic water system should be completely replaced with a modern Cross-Linked Polyethylene (PEX) piping system. A new domestic water stub will be brought into the basement from the city main on NE 4th Avenue. This new line should be backflow protected with a double-check valve assembly (DCVA) located at street level in a below grade box. A new pressure reducing valve and water meter should also be installed in the basement exercise room. At street level downstream of the building DCVA, a tee should be provided for the fire station wash down. This 2-inch line should also be protected with an additional DCVA. All new internal water piping will be routed above grade and insulated. All hose bibs interior and exterior will be replaced.

5.2.5 Domestic Hot Water

Currently, the hot water system is supplied with two electric water heaters located on different halves of the building. Both should be relocated to the mechanical room and a hot water recirculation loop added to the system. This will address the issue of hot water not making it to the fixture in a reasonable time. Adding the recirculation system will decrease water usage. All hot water piping will be insulated and installed above grade. An instantaneous gas water heater system is not feasible due to the 2021 WSEC.

5.2.6 Gas Piping

The gas piping system will be re-piped, as needed, for the HVAC equipment. No plumbing fixtures utilize gas on this building.

5.2.7 Radon

The radon system is working properly and no changes are required.

5.2.8 Fire Station 41 Plumbing

Fire Station 41 plumbing was redone in 2008 with new fixtures and piping. This area will not require any work at this time.



5.2.9 Fire Station 41 – Garage Plumbing

In the fire station garage, the stainless-steel freestanding tub and washer machine will require new waste, vent, and water piping. The vent and water lines will route exposed in the Emergency Medical Services (EMS) storage room. Waste will be routed below grade from the basement exercise room. This will require concrete cutting through the EMS storage room floor at the fixtures which provide a washer box and quarter stops.

The drain in the hose tower will also need to be replaced. This will require a waste line to be routed from the basement exercise room. This will require saw cutting across the hose tower and into the channel cut through the EMS storage room.

5.2.10 Building Department Plumbing

The building department fixtures will all be demolished. The toilet bowls and kitchen sink will be saved for reuse. In both restrooms, automatic fixtures should be installed and a flush valve on the water closets. The kitchenette sink faucet should be replaced and a instant hot water system added. There will also be a bottle filler installed in the hallway near the kitchenette.

5.2.11 City Hall Plumbing

Similarly, to the building department, both restroom plumbing fixtures will be removed and the water closet bowls saved for reuse. All fixtures are to be automatic with the water closet served by a flush valve. The drinking fountain, in the lobby area, is located on a CMU wall and will need to be relocated to the men's restroom wall which will allow the new water and waste piping to route to the fixture. It should be replaced with a drinking fountain bottle filler combo. An additional bottle filler will be installed in the open office space of the city hall. The kitchenette sink faucet will be replaced with a deck mount fixture. The existing kitchen sink will be reused.

5.2.12 Finance Plumbing

Currently, no plumbing is present in the finance area. A bottle filler station will be added near the exit door to the city hall lobby area.

5.2.13 Parking Garage Plumbing

The existing trench drain, which is routing to the sanitary sewer, will need to be re-piped to the street through a curb weep hole. The trench drain will need to be replaced along with the grates. In addition, an area drain will be added near the parking garage exterior main door; it will be routed to the sanitary sewer. This will collect any water brought into the garage from vehicles or people.

5.2.14 Basement Plumbing

In the men's locker room, the plumbing fixtures will all be removed and the water closet bowl saved for reuse. The new fixtures will all be automatic and the water closet will be served with a flush valve. A fur wall will be added to the inside of the corridor wall to house the new piping. Drains will be added to the bathroom and shower area. The concrete shower stall will have a fur wall added on the valve side and the shower will be waterproofed and tiled.



The women's locker room will receive the same fixtures as the men's. A fur wall will be added to the break room side of the bathroom wall; this will house the new plumbing piping. In the shower room, the existing fiberglass shower and water heater will be removed. The new fiberglass will be the same size as the existing but the water heater enclosure should be removed to free up space in the room.

The lunchroom sink will be demolished, along with the casework and countertop. New casework should be modern and leave an Americans with Disabilities Act (ADA) opening under the kitchen sink. Install a new stainless-steel sink, faucet, and instant hot system.

5.2.15 Lower Basement Plumbing

Lower basement water closet and lavatory should be replaced with new manual fixtures. Water closet should be served with a flush valve. A grinder pump should be added to serve both fixtures and to discharge to the sanitary sewer in the ceiling of the lower basement. The water heater will be relocated to the mechanical room. The water closet should be shifted towards the wall. A sump pump system should be installed on the north end of the lower basement to catch all water from the annual fire sprinkler system testing. The pump should discharge to the waste system in the ceiling of the lower basement.

6.0 ARCHITECTURAL AND STRUCTURAL

The following is a summary of architectural and structural design scope associated with the mechanical, electrical, and plumbing system upgrades.

The construction cost related to this design scope is currently being covered as "contingency" in section 7.4, Total Project Cost Estimate.

6.1 Architectural

- New furring walls in the lower-level restrooms to accommodate new piping and plumbing fixtures.
- ADA clearance verification and restroom partition design and specification in lower-level restrooms.
- Wall repair, paint matching, and replacement drop ceiling specifications.

6.2 Structural

- Structural design and detailing to accommodate roof mounted mechanical equipment.
- Structural footing analysis and design associated with new underground piping and trenching.



7.0 PROJECT COST ESTIMATE

The following project cost estimates are provided for general budgeting purposes. These estimates are based on previous project experience and current equipment vendor-provided equipment costs. Due to unforeseen market conditions during the time of project bidding, Windsor cannot guarantee the accuracy of the following estimate.

7.1 Mechanical

7.1.1 Equipment

- Boiler – \$110,000
- Cooling Tower – \$185,000
- Pumps, Variable Speed – \$45,000
- Water-Source Heat Pumps – \$210,000
- Hydronic Piping – \$135,000
- Energy Recovery Ventilators (ERVS) – \$195,000
- Ductwork & Terminals- \$145,000

7.1.2 Labor

- Boiler – \$35,000
- Cooling Tower – \$23,000
- Pumps, Variable Speed – \$9,000
- Water-Source Heat Pumps – \$60,000
- Hydronic Piping – \$85,000
- Energy Recovery Ventilators (ERVS) – \$60,000
- Ductwork & Terminals- \$80,000

7.1.3 Controls

BAS Hardware, Installation and Setup - \$85,000

7.1.4 Other Associated Costs

Demolition - \$123,000

Test and Balance – \$24,000

Commissioning: - \$35,000



7.1.5 Total

Mechanical: \$1,644,000

7.2 Electrical

7.2.1 Materials

Light Fixtures: \$40,000

Lighting Controls: \$80,000

Panelboards: \$20,000

Distribution Boards: \$30,000

ATS: \$30,000

7.2.2 Labor

Labor: \$280,000

7.2.3 Total

Electrical: \$480,000

7.3 Plumbing Cost Estimate

7.3.1 Sanitary Sewer

Labor: \$73,000

Material: \$73,000

7.3.2 Storm Sewer

Labor: \$36,000

Material: \$36,000

7.3.3 Domestic Water

Labor: \$100,000

Material: \$100,000

7.3.4 Domestic Hot Water

Labor: \$100,000

Material: \$100,000



7.3.5 Gas Piping

Labor: \$15,000

Material: \$15,000

7.3.6 Radon

No Scope.

7.3.7 Fire Station 41 Plumbing

No Scope.

7.3.8 Fire Station 41 – Garage Plumbing

Labor: \$22,000 100% of Material

Material: \$6,000

Oil Water Separator: \$5,000

Trench Drain: \$11,500

7.3.9 Building Department Plumbing

Labor: \$8,700

Material: \$2,900

Plumbing Fixtures: \$5,300

7.3.10 City Hall Plumbing

Labor: \$14,618

Material: \$4,300

Plumbing Fixtures: \$15,000

7.3.11 Finance Plumbing

Labor: \$4,500 100% of Material

Material: \$700

Bottle Filler: \$3,600

7.3.12 Parking Garage Plumbing

Labor: \$21,928 100% of Material

Material: \$5,847

Trench Drain: \$2,924



Area Drain: \$750

7.3.13 Basement Plumbing

Labor: \$51,000

Material: \$3,000

Plumbing Fixtures: \$11,500

Drains: \$750

Shower Remodel: \$7,000

Breakroom Remodel: \$17,500

Fur Walls: \$7,300

7.3.14 Lower Basement Plumbing

Labor: \$14,618

Material: \$4,386

Plumbing Fixtures: 1,900

Grinder Pump: 3,000

Sump Pump: \$3,000

7.3.15 Total

Plumbing: \$920,000

7.4 Total Project Estimate

Subtotal: \$3,050,000

Pre-Design Contingency (15%): \$450,000

Total Project Estimate: \$3,500,000



**WINDSOR
ENGINEERS**

Ridgefield, WA
Duluth + Minneapolis, MN
WindsorEngineers.com
Project No: 23196

CAMAS FACILITIES CITY HALL
CAMAS, WA

Revisions:

Project No:

PROJECT MANAGER: _____
DRAWN BY: E.DRAW
CHECKED BY: _____

Issue Date:
2/26/2024

ELECTRICAL
LOWER LEVEL PLAN

E202



1 LOWER LEVEL PLAN - POWER
1/8" = 1'-0"



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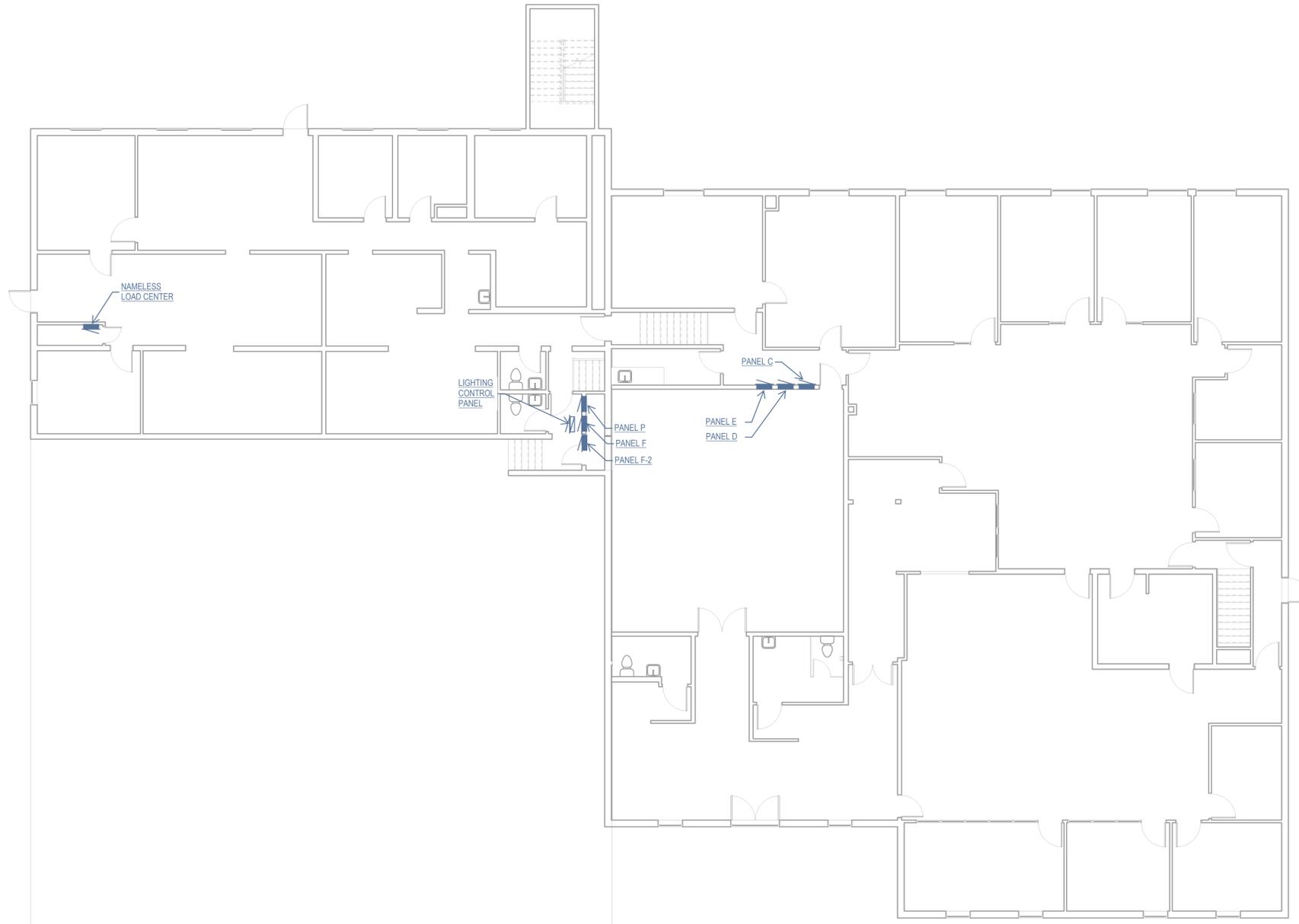
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ELECTRICAL
LEVEL 1 PLAN

E201



1 LEVEL 1 PLAN - POWER
1/8" = 1'-0"



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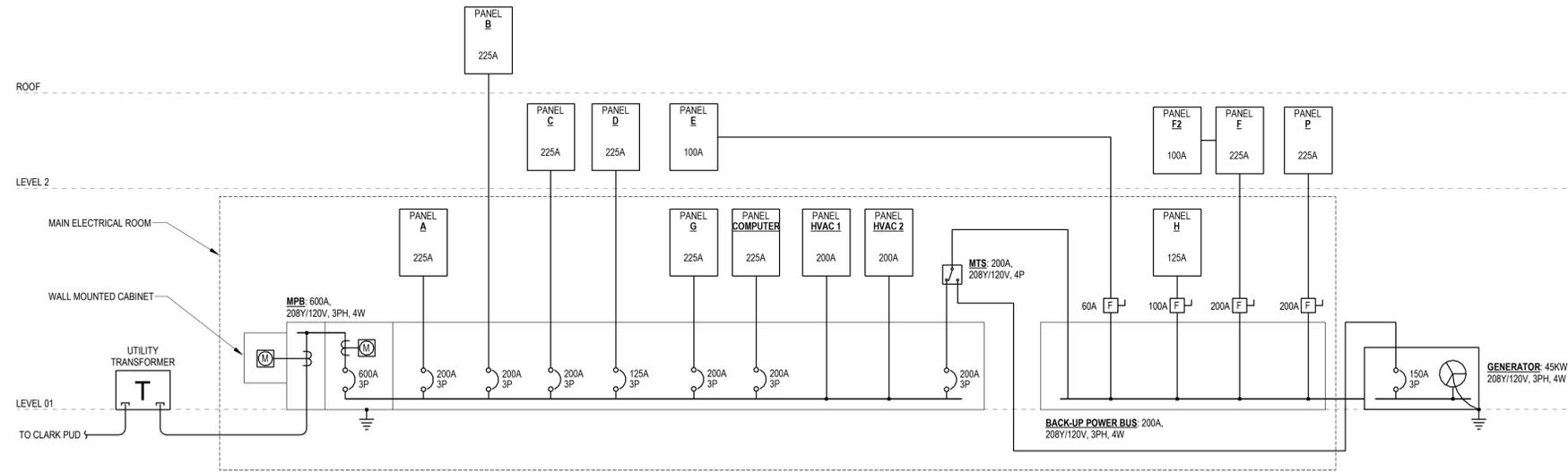
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ELECTRICAL
ONE-LINE DIAGRAM

E100



① ONE-LINE DIAGRAM - ELECTRICAL (EXISTING)
1/2" = 1'-0"



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3/22/2024

MECHANICAL
FIRE STATION DORMS
& GARAGE PLAN

M100

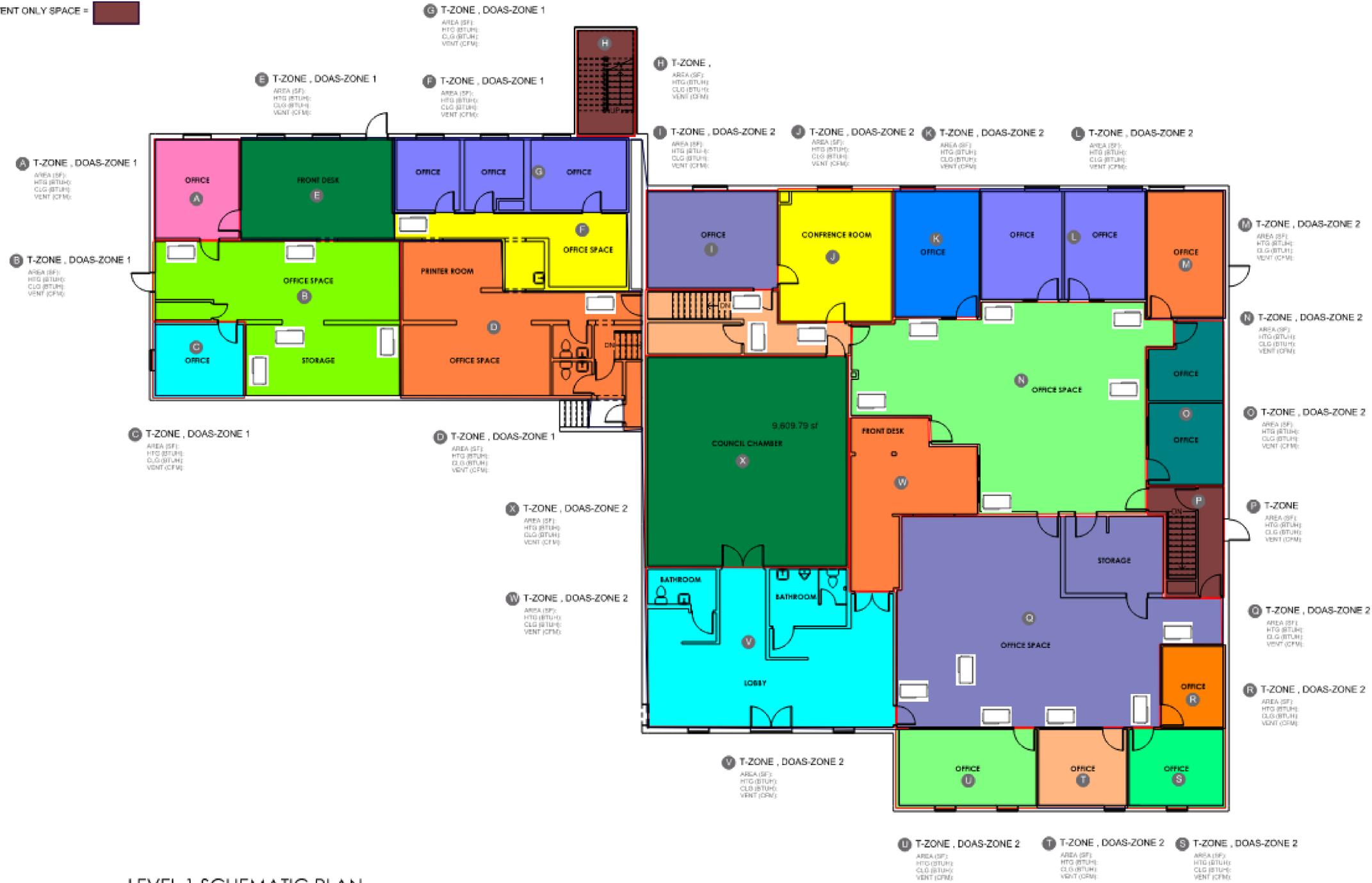
HEATING AND VENT ONLY SPACE = 



① FIRE STATION DORMS & GARAGE
1/8" = 1'-0"



HEATING AND VENT ONLY SPACE =



① LEVEL 1 SCHEMATIC PLAN
1/8" = 1'-0"

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MECHANICAL
LEVEL 1 PLAN

M101



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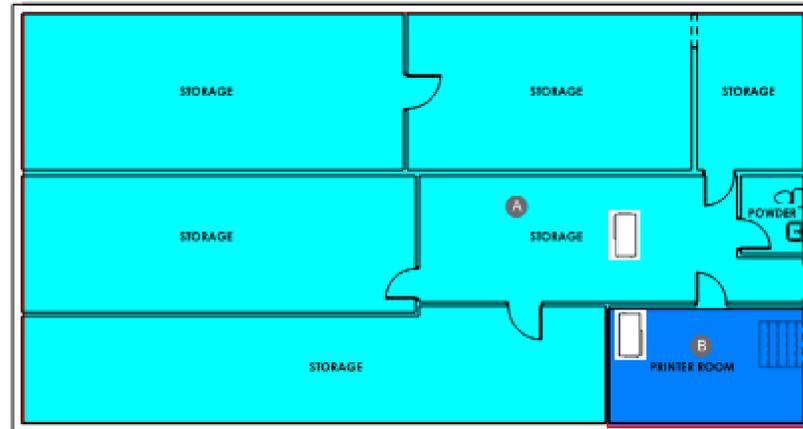
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MECHANICAL
 LOWER LEVEL PLAN

HEATING AND VENT ONLY SPACE =

A T-ZONE , DOAS-ZONE 1
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):



I T-ZONE , DOAS-ZONE 2
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):

J T-ZONE , DOAS-ZONE 2
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):

E T-ZONE , DOAS-ZONE 1
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):

C T-ZONE , DOAS-ZONE 2
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):

D T-ZONE , DOAS-ZONE 2
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):

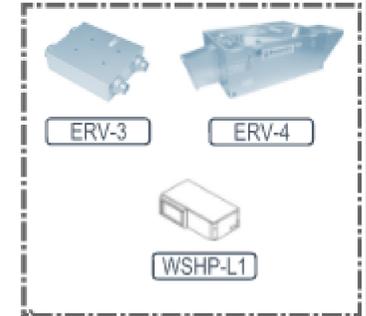
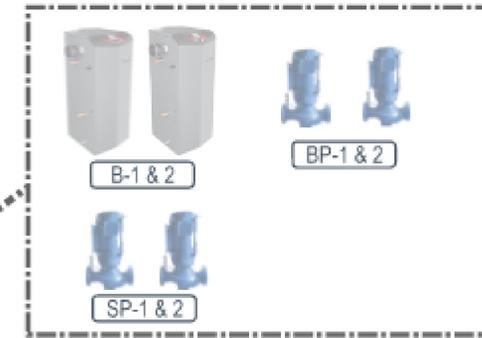
K T-ZONE , ERV 3 & 4
 AREA (SF):
 HTG (BTUH):
 VENT (CFM):
 LONGT (CFM):

H T-ZONE , DOAS-ZONE 1
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):

E T-ZONE , DOAS-ZONE 2
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):

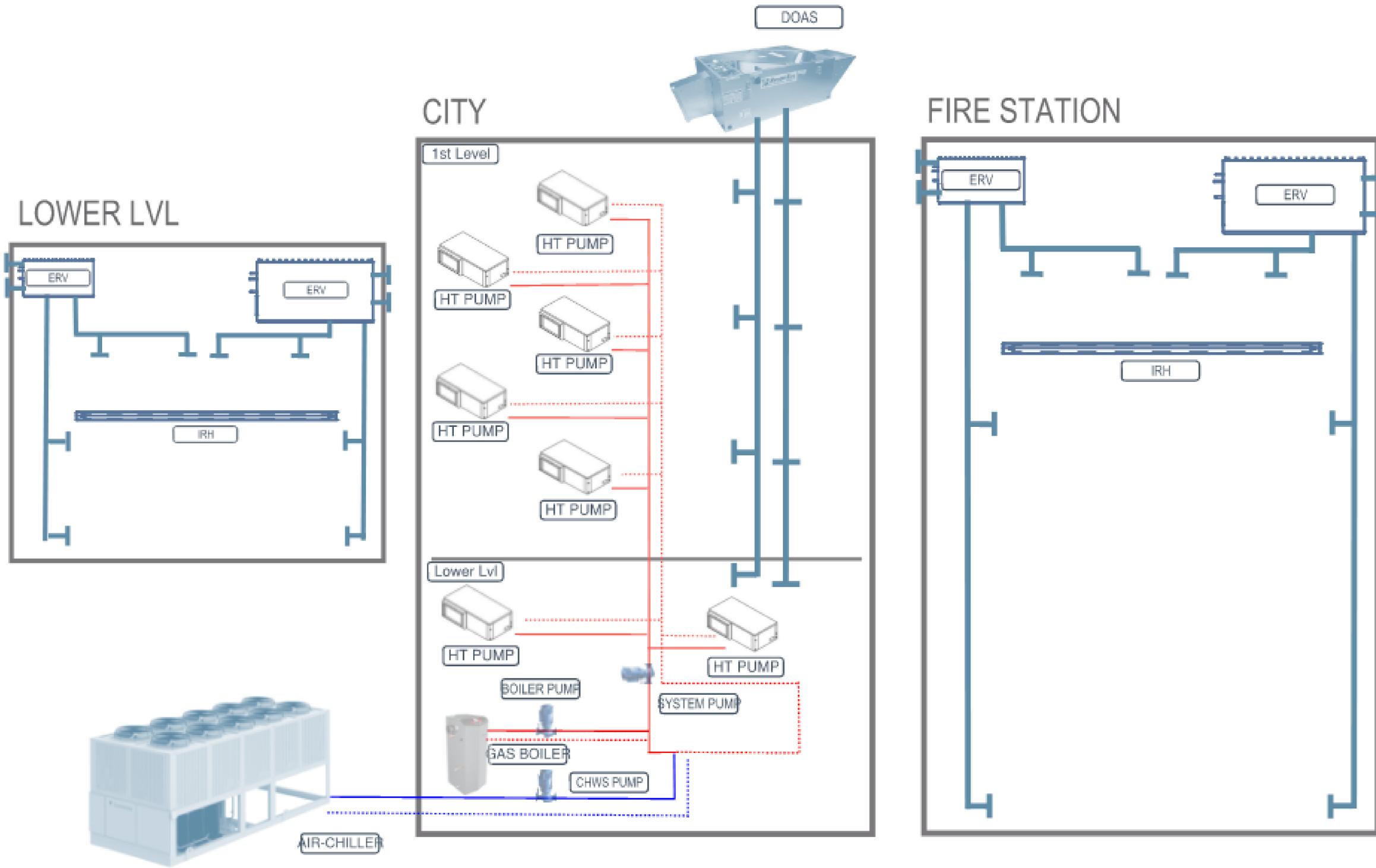
F T-ZONE , DOAS-ZONE 2
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):

G T-ZONE , DOAS-ZONE 2
 AREA (SF):
 HTG (BTUH):
 CLG (BTUH):
 VENT (CFM):



1 LOWER LEVEL SCHEMATIC PLAN
 1/8" = 1'-0"

HVAC SYSTEM SCHEMATIC



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MECHANICAL
 DIAGRAMS

M601

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ABBREVIATIONS			
Ø	ROUND	HWP	HEATING WATER PUMP
AC	AIR CONDITIONING UNIT	HX	HEAT EXCHANGER
ACC	AIR COOLING CONDENSER	HYD	HYDRANT
ACCU	AIR COOLING CONDENSING UNIT	ID	INDIRECT
AD	AREA DRAIN	IN	INCH
ADD	ADDENDUM	INW	INVERT
AFF	ABOVE FINISHED FLOOR	LB	POUND
AHU	AIR HANDLING UNIT	LP	LOW PRESSURE
ALT	ALTERNATE	LPG	LIQUEFIED PETROLEUM GAS
AP	ACCESS PANEL	LVR	LOUVER
ARCH	ARCHITECT/ARCHITECTURAL	MAX	MAXIMUM
AS	AIR SEPARATOR	MBH	ONE THOUSAND BTU PER HOUR
B	BOILER	MCF	ONE THOUSAND CUBIC FEET
BFF	BELOW FINISHED FLOOR	MECH	MECHANICAL
BTU	BRITISH THERMAL UNITS	MFR	MANUFACTURER
BTUH	BRITISH THERMAL UNITS PER HOUR	MIN	MINIMUM
CAP	CAPACITY	MISC	MISCELLANEOUS
CB	CATCH BASIN	MUA	MAKE-UP/AIR
CFM	CUBIC FEET PER MINUTE	NIC	NOT IN CONTRACT
CH	CHILLER	NO	NUMBER
CO	CLEAN OUT	NTS	NOT TO SCALE
CT	COOLING TOWER	O	OXYGEN
CUH	CABINET UNIT HEATER	ORD	OVERFLOW ROOF DRAIN
CW	COLD WATER	PD	PRESSURE DROP
CWP	CONDENSER WATER PUMP	PIV	POST INDICATOR VALVE
CHWP	CHILLED WATER PUMP	PRESS	PRESSURE
D	DEGREE	PRV	PRESSURE REDUCING VALVE
DB	DRY BULB	PSI	POUNDS PER SQUARE INCH
DBP	DOMESTIC WATER BOOSTER PUMP	PSIG	POUNDS PER SQUARE INCH GAUGE
DCP	DOMESTIC WATER CIRCULATING PUMP	PWR	POWER
DIA	DIAMETER	(R)	RELOCATE
DN	DOWN	RD	ROOF DRAIN
DW	DISTILLED WATER	REC	RECESSED
(E)	EXISTING	RED	REDUCER
ELEC	ELECTRICAL	RH	RELATIVE HUMIDITY
EQUIP	EQUIPMENT	RUA	RELIEF AIR
ET	EXPANSION TANK	RM	ROOM
EWC	ELECTRIC WATER COOLER	RPM	REVOLUTIONS PER MINUTE
EWV	ELECTRIC WATER HEATER	RTU	ROOF TOP UNIT
°F	DEGREES FAHRENHEIT	RW	RAIN WATER
FCO	FLOOR CLEAN OUT	SF	SQUARE FOOT
FCU	FAN COIL UNIT	SAN	SANITARY
FD	FLOOR DRAIN	SEP	SEWAGE EJECTOR PUMP
FDV	FIRE DEPARTMENT VALVE	SF	SQUARE FOOT
FL	FLOOR	SP	STANDPIPE
FO	FUEL OIL	SP	STATIC PRESSURE
FOV	FUEL OIL VENT	SP	SUMP PUMP
FOR	FUEL OIL RETURN	STM	STEAM
FOS	FUEL OIL SUPPLY	T	THERMOSTAT
FP	FIRE PUMP	TD	TEMPERATURE DROP
FFM	FEET PER MINUTE	TDR	TRENCH DRAIN
FS	FLOOR SINK	TEMP	TEMPERATURE
FT	FOOT/FEET	TYP	TYPICAL
FU	FIXTURE UNITS	UG	UNDERGROUND
FV	FLUSH VALVE	VAC	VACUUM
GAL	GALLON	V	VENT
GC	GENERAL CONTRACTOR	VENT	VENTILATION
GI	GREASE INTERCEPTOR	VTR	VENT THROUGH ROOF
GPM	GALLONS PER MINUTE	W	WASTE
GW	GREASE WASTE	WCO	WALL CLEAN OUT
HB	HOSE BIB	WH	WALL HYDRANT
HP	HORSE POWER	WH	WATER HEATER
HRRU	HEAT RECOVERY UNIT	(X)	DEMOLITION
HW	HOT WATER		

PLUMBING GENERAL NOTES	
1.	THE CONTRACTOR SHALL PROVIDE COMPLETE PLUMBING SYSTEMS AS DETAILED IN THESE DRAWINGS. WORK CONSISTS OF FURNISHING ALL MATERIALS, EQUIPMENT, AND SERVICES REQUIRED FOR COMPLETE SYSTEMS. INCLUDE ANY INCIDENTAL APPARATUS, APPLIANCES, MATERIAL LABOR AND SERVICES NECESSARY TO MAKE NEW WORK COMPLETE IN ALL RESPECTS AND FULLY READY FOR OPERATION.
2.	UPON COMPLETION OF THE WORK UNDER THIS CONTRACT, THE CONTRACTOR SHALL SUBMIT TO OWNER A COMPLETE O&M MANUAL, LISTING ALL EQUIPMENT AND FIXTURES INSTALLED.
3.	FINAL PRODUCT SHALL CONFORM TO ALL REQUIREMENTS OF APPLICABLE FEDERAL, STATE, AND LOCAL CODES, INCLUDING BUT NOT LIMITED TO THE UNIFORM PLUMBING CODE AND/OR INTERNATIONAL PLUMBING CODE WITH PRIOR AHJ APPROVAL.
4.	ALL MATERIALS INSTALLED MUST HAVE PROPER LISTING REQUIRED BY APPLICABLE CODES INCLUDING BUT NOT LIMITED TO UPC/APMO, NSF UNLESS RECEIVING PRIOR APPROVAL IN WRITING FROM AUTHORITY HAVING JURISDICTION (AHJ).
5.	IT IS THE CONTRACTOR'S RESPONSIBILITY TO FOLLOW MANUFACTURER RECOMMENDED INSTALLATION INSTRUCTIONS AND START-UP PROCEDURES ON ANY EQUIPMENT SPECIFIED SUCH AS BOILERS, PUMPS AND FIXTURES. ANY DAMAGE TO EQUIPMENT OR PREMISES, PERSONAL INJURY OR EQUIPMENT FAILURE DUE TO NOT FOLLOWING MANUFACTURER INSTRUCTIONS IS THE INSTALLER'S RESPONSIBILITY.
6.	UPON COMPLETION OF THE WORK UNDER THIS CONTRACT, THE CONTRACTOR SHALL REMOVE ALL TOOLS, APPLIANCES, SURPLUS MATERIALS, AND SCRAP. ALL IDENTIFIED EXISTING EQUIPMENT TO BE REMOVED SHALL BE TURNED OVER TO THE OWNER.
7.	THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND EQUIPMENT. FINAL LOCATIONS OF EQUIPMENT SHALL BE FIELD DETERMINED. ALL DISCREPANCIES IN THE DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT IN WRITING BEFORE SUBMISSION.
8.	EQUIPMENT FOR OTHER DISCIPLINES MAY BE SHOWN FOR REFERENCE ONLY. REFER TO OTHER DISCIPLINES DRAWINGS FOR MORE DETAIL REGARDING EQUIPMENT SPECIFICATIONS AND INFORMATION.
9.	PLANS SHALL GOVERN IN MATTERS OF QUANTITY; SPECIFICATIONS SHALL GOVERN IN MATTERS OF QUALITY. IN CASE OF DISCREPANCY BETWEEN DRAWINGS AND SPECIFICATIONS, THE SPECIFICATIONS SHALL GOVERN. PLANS ARE TO BE TIED TO SPECIFICATIONS FOR A COMPLETE DESIGN PACKAGE.
10.	ANYTHING MENTIONED IN THE SPECIFICATIONS AND NOT SHOWN ON THE DRAWINGS, OR SHOWN ON THE DRAWINGS AND NOT MENTIONED IN THE SPECIFICATIONS, SHALL BE OF LIKE EFFECT AS IF SHOWN OR MENTIONED IN BOTH.
11.	THE CONTRACTOR SHALL BE FAMILIAR WITH ALL CONDITIONS, BOTH EXISTING AND THOSE ILLUSTRATED BY THESE DOCUMENTS, AS WELL AS THOSE THAT CAN BE REASONABLY ANTICIPATED INCLUDING, BUT NOT LIMITED TO ARCHITECTURAL, ELECTRICAL, VENTILATION, PLUMBING, AND OTHER SYSTEMS INVOLVED IN THIS PROJECT.
12.	THE CONTRACTOR SHALL COORDINATE WORK WITH OTHER TRADES TO ENSURE ANY CONFLICT IN LAYOUT, NEEDED SPACE, SHARED EQUIPMENT REQUIREMENTS ETC. IS ADDRESSED BEFORE INSTALLATION, SO ADJUSTMENTS CAN BE MADE, IF NECESSARY.
13.	LOCATION AND INVERTS OF SITE UTILITIES SHALL BE FIELD VERIFIED BEFORE INSTALLATION. ROUTE DOMESTIC WATER, SANITARY SEWER, AND STORM SEWER SERVICES TO SITE UTILITIES 5'-0" FROM BUILDING UNLESS NOTED OTHERWISE. REFER TO CIVIL PLANS FOR CONTINUATION. FIRE PROTECTION DESIGN IS BY OTHERS.
14.	REFER TO ARCHITECTURAL PLANS FOR THE EXACT LOCATION OF PLUMBING FIXTURES AND FLOOR DRAINS.
15.	LOCATE PIPING AND EQUIPMENT AWAY FROM THE SPACE ABOVE ELECTRICAL PANELS, TRANSFORMERS AND OTHER ELECTRICAL EQUIPMENT.
16.	INSTALL EXPOSED PIPING AS HIGH AS PRACTICAL IN ROOMS WITHOUT CEILINGS.
17.	WHERE VALVES OCCUR ABOVE DRYWALL OR PLASTER OR ARE CONCEALED BEHIND WALLS, THE CONTRACTOR SHALL FURNISH AND INSTALL ACCESS PANELS. COORDINATE LOCATION, SIZE, COLOR AND STYLE WITH ENGINEER/ARCHITECT.
18.	PROVIDE FIREPROOFING FOR ALL PENETRATIONS OF FIRE-RATED ASSEMBLIES. FIREPROOFING MUST BE EQUIVALENT OR HIGHER TO THAT OF THE PENETRATED ASSEMBLY. REFER TO ARCHITECTURAL PLANS FOR LOCATION OF FIRE-RATED ASSEMBLIES.
19.	COORDINATE UNDERGROUND PIPE ROUTING WITH CIVIL AND STRUCTURAL PLANS.
20.	CONSULT STRUCTURAL ENGINEER OF RECORD FOR ALL STRUCTURAL PENETRATIONS.
21.	COORDINATE LOCATION OF PLUMBING VENTS WITH MECHANICAL INTAKES AND ARCHITECTURAL PLANS. NO VENT THROUGH ROOF SHALL TERMINATE CLOSER THAN 10 FT TO ANY OUTSIDE AIR INTAKE OR VENTILATION LOUVERS, DOORS, WINDOWS, AND OTHER BUILDING OPENINGS. GROUP PLUMBING VENTS TOGETHER WHERE PRACTICAL.
22.	WHERE FLOOR DRAINS OCCUR WITHIN THE LIMITS OF CONSTRUCTION, PREVENT CONSTRUCTION DEBRIS FROM ENTERING THE DRAIN BODY BY SEALING THE DRAIN OPENING BEFORE START OF WORK. UNSEAL DRAINS AT COMPLETION OF CONSTRUCTION.
23.	FLOOR DRAINS SHALL BE PROVIDED WITH TRAP PRIMERS WHERE REQUIRED BY CODE.
24.	PIPE SIZES SHOWN SHALL BE CONTINUED IN THE DIRECTION OF FLOW UNTIL ANOTHER SIZE IS SHOWN.
25.	SANITARY WASTE PIPING SHALL BE SLOPED UNIFORMLY NOT LESS THAN 1/4 INCH PER FOOT. WHERE NOTED AND DEEMED NECESSARY AND APPROVED BY AHJ AND ENGINEER OF RECORD, WASTE PIPING 4" AND LARGER, MAY BE SLOPED NOT LESS THAN 1/8 INCH PER FOOT.
26.	ALL SANITARY AND WATER PIPING UNDERGROUND SHALL BE A MINIMUM OF 12" BELOW GRADE OR FINISHED FLOOR UNLESS NOTED OTHERWISE.
27.	WASTE AND VENT PIPING BELOW THE FLOOR AND THROUGH THE FLOOR SHALL BE 2" MINIMUM.
28.	CLEANOUTS SHALL BE PROVIDED AS SHOWN AND WHERE REQUIRED BY CODE. INSTALL CLEANOUT IN ACCESSIBLE LOCATION AT THE BASE OF ALL WASTE PLUMBING RISERS BEFORE THE ENTRANCE TO BELOW GRADE. PROVIDE ALL SINKS AND LAVATORIES WITH SLIP JOINT TRAP FITTINGS FOR CLEANOUT.
29.	PROVIDE LOW POINT DRAINS IN MAIN CW AND HW LINES WHEN SHUT OFF, MAY BE DRAINED TO ELIMINATE THE RISK OF FLOODING IN THE EVENT OF FUTURE UPGRADE OR REPAIR.
30.	PROVIDE SHUTOFF VALVES ON ALL EXTERIOR HOSE BIBS.
31.	BALL VALVES SHALL BE INSTALLED SO THAT WHEN OPEN, THE HANDLE POINTS IN DIRECTION OF FLOW.
32.	ALL HOT WATER PIPING SHALL BE INSULATED PER THE GOVERNING ENERGY CODE.
33.	INSULATION AND/OR HEAT TRACE SHALL BE PROVIDED WHERE REQUIRED FOR FREEZE PROTECTION.
34.	PROVIDE DIELECTRIC UNIONS AT ALL CONNECTIONS BETWEEN ELECTROLYSIS-PRODUCING DISSIMILAR PIPING METALS.
35.	PROVIDE HAMMER ARRESTORS AT ALL FAST-CLOSING VALVES.
36.	PROVIDE DISINFECTION OF POTABLE WATER PIPING SYSTEMS PER CODE REQUIREMENTS.
* NOTE - ALL OF THE GENERAL NOTES ON THIS SHEET ARE TO BE APPLIED TO ALL OTHER DRAWINGS IN THIS SET. THE SYMBOLS AND ABBREVIATIONS SHOWN ON THIS SHEET MAY OR MAY NOT BE USED IN THIS SET OF DRAWINGS.	

PIPING SYSTEMS	
	PIPE SIZE TAG (DIAMETER)
	ABOVE GROUND PIPING
	BELOW GROUND PIPING
	EXISTING PIPE TAG
	PIPING BEING DEMOLISHED
	CONDENSATE DRAINAGE
	NATURAL GAS
	NATURAL GAS (MEDIUM PRESSURE)
	NATURAL GAS VENT
	PROPANE GAS
	PROPANE GAS VENT
	COMPRESSED AIR
	DOMESTIC COLD WATER
	FILTERED COLD WATER
	REVERSE OSMOSIS WATER
	HOT WATER
	HOT WATER 140°
	HOT WATER RECIRCULATION
	HOT WATER RECIRCULATION 140°
	GREASE VENT
	GREASE WASTE
	INDIRECT WASTE
	OIL WASTE
	OIL WASTE VENT
	PUMP DISCHARGE
	SANITARY VENT
	SANITARY SEWER (WASTE)
	SOLAR HOT WATER RETURN
	SOLAR HOT WATER RETURN
	STORM DRAINAGE
	OVERFLOW STORM DRAINAGE

MISC. FITTINGS & SYMBOLS	
	PIPE CONTINUATION
	RISER
	ELBOW UP TO LEVEL ABOVE
	ELBOW UP
	ELBOW DOWN TO LEVEL BELOW
	ELBOW DOWN
	DROP TO LOWER ELEVATION
	TEE DOWN
	DIRECTION OF FLOW
	DIRECTION OF SLOPE
	PIPE SLEEVE
	HEAT TRACE
	PIPE REDUCER
	90 DEGREE ELBOW
	45 DEGREE ELBOW
	CAP
	JOINT OR COUPLING POINT

PLUMBING FIXTURES	
	HOSE BIBB
	WALL HYDRANT
	FLOOR DRAIN
	AREA DRAIN
	PARKING DECK DRAIN
	HUB DRAIN (FUNNEL TYPE)
	FLOOR CLEANOUT
	CLEANOUT TO GRADE
	VENT THROUGH ROOF
	ROOF DRAIN
	OVERFLOW DRAIN
	COMBINATION DRAIN
	TRENCH DRAIN
	WALL CLEANOUT
	DOWNSPOUT NOZZLE
	OUTLET BOX
	CONDENSATE BOX

PLUMBING VALVES	
	SWING CHECK
	CHECK VALVE
	ALTERNATE CHECK VALVE
	BALANCING VALVE
	CIRCUIT SETTER
	GATE VALVE
	QUICK OPENING VALVE
	BALL VALVE
	FLUID STRAINER
	EMERGENCY GAS SHUTOFF
	PLUG VALVE
	GAS SHUTOFF COCK
	GAS PRESSURE REGULATOR
	THERMOSTATIC VALVE
	TRAP PRIMER
	ELECTRIC TRAP PRIMER
	ELEC. CONTROL VALVE
	MIXING VALVE
	SOLENOID VALVE
	PRESSURE REDUCING VALVE
	WATER METER
	GAS METER
	IRRIGATION METER
	DOUBLE CHECK VALVE
	REDUCED PRESSURE ZONE

SYMBOLS	
	KEYNOTE
	REVISION TAG
	REVISION CLOUD
	NORTH ARROW
	MATCHLINE
	POINT OF CONNECTION
	POINT OF DEMOLITION
	ITEM TO BE DEMOLISHED
	AREA NOT IN CONTRACT

PLUMBING TAGS	
EQUIPMENT	
	UNIT NUMBER
	FLOOR UNIT IS LOCATED ON
	EQUIPMENT TYPE
FIXTURE	
	FIXTURE TYPE/NUMBER
	FIXTURE UNITS
	FIXTURE TYPE
RISER	
	SYSTEM TYPE
	RISER NUMBER
DETAIL CALLOUT	
	VIEW NUMBER OR DETAIL NUMBER
	SHEET NUMBER
EQUIPMENT BY OTHERS	
	TAG NUMBER

PLUMBING SHEET INDEX	
P001	COVER SHEET
P200	FIRE STATION DORMS & GARAGE PLAN
P201	LEVEL 1 PLAN
P202	LOWER LEVEL PLAN



**WINDSOR
ENGINEERS**

Ridgefield, WA
Duluth + Minneapolis, MN
WindsorEngineers.com
Project No: 23196

CAMAS FACILITIES CITY HALL
CAMAS, WA

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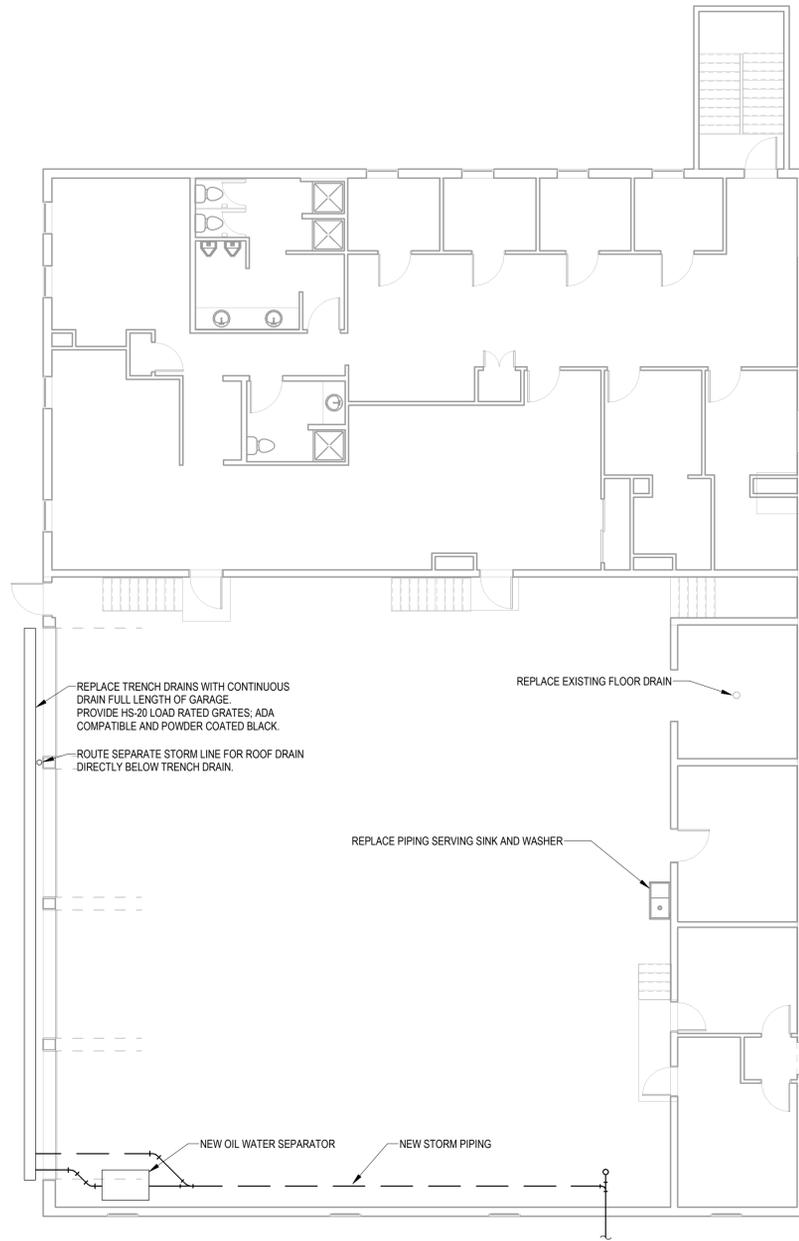
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PLUMBING
FIRE STATION DORMS
& GARAGE PLAN

P200



1 FIRE STATION DORMS & GARAGE PLAN - PLUMBING
1/8" = 1'-0"



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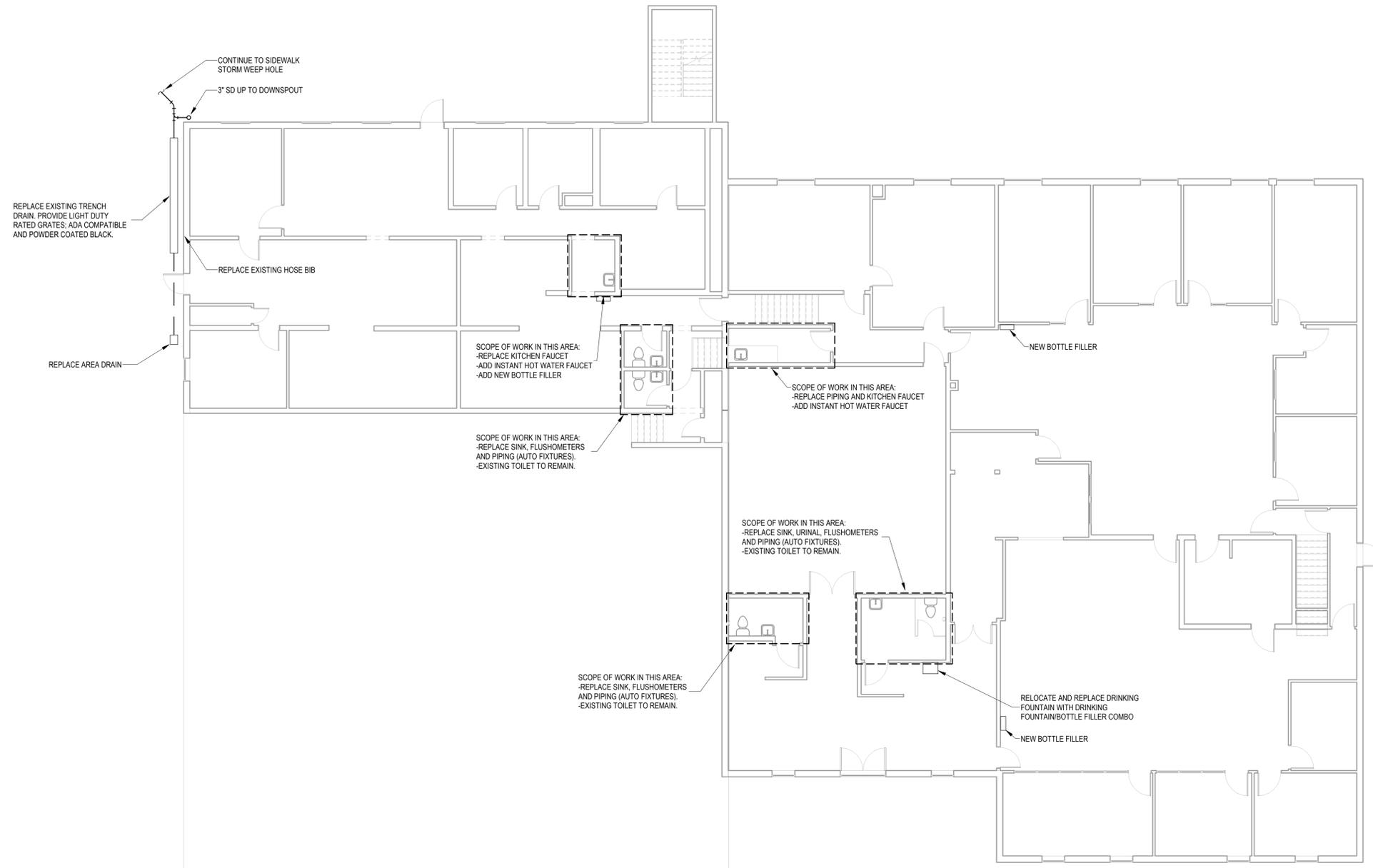
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PLUMBING
LEVEL 1 PLAN

P201



1 LEVEL 1 PLAN - PLUMBING
1/8" = 1'-0"

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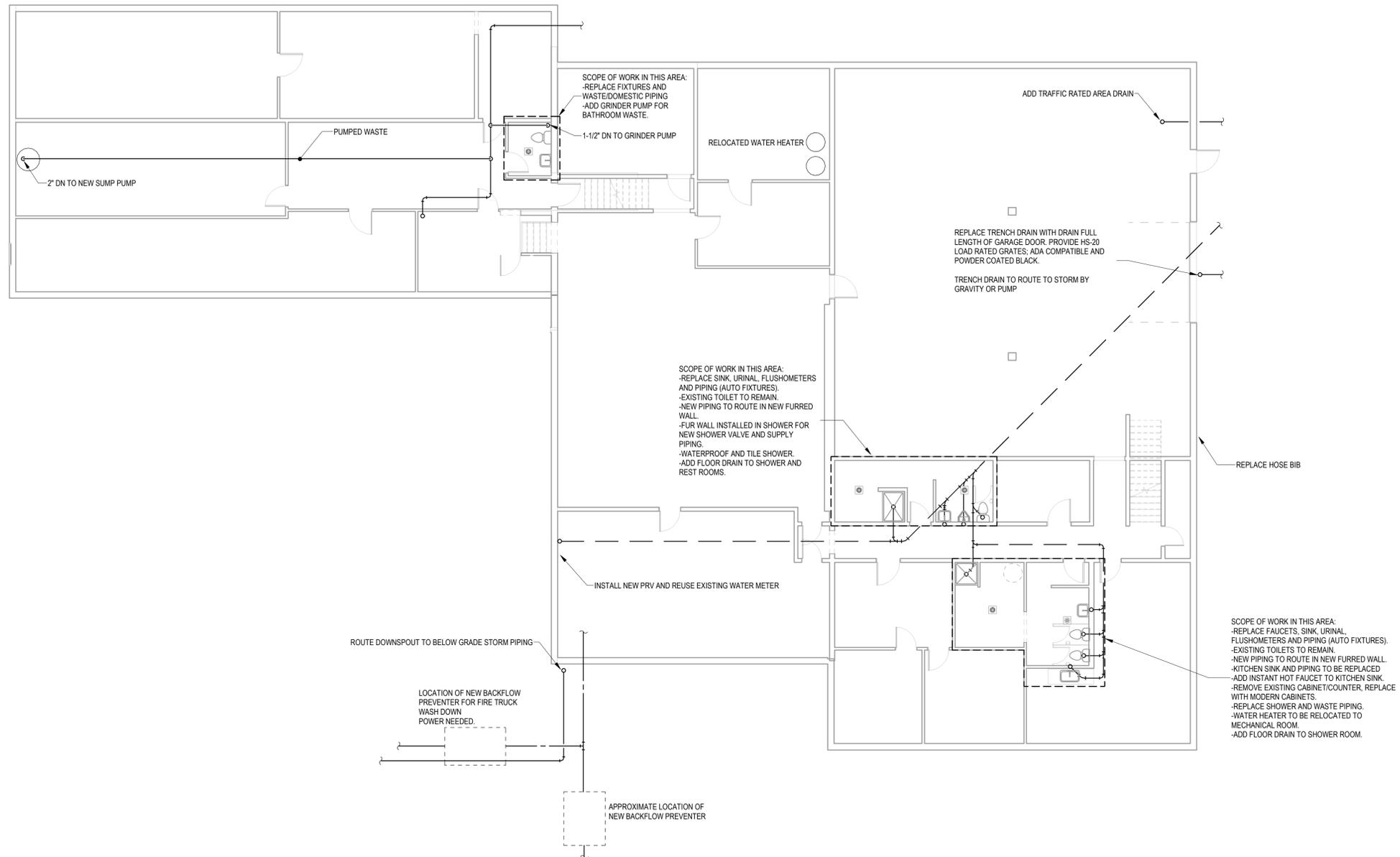
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PLUMBING
LOWER LEVEL PLAN



1 LOWER LEVEL PLAN - PLUMBING
1/8" = 1'-0"