



## Kaiser PLP Mechanical Improvements

Construction Documents Narrative

June 23, 2023

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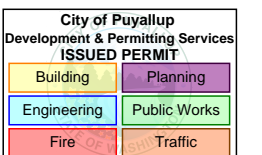




Table of Contents

1.0 Project Description ..... 1  
 1.1 Codes and Standards..... 1  
 2.0 Building Analysis..... 1  
 2.1 Cooling Historical Loads ..... 1  
 2.2 Utility Data..... 2  
 2.3 Clockworks..... 2  
 2.4 EUI ..... 2  
 3.0 Mechanical ..... 3  
 3.1 Re-Zoning: Meds Rooms ..... 3  
 3.2 Re-Zone: Pharmacy ..... 5  
 3.3 Re-Zoning: 24/7/365 Loads ..... 6  
 4.0 Electrical..... 7  
 4.1 Power..... 7  
 5.0 Acceptance Criteria ..... 8  
 5.1 Thermal Zones ..... 8  
 5.2 Trending ..... 8

Figures

Figure 1: Peak Cooling Loads..... 1  
 Figure 2: Internal and Envelope Loads..... 2  
 Figure 3: Electric Utility Usage ..... 2  
 Figure 4: Natural Gas Utility Usage..... 2  
 Figure 5: Level 2 Meds Rooms ..... 3  
 Figure 6: BMS Level 2 North Zone Map ..... 3  
 Figure 7: BMS Level 2 South Zone Map..... 3  
 Figure 8: Level 2 Piping As-Builts ..... 4  
 Figure 9: Level 2 Sheet Metal As-Builts..... 4  
 Figure 10: Level 1 Floor Plan ..... 5  
 Figure 11: Pharmacy Sheet Metal As-Builts ..... 5  
 Figure 12: Pharmacy Piping As-Builts ..... 5  
 Figure 13: Level 1 Floor Plan ..... 6  
 Figure 14: Level 1 Scope ..... 6

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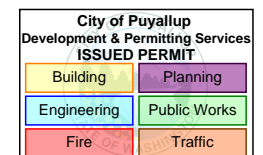
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# 1.0 Project Description

The facility, Kaiser Puyallup (PLP) is a 53,000 SF 2-story Medical Office Building in Puyallup WA. It was built in 2012 as part of Group Health at the time. The building has lobbies, clinics, light imaging (x-ray and CT scan), clinical lab, support spaces and a non-compounding pharmacy area. There is also a mobile MRI parked on the east side of the building.

The building operates Monday through Friday 7am-6pm and on Saturdays from 9am-5pm.

No part of the building is under the Kaiser Hospital license therefore is not subject to the FGI code and is not reviewed by Department of Health.

Since opening in 2012 the rooftop VRF condensing units have had issues.

This project is to address some problematic zones by adding zones to the VRF system and adding a new 24/7 cooling system.

The ventilation system, rooftop dedicated outdoor air units, are operating as expected and no ventilation will be addressed as part of this project.

## 1.1 Codes and Standards

Include all applicable codes, guidelines, regulations, and other references that will be put into practice.

- 2018 Washington State Energy Code
- 2018 Washington State Mechanical Code
- 2018 Washington State Building Code
- 2018 Washington State Plumbing code (UPC)
- ASHRAE Standard 62.1-2016 – Ventilation for Acceptable Indoor Air Quality
- ASHRAE Standard 55-2017 – Thermal Environmental Conditions for Human Occupancy
- ASHRAE Standard 90.1-2019 – Energy Standard for Buildings Except Low-Rise Residential Buildings
- ASHRAE Standard 170-2017 – Ventilation of Health Care Facilities
- ASHRAE Standard 188-2018 – Legionellosis: Risk Management for Building Water Systems
- ADA or Uniform Federal Accessibility Standards
- National Fire Protection Association (NFPA) Standards
- USGBC LEED Green Building Rating System for New Construction (LEED-NC)
- American National Standards Institute (ANSI)
- Institute of Electrical and Electronics Engineers (IEEE)
- National Electrical Manufacturers Association (NEMA)
- Underwriters Laboratories (UL)
- Americans with Disabilities Act (ADA)

# 2.0 Building Analysis

## 2.1 Cooling Historical Loads

In 2021 Kaiser performed a research study to collect hourly loads from common space types for May through October to gather enough information to create a "Historical Load" spreadsheet. This includes envelope and internal loads only; it does not include ventilation loads.

The data is broken out into exceedance levels, meaning 50 percent exceedance is the median and 50 percent of the spaces will have btu/sf larger than that value and 50 percent will have btu/SF values lower.

## RESULTS - PEAK COOLING LOADS

### AGGREGATE DATA RESULTS

Zone Type	Cooling Zone Sensible Cooling Load for Health Care Zone Types									
	Total Sample Size	Sample Counts					Zone Sensible Cooling Load (Btu/h-ft <sup>2</sup> [W/m <sup>2</sup> ])			
	San Leandro	Modesto	Riverside	Clirby	South Bay	75% exceedance	50% exceedance	25% exceedance	2% exceedance	0.4% exceedance
Patient Room	67	27	24	-	16	3.7 11.8	7.0 22.1	12.4 39.1	24.7 78.0	30.1 95.1
Exam Rooms	56	23	-	33	-	2.0 6.2	3.1 9.6	5.6 17.6	19.4 61.3	30.8 97.1
Office or Staff Workspace	56	29	-	27	-	3.2 10.0	5.4 17.1	9.4 29.8	25.2 79.5	35.8 109.6
Patient Room ICU/CCU	40	23	8	-	17	5.5 17.4	9.1 28.8	13.8 43.6	22.2 70.1	25.4 80.0
Nurse Station	20	20	-	-	-	8.5 26.8	15.5 48.9	33.2 104.6	62.2 196.3	70.2 221.5
Break room or Amenities	19	9	-	10	-	3.9 12.2	9.1 28.8	17.0 53.5	47.3 149.2	54.7 172.4
Corridors/Hallways	18	6	-	-	12	3.0 9.4	15.5 48.9	9.2 29.1	49.9 157.5	63.9 201.7
Nursery, well-baby	15	15	-	-	-	5.1 16.1	11.3 35.8	21.6 68.0	60.0 187.9	63.4 199.8
Imaging, X-Ray, CT, Ultrasound	14	7	-	7	-	2.5 7.7	5.5 17.2	11.2 35.4	48.2 152.1	57.0 179.8
Waiting	12	7	-	-	5	5.1 16.2	11.6 36.6	23.4 73.8	32.1 101.4	34.6 109.0
Procedure	11	1	-	10	-	2.0 6.4	2.6 8.2	3.7 11.8	8.4 26.4	10.2 32.2
Airborne Isolation Room	10	9	1	-	-	7.6 23.8	11.5 36.3	20.3 64.0	31.7 99.9	34.3 108.3
Post Anesthesia Care Unit	10	2	8	-	-	9.9 31.3	14.2 44.7	21.0 66.2	51.7 163.0	67.4 212.5
Operating Rooms	10	10	-	-	-	4.1 12.9	6.6 20.7	8.9 28.1	12.4 39.2	13.8 43.6
Clean Workroom or Storage	7	7	-	-	-	1.9 6.0	4.6 14.7	11.6 36.5	20.6 65.1	21.3 67.2
Med Prep Room, IV Prep	6	3	-	3	-	2.4 7.7	4.1 12.8	25.6 80.9	47.9 151.1	51.7 163.1

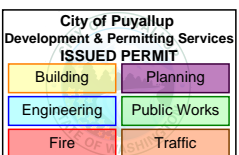


Figure 1: Peak Cooling Loads

PAE was provided a floor-by-floor SF space allocation table, then assigned each space the most appropriate category from the above listed categories.

There was ~20K SF unassigned in the floor-by-floor SF provided, that was assigned as Corridors/Hallways in this exercise.

There is one space in PLP that do not have appropriate categories to assign: Level 1: Pathology/Lab-Clinical Lab, 937 SF. This was assigned "Med Prep Room" to account for the high equipment loads.







The summary of exercise is the following, broken out by sum totals per exceedance category:

	75% exceedance	50% exceedance	25% exceedance	2% exceedance	0.4% exceedance
SUM Internal & Envelope Btu/Hr	140,264	442,119	501,306	1,859,349	2,468,678
Internal & Envelope Btu/SF	2.6	8.3	9.5	35.1	46.6
SUM Internal & Envelope Tons	11.69	36.84	41.78	154.95	205.72

**Figure 2: Internal and Envelope Loads**

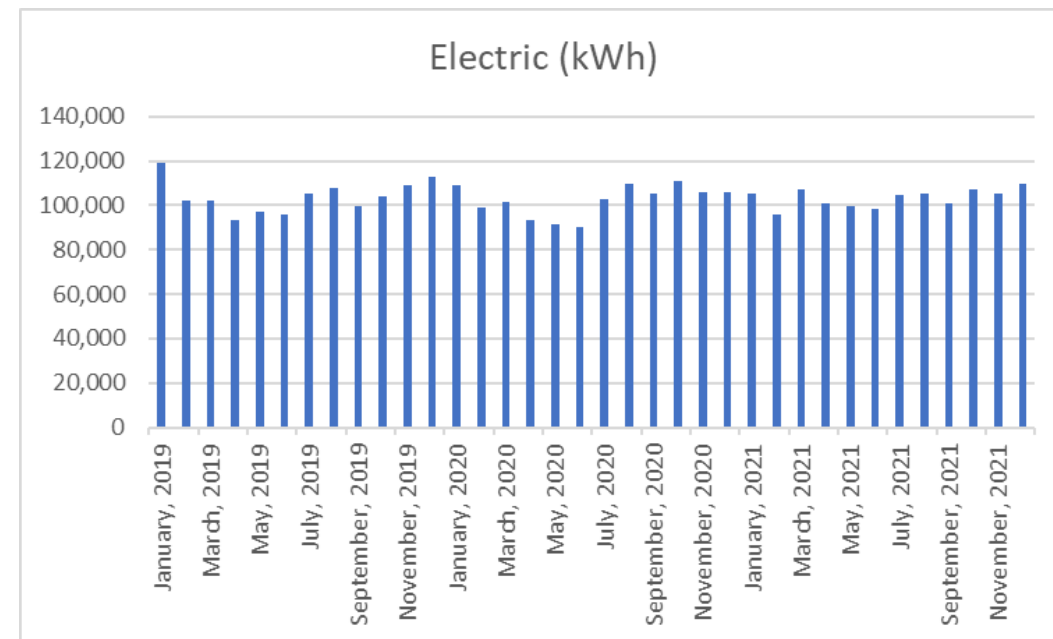
The load summary above does not include building ventilation loads. For this project, the ventilation load is addressed all at the rooftop equipment and the VRF system only deals with the zone (envelope and internal gains) loads.

The VRF system was sized to provide 130 Tons of cooling. The proposed solution replaces the VRF rooftop units in kind, for a full 130 Tons of cooling.

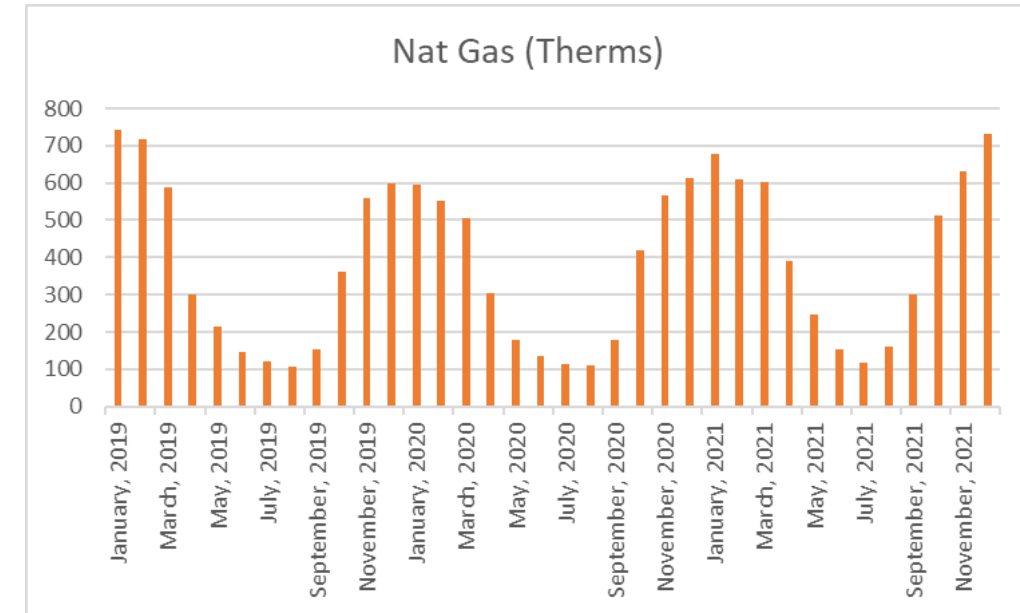
## 2.2 Utility Data

The following are the utility bills for 2019 through 2021, first the electricity followed by the natural gas.

Note that the natural gas serves the heat within DOAS (dedicated outdoor air unit – i.e., building ventilation fresh air) and domestic hot water. The rest of the building heating and cooling is provided by electricity via the VRF system.



**Figure 3: Electric Utility Usage**



**Figure 4: Natural Gas Utility Usage**

Since the electricity provides building power and heating and cooling it is difficult to draw meaningful conclusions from the utility data.

The natural gas monthly usage allows two conclusions to be drawn:

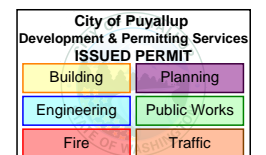
- The baseline usage, in the summer, represents the constant domestic hot water load.
- The rooftop DOAS units are addressing the ventilation load as expected, peaking when outdoor air temperatures are lowest, and reducing dramatically once the outdoor temperatures get more moderate.

## 2.3 Clockworks

There is no Clockworks trending data set up for this facility.

## 2.4 EUI

EUI is a metric that measures units of energy usage per year per square foot. The EUI for Kaiser PLP, according to the utility bills, is 78.8.







# 3.0 Mechanical

The mechanical solutions include:

- Re-zoning of three Meds Rooms
- Re-zone the pharmacy
- Add dedicated cooling, separate from main system for several areas with 24/7 cooling demands

## 3.1 Re-Zoning: Meds Rooms

Through discussion with facilities as well as a site walk on 5/25/2022 it was clear that there are three Meds Rooms, all on level 2, that are zoned with large office areas causing issues of overheating the meds rooms. The proposed solution is to add new wall mounted VRF units to these three spaces.

The spaces are MEDPR H225, MEDPR J215, MEDPR K275.

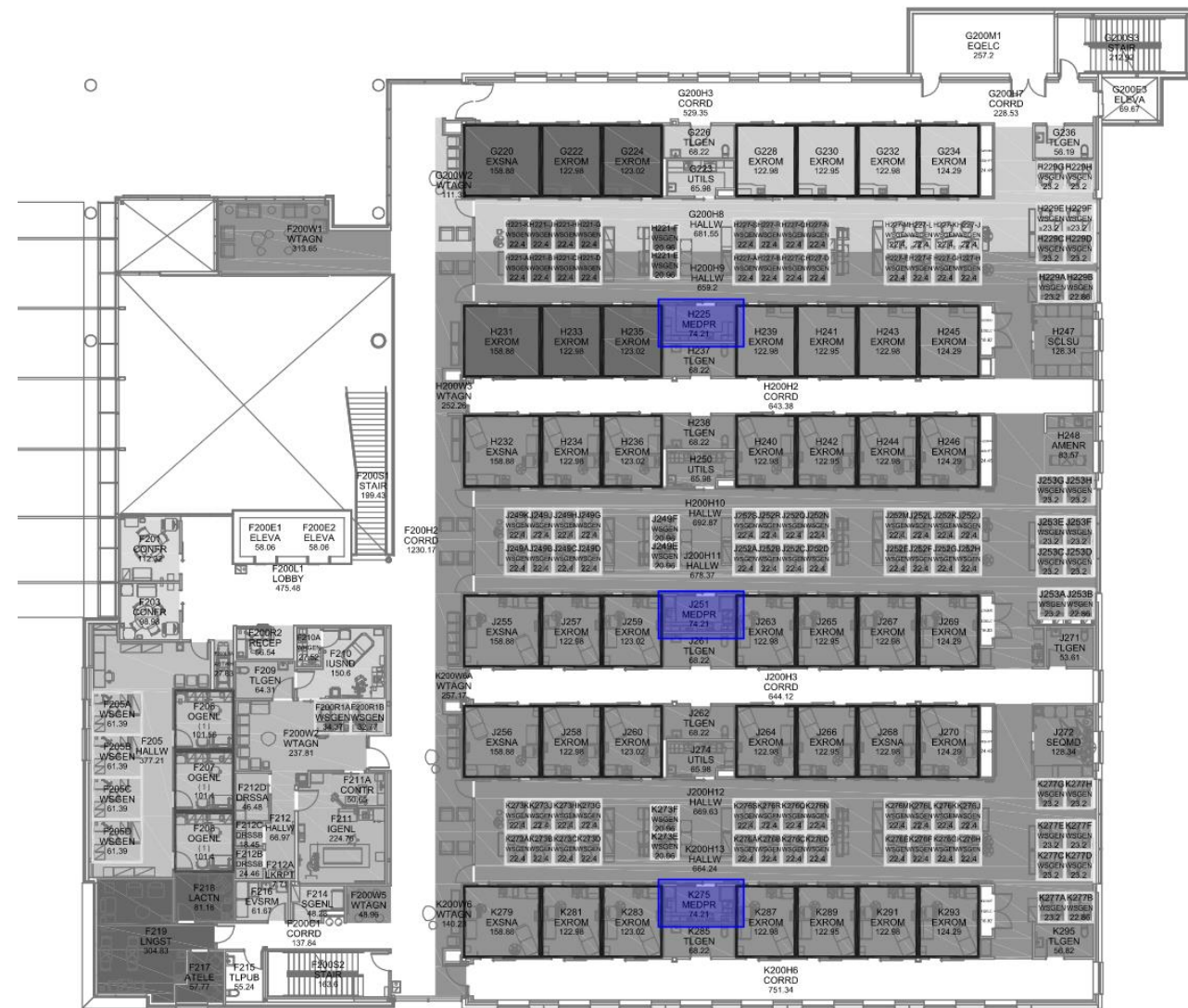


Figure 5: Level 2 Meds Rooms

The following are zone map screen shots from the building BMS:

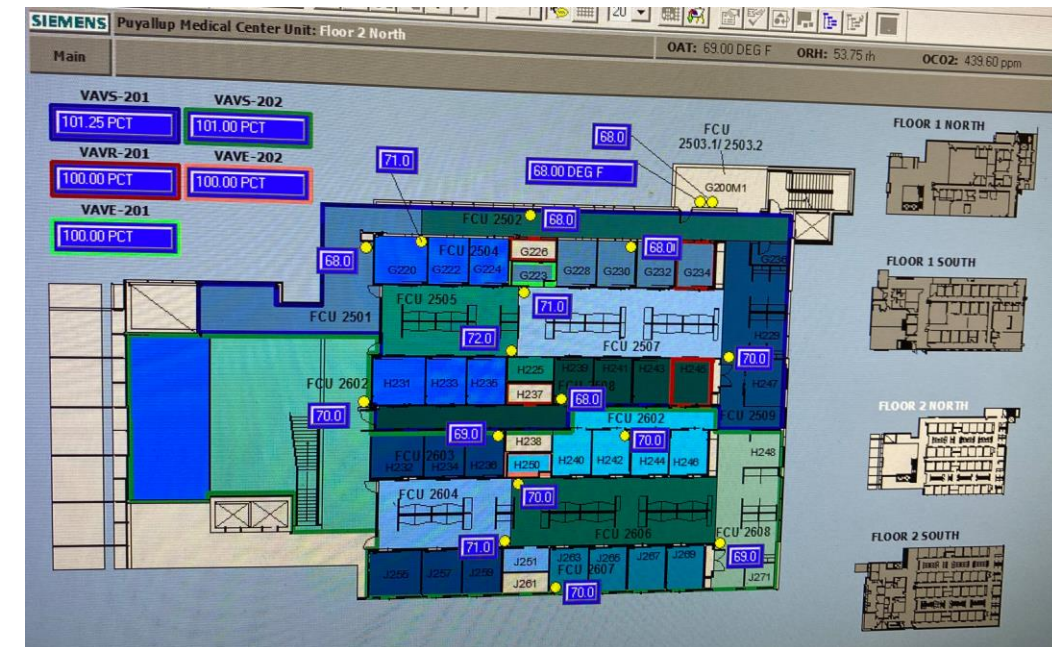


Figure 6: BMS Level 2 North Zone Map

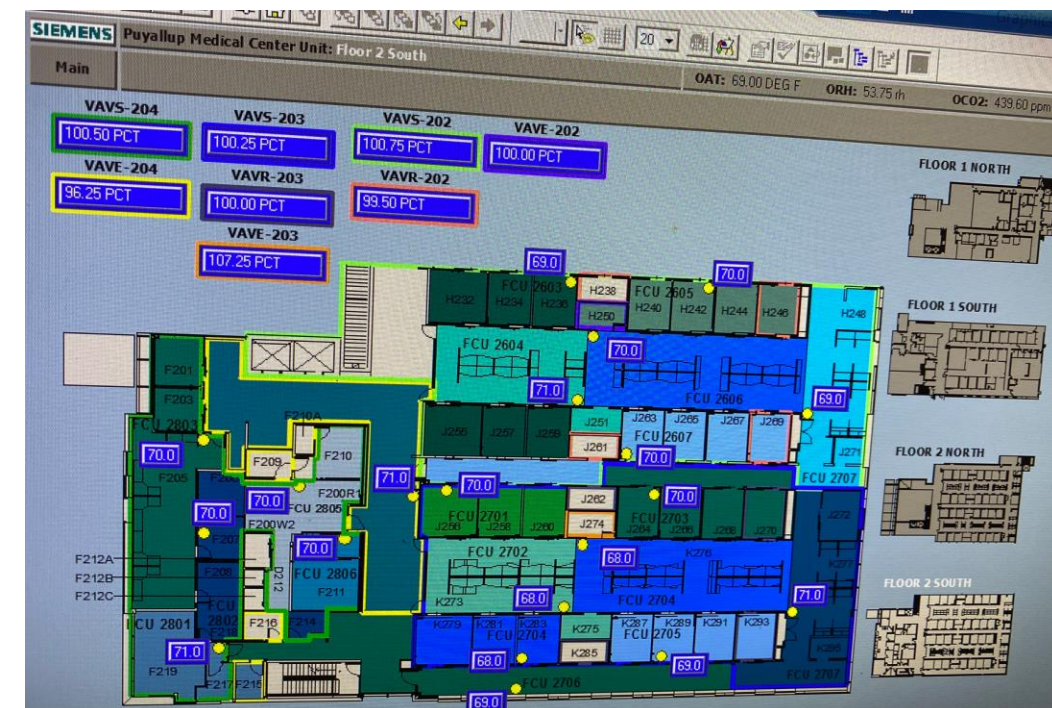


Figure 7: BMS Level 2 South Zone Map

H225 is zoned with FCU 2505, with the thermostat right outside the meds rooms.  
 J215 is zoned with FCU 2604 with the thermostat right outside the meds rooms.  
 K275 is zoned with FCU 2702 with the thermostat right outside the meds rooms.  
 The thermostat locations indicated on the BMS map were also validated on site.

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The following are the mechanical TI as-builts. Rooms are in blue, the FCUs listed above are in green, the VRF heat recovery boxes are in yellow. The red represents the ductwork demo scope, the new VRF wall mounted units and new refrigerant piping scope.



Figure 8: Level 2 Piping As-Builts



Figure 9: Level 2 Sheet Metal As-Builts

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### 3.2 Re-Zone: Pharmacy

On Level 1 the retail Pharmacy space and surrounding offices are not comfortable. This project will decouple the two offices from the main FCU serving the pharmacy. The two offices will get .5 Ton ceiling cassettes.



Figure 10: Level 1 Floor Plan

The following are the mechanical TI as-builts. Rooms are in blue, the VRF heat recovery boxes are in yellow. The red represents the ductwork demo scope, the new VRF cassettes and new refrigerant piping scope.

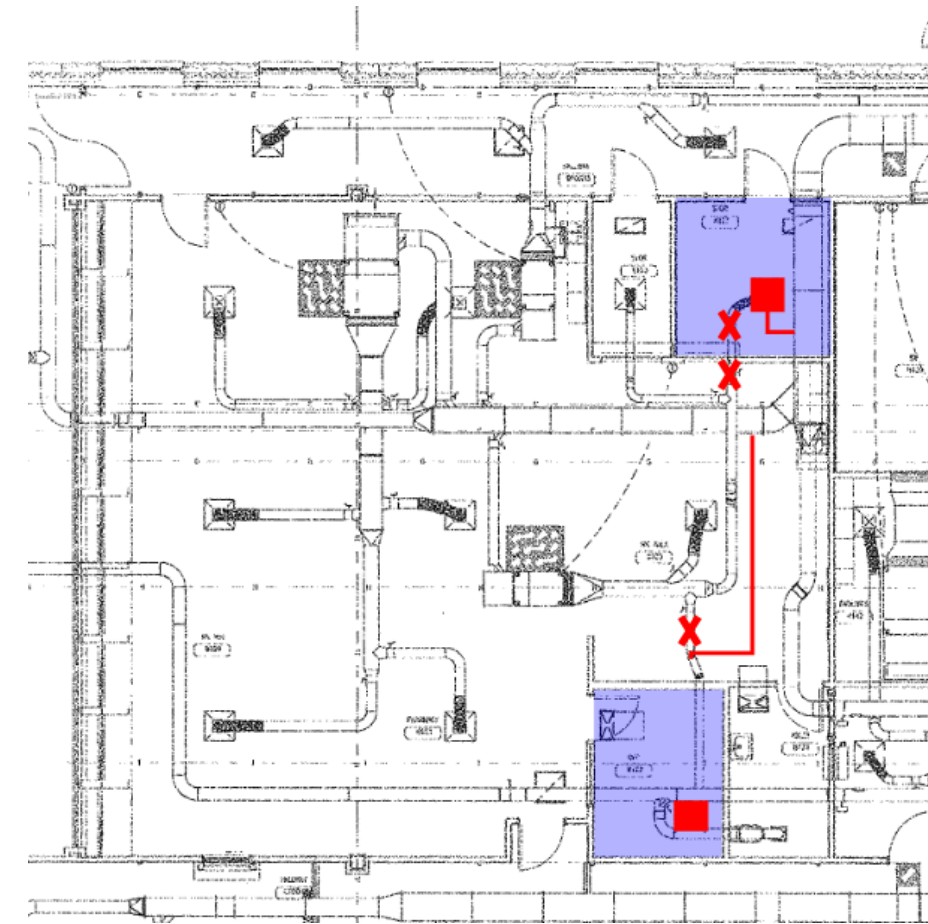


Figure 11: Pharmacy Sheet Metal As-Builts

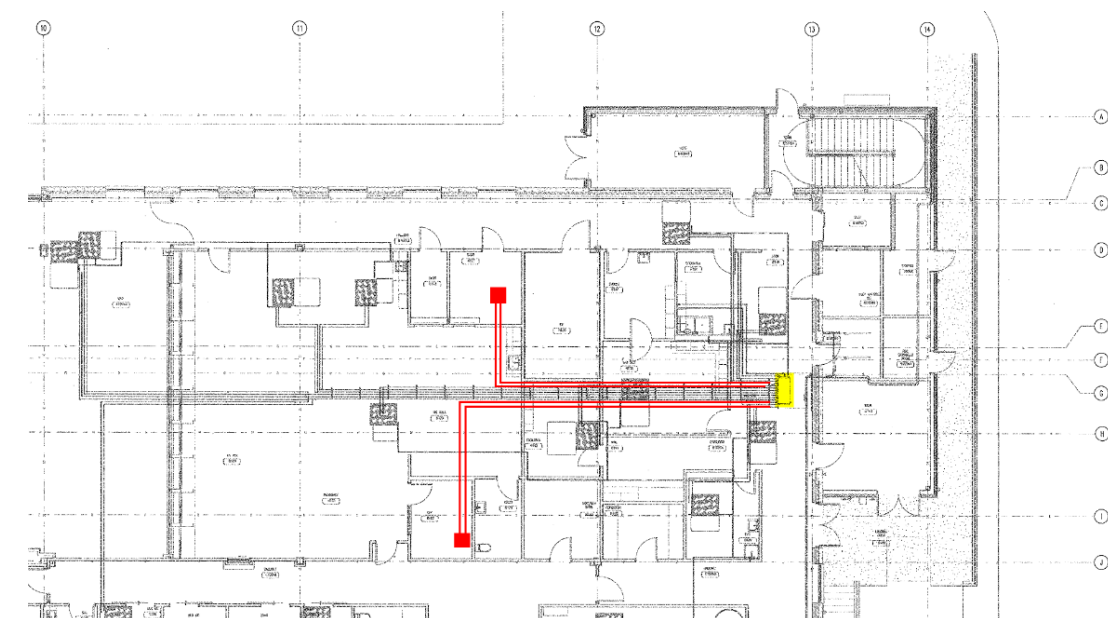


Figure 12: Pharmacy Piping As-Builts

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### 3.3 Re-Zoning: 24/7/365 Loads

There are several zones that are on the main building BMS system. They should not be as they are areas that always emit heat, independent of the building operating schedule.

- Level 1 Electrical Room: B100M3 EQELC
- Level 1 Mechanical Room: B100M5 EQMEC
- Level 1 Telecom Room: A100M1 EQTER

There are two spaces additional spaces that currently individual dedicated split systems

- Level 1 Mechanical Room: A100M2 EQMECH - has a dedicated split system
- Level 1 Elevator Machine Room: B100M4 EQELV - has dedicated Split System CU-09

According to the Kaiser Facilities Design Program document, the telecom room must have “resilient cooling”, meaning cooling can still be provided when there is one cooling source failure. No such requirement exists for the Mechanical and Electrical rooms.

The spaces are highlighted below, blue are spaces without split systems, purple have split systems.



Figure 13: Level 1 Floor Plan

Level 1 Elevator Machine Room: B100M4 EQELV has its own dedicated split system (CU-09), no change is recommended.

For the two remaining rooms in the northeast corner B100M3 EQELC and B100M5 EQMEC, a two-zone split system is proposed, 5 Tons. The new unit will be called CU-11.

For the rooms in the south, while A100M2 EQMECH already has a split system, the proposal is to remove the existing split system (CU-10) and replace it with a new two-zone split system to serve both A100M2 EQMECH and A100M1 EQTER, 5 Tons. The new unit will be called CU-10.



Figure 14: Level 1 Scope

The existing main VRF unit FCUs will remain but be reprogrammed only to turn on if the space temperatures get above 75F for more than 30 mins.

The new split systems will be integrated into the building BMS system.

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# 4.0 Electrical

## 4.1 Power

### EXISTING CONDITIONS

The Kaiser Puyallup Medical Center is fed from a 1600A, 277/480V electrical service from Puget Sound Energy. An exterior, pad-mounted transformer feeds a 1600A main switchboard located in the Level 1 Electrical Room. This main switchboard feeds HVAC panels on the roof, lighting inverters, imaging equipment, and lighting panels, mechanical panels and imaging panels throughout the building.

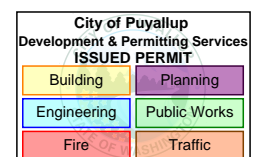
In addition, the main switchboard feeds a 500kVA transformer which in turn serves a 1600A, 120/208V switchboard that serves branch panels located throughout the facility that serve receptacles and small equipment loads.

### PROPOSED MODIFICATIONS

Provide new circuit breakers and feeders for the new equipment on the first and second floors and new circuit breakers and fused disconnects for the replacement of existing equipment on the roof. Existing conduit and wiring shall be verified in alignment with the equipment connection schedule and provide new if needed for the following:

- CU-01A: Provide one new 30A/3P breaker in Panel RM1. Provide new 30A feeder to unit that consists of a 3/4" C with four #10 CU and one #10 CU gnd.
- CU-01B: Provide one new 30A/3P breaker in Panel RM1. Provide new 30A feeder to unit that consists of a 3/4" C with four #10 CU and one #10 CU gnd.

- CU-02A: Provide new 20A/3P circuit breaker in panel RM1 and new feeder consisting of 3/4" C with four #12 CU + one #12 CU gnd.
- CU-02B: Provide new 20A/3P circuit breaker in panel RM1 and new feeder consisting of 3/4" C with four #12 CU + one #12 CU gnd.
- CU-03: Provide new 30A/3P circuit breaker in panel RM2 and new feeder consisting of 3/4" C with four #10 CU + one #10 CU gnd.
- CU-04A: Provide new 25A/3P circuit breaker in panel RM2 and new feeder consisting of 3/4" C with four #10 CU + one #10 CU gnd.
- CU-04B: Provide new 25A/3P circuit breaker in panel RM2 and new feeder consisting of 3/4" C with four #10 CU + one #10 CU gnd.
- CU-05A: Provide new 25A/3P circuit breaker in panel RM1 and new feeder consisting of 3/4" C with four #10 CU + one #10 CU gnd.
- CU-05B: Provide new 25A/3P circuit breaker in panel RM1 and new feeder consisting of 3/4" C with four #10 CU + one #10 CU gnd.
- CU-06A: Provide new 20A/3P circuit breaker in panel RM1 and new feeder consisting of 3/4" C with four #12 CU + one #12 CU gnd.
- CU-06B: Provide new 20A/3P circuit breaker in panel RM1 and new feeder consisting of 3/4" C with four #12 CU + one #12 CU gnd.
- CU-07: Provide new 30A/3P circuit breaker in panel RM2 and new feeder consisting of 3/4" C with four #10 CU + one #10 CU gnd.
- CU-08: Provide new 30A/3P circuit breaker in panel RM2 and new feeder consisting of 3/4" C with four #10 CU + one #10 CU gnd.
- FCU-1112: Provide new 15A/2P circuit breaker in panel 1M2 and new feeder consisting of 3/4" C with two #12 CU + one #12 CU gnd.
- FCU-1113: Provide new 15A/2P circuit breaker in panel 1M2 and new feeder consisting of 3/4" C with two #12 CU + one #12 CU gnd.
- FCU-2510: Provide new 15A/2P circuit breaker in panel 2M2 and new feeder consisting of 3/4" C with two #12 CU + one #12 CU gnd.
- FCU-2609: Provide new 15A/2P circuit breaker in panel 2M2 and new feeder consisting of 3/4" C with two #12 CU + one #12 CU gnd.
- FCU-2708: Provide new 15A/2P circuit breaker in panel 2M2 and new feeder consisting of 3/4" C with two #12 CU + one #12 CU gnd.







## 5.0 Acceptance Criteria

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The following shall be used as acceptance criteria for this project. This shall be included in the Commissioning plan.

### 5.1 Thermal Zones

#### **NON-PHARMACY ZONES: TEMPERATURE IN CONTROL**

For all zones, during occupied hours, 90% of temperature observations shall be within 3 degrees of the zone setpoint, with not more than a 6-degree range. Minimum data required is Timestamp; Zone ID; Zone Temperature Setpoint; Zone Temperature

#### **PHARMACY ZONES: TEMPERATURE IN CONTROL**

For all zones, during occupied hours, 90% of temperature observations shall be within 3 degrees of the zone setpoint, with not more than a 6-degree range. Minimum data required is Timestamp; Zone ID; Zone Temperature Setpoint; Zone Temperature

### 5.2 Trending

Test trended acceptance conditions by collecting data in a “hands-off” condition using a connected data analytics program. Data shall be collected at 15-minute intervals for the minimum periods as defined below:

For Medical Office Buildings and clinics, minimum acceptance period is five (5) days of trending. For equipment replacements in existing facilities, and tenant improvements, minimum acceptance period is five (5) days of trending.

