Blanchet House of Hospitality

Blanchet House of Hospitality is a charitable organization dedicated to providing hot food and temporary housing to those in need. Offering breakfast, lunch, and dinner, the mission serves between 600-800 meals per day, six days a week at no charge to its guests. Blanchet undertook an ambitious building project and received LEED Platinum certification. The building, which is adjacent to organization's previous location in Old Town/Chinatown, includes a variety of high performance features. The project targeted net-zero energy and net–zero water for the residential portion of the building and incorporates rainwater collection, tenant metering, heat recovery from the kitchen and an ecoroof with an outdoor terrace. Most importantly, the new facility creates a healthy and vibrant environment for those individuals being served by the mission.

Project Highlights

LEED and Living Building Challenge standards

Energy efficient design

Net-zero water and energy use

Geothermal heating and cooling

Portfolio Contents

Project Plan

Project Website (External Link)

Sustainable Business Oregon Article (External Link)

Blanchet House of Hospitality

Mechanical and Electrical Design Narrative

I. PROJECT DESCRIPTION

A. General Building Description

The project includes the construction of a new 3-story building located in downtown Portland, Oregon on NW 3rd and Glisan. A future 4th floor is anticipated. The Blanchet House is a charitable organization whose mission is to provide food and temporary housing to those in need. The new facility will be ~29,000 sf and will contain a ground floor kitchen/office/storage/queuing/loading dock area and SRO-type housing on the 2 floors above. A basement will contain building services, storage and an exercise area. The structural system will be concrete with post-tensioned slabs.

The maintenance of MEP systems will be performed by the building tenants. This will require proper selection of systems, adequate training, and requiring external service contracts for complex systems.

Design Team:
Blanchet House of Hospitality - Owner
Melvin Mark - Developer
SERA - Architect
KPFF – Structural Engineer
MGH – Civil Engineer
PAE – MEP Engineer

Occupancy Classifications:
S-2 – Storage
A-2 – Dining Hall (with incidental use spaces such as office and kitchen)
R-2 – Sleeping Units

B. Sustainability Goals

1. Create the most sustainable project for a non-profit in the United States.
2. LEED: The project is currently targeting a Gold minimum rating (Platinum is preferred) utilizing the US Green Building Council's LEED Rating System. Refer to LEEDv2.2 scorecard provided by SERA Architects.
3. Living Building Challenge: The goal is to incorporate as many prerequisites from the Living Building Challenge as possible.
4. Energy efficiency: The primary goal of the project is to reduce the energy consumption by 60% over a typical building. The energy use target for the residential portion of the building is ~22 kbtu/sf. Note that this does not necessarily equate to 50% savings for LEED. The kitchen (~100 kbtu/sf) will increase the total energy use for the building. Achieving this goal requires a highly insulated building envelope, efficient mechanical and lighting systems,

and efficient owner furnished equipment. The owner would like to have a 15 year payback on investments for energy efficiency.

5. Building envelope: Balance point calculations indicate that 20-30% glazing (0.37 overall U-value & 0.35 SC), a tight envelope (max infiltration of 0.05 CFM/sf wall area), and a wall U-value of 0.045 max (4" rigid) are required to reduce the requirement for heating to outside temperatures below 49°F. This approach will significantly reduce heating energy consumption. This is being targeted for the residential units. The infiltration should be verified by a blower door test. A large quantity of street level glazing is desired due to visibility of the Blanchet services.
6. Water Efficiency: The goal is to specify low flow fixtures and to use rainwater as potable water and greywater for flushing toilets to achieve net zero water use for the residential portion of the building. The kitchen will require potable water.
7. Indoor Air Quality: Construction IAQ management plans shall be prepared by the contractor and implemented during construction and before occupancy to meet LEED IEQc3.1 and IEQc3.2.
8. Materials: Specified materials shall be durable. The goal is to build a 50-100 year building.

D. Codes and Standards

2007 Oregon Structural Specialty Code (2006 IBC with Oregon Amendments)
2007 Oregon Mechanical Specialty Code (2006 IMC with Oregon Amendments)
2007 Oregon Fire Code (2006 IFC with Oregon Amendments)
2008 Oregon Plumbing Specialty Code (2006 UPC with Oregon Amendments)
2008 National Electrical Code
ASHRAE Standard 62.1-2007 – LEED Ventilation Reference Standard
ASHRAE Standard 55-2004 – LEED Thermal Comfort Reference Standard
ASHRAE Standard 90.1-2007 – LEED Energy Reference Standard
National Fire Protection Association Standards

II. MECHANICAL

A. HVAC Systems

1. Design Criteria

Outdoor Conditions: (ASHRAE 0.4% Summer and 99.6% Winter Data)
Summer: 91°F DB/ 67°F WB
Winter: 21°F

Indoor Conditions:	Summer	Winter
Kitchen	75-85°F (1)	70°F ±2°F
Dining	75-85°F (2)	70°F ±2°F
Staff Offices (level 1)	75-85°F (2)	70°F ±2°F
Residential Sleeping	75-95°F (2)	70°F ±2°F
Residential Lounge	75-95°F (2)	70°F ±2°F
Board Room (level 4)	75°F ±2°F	70°F ±2°F
Elec/Telecom/Elev MR	75°F ±2°F	70°F ±2°F
Circulation, Restrooms, Storage, laundry	78°-95°F (3)	68°F ±2°F

Notes:

(1) Cooling provided by evaporative cooling, and not sized for full cooling
(2) Radiant panels and mixed mode natural ventilation provided.
(3) No cooling.

Relative Humidity:	no humidity control
Acoustical Criteria:	None established

Outside Air Requirements:

Kitchen	15 CFM/person (20P/ 1000 sf)
Dining	20 CFM/person (70P/ 1000 sf)
General Office	20 CFM/person (7P/ 1000 sf)
Residential Sleeping	0.35 ACH or 15 CFM/person
Lounge	20 CFM/person (50P /1000 sf)
Board Room	20 CFM/person (50P /1000 sf)
Corridors/Utilities	0.05 CFM/sf
Laundry	15 CFM/person (20P/100 sf)

* Outside air intakes & operable windows must be 15 ft minimum from plumbing vents and exhaust outlets.

Exhaust Air Requirements:

Restrooms and Janitor	1.5 CFM/sf (75 CFM/shower and 50 CFM/shower)
Trash / Compost	2.0 CFM/sf
Dryer	~200 CFM/dryer (need cut sheet of dryer)
Kitchen Hoods	(as specified by kitchen consultant)
Elevator Car	1.0 CFM/sf (provided w/ elevator, spec'd by SERA)

Low-Pressure Ductwork:

Static Pressure Loss:	Maximum 0.1 inches WC per 100 feet
Main Velocity:	Maximum 1,800 feet per minute
Branch Velocity:	Maximum 1,500 fpm
Flexible Ducts:	Maximum length 7 feet/ minimize total 90° bends.

Hydronic Piping:

Static Pressure Loss:	Maximum 4 feet WC per 100 feet
Velocity:	Maximum 8 feet per second

2. **Central Mechanical Systems**

a. Option 1: Geothermal with peak boiler & DHW
   (1) Geothermal heating and cooling provided by 30 vertical wells, 300 ft deep each installed under the building. A bank of water-to-water heat pumps will provide heating and cooling water to the building. Buffer tanks (250 gallons each) for heating water and chilled water will prevent the heat pumps from cycling. One 600 MBH electric boiler located in the basement mechanical room will provide heating water to the building for peak heating.

b. Option 2: Boilers
   (1) Two 1000 MBH high-efficiency condensing boilers located in the basement mechanical room will provide heating water to the building. Boiler vent and flue ducts will extend up to the roof.
   (2) No central cooling system.

c. Pumping: Variable speed primary pumps (2 total) will circulate each boiler.

3. **Kitchen / Dining Room Systems**

a. Base Ventilation Systems: Rooftop make-up air unit (~5000 CFM) with heating water coil, cooling coil or evaporative cooler, pre-filters and MERV-13 final filters located on the level 4 roof and ducted to the dining room. Three kitchen exhaust hoods (refer to kitchen consultant report) including two Class I grease hood and one dishwasher hood. Duct to fans on the level 4 roof.
b. Alternate – Hood Heat Recovery: UV filtration for the hood can remove grease from the air and allow for heat recovery installed in the MAU.
c. Alternate Ventilation Systems: Separate rooftop make-up air units for kitchen (~5,000 cfm) and dining (~4,000 cfm) areas. Each unit is included with heating water coil, cooling coil or direct evaporative cooler (kitchen unit), pre-filters and MERV-13 final filters located on the level 4 roof and ducted to the dining room.
d. Heating: Radiant heating panels located in the spaces (radiant heat panels can also be utilized as a light shelf.)
e. Cooling: Mixed mode natural ventilation system with radiant ceiling panels.
f. Code Issues: UV filtration and grease hood heat recovery will require a code appeal.

4. **Residential Systems**
a. Ventilation Option 1 (Base System): Cascading use of air
(1) Rooftop heat recovery unit with heating water coils, pre-filters and MERV-13 final filters serving levels 2 and 3 (~3,600 cfm)
(2) Ventilation ductwork in 1 sheetmetal shaft from the heat recovery unit supplying each studio plus air to the lounges and laundry, horizontally distributed at each floor, FSD (fire/smoke damper) at the shaft for each floor
(3) Ventilation serving the corridors, another FSD at the shaft for each floor
(4) Transfer air from the studios under the door, into the corridor, then into the toilet room through a transfer grille with FSD
(5) Exhaust air from the toilet rooms into 1 sheetmetal shaft, back to the heat recovery unit, FSD at each floor
(6) This system will require a tight envelope (already assumed for the project) to ensure that the air is drawn under the door from each unit.
(7) Operable windows will be provided in each of the sleeping units in addition to one of the following options.

b. Ventilation Option 2 (Alternate): Separate air for studios and toilet rooms
(1) Rooftop heat recovery unit with heating water coils, pre-filters and MERV-13 final filters serving levels 2-4 (~4,600 cfm)
(2) Ventilation ductwork in 1 sheetmetal shaft from the heat recovery unit supplying each studio plus air to the lounges and laundry, horizontally distributed at each floor, FSD (fire/smoke damper) at the shaft for each floor

(3) Exhaust air subducted into sheetmetal shafts (as shown on your sketches) from each studio and collected at the roof and ducted back to the heat recovery unit.
(4) Ventilation serving the corridors, another FSD at the shaft for each floor
(5) Transfer air from the corridor into the toilet room through a transfer grille with FSD
(6) Exhaust air from the toilet rooms into 1 shaft, back to the heat recovery unit, FSD at each floor

c. Heating Option 1 (Base System): Electric Valence Heaters
Heating for the residential units will be provided by electric heaters (approximately 1.5kW each) provided by Division 26. These heaters may be valence type that are installed high on the exterior wall or duct mounted.

d. Heating Option 2: Radiant Ceiling Panels (heating only)
Radiant ceiling panels provided near the perimeter will installed in each room and piped overhead to piping mains on each floor.

e. Code Issues:
Ventilation Option 1 requires a code appeal to OSMC 1017.4 to use the corridor as path for room air to get to the toilets. Preliminary discussion with the City of Portland indicates that this appeal could be granted if the smoke detectors in the studios are addressable and shut down the heat recovery units on detection in any room (refer to fire alarm scope for more info).

5. **Miscellaneous Systems**
a. Laundry Rooms: Dryer vents will be ducted to an exterior wall with-in each laundry room. General exhaust will be provided in the laundry rooms with an exhaust fan discharging at the exterior wall.
b. Garage / Compost Storage / Trash Storage: Air will be exhausted from these space with a fan located in the trash room and ducted to the side wall.
c. Electrical/Telecom Room: Duct-less split system heat pump
d. Elevator Machine Room: Duct-less split system heat pump
e. Level 1 Offices, Nurse Room, Meeting Room: Radiant panels will provide heating and cooling with mixed mode natural ventilation.
f. Level 2 & 3 Common Rooms: Radiant panels will provide heating and cooling.
g. Entry Vestibules: Entry vestibules will be heated by cabinet unit heaters.

B. Plumbing Systems

1. Domestic Water

a. Base Scope: Domestic and fire water will be provided to the facility from the city water main on Glisan St. Required backflow devices will be located within a vault on-site prior to water and fire services entering building.
b. Base System- The first floor kitchen equipment and restroom lavatories will be served by the domestic city water. Showers, clothes washers and

lavatories and toilets on floors 2-3 will be served by a domestic rainwater recovery system located in the basement. A 100,000 gallon structural storage tank will be provided below the basement to serve the rainwater system.

c. Alternate - All toilets within the facility will be served by a grey water system located within the basement. A 10,000 gallon fiberglass or plastic tank will be provided within the basement.

d. Code Issues: Domestic rainwater use will need to be appealed with the city of Portland, currently the code does allow for rainwater to be used as potable water but only in areas where a municipal water supply is not available.

2. Domestic Hot Water

a. Base Scope - Geothermal Domestic Water Preheat: A water-to-water heat pump with a double wall heat exchanger will provide preheat for the domestic hot water and will be able to provide 100-120°F water most of the year. An electric water heater will boost the water to 140°F. A recirculating hot water loop and hot water circulation pump will be provided for the hot water system. The hot water system will produce 140°F to assure treatment for Legionelle, & serve the kitchen per Oregon State Health Department requirements. A master mixing valve assembly will be provided for the hot water system to temper the hot water for plumbing fixtures to deliver 120°F hot water (kitchen will have 140°F hot water). Expansion tanks will be provided on hot water systems to eliminate pressure buildup when the systems are not being used.

b. Alternate – Solar Hot Water System: A solar hot water system is intended to preheat the water supply to the domestic hot water system. 20 flat panel solar collection panels will be provided to collect heat from the sun's radiation. A pump will be used to circulate a glycol mixture between the panels and is a solar exchange tank where cold water enters the system. The glycol loop will prevent the possibility of water freezing inside the solar panels. Hot water from the exchange tank will pass through a double wall heat exchange connected to the domestic hot water system to boost water temperature if required. Finally, the hot water enters a master mixing valve to maintain a constant delivery temperature. A hot water circulation loop will be provided to maintain hot water near the point-of-use.

3. Sanitary Sewer

a. Base Scope: Sanitary waste piping will stub out of the building for connection by the Civil Engineer. Refer to Civil Drawings.
Point of use grease interceptors will be provided within the kitchen area's as required. Sump pumps will be provided for elevator shafts and connect to the building sanitary system. A sewage ejector will be provided within the basement to collect any waste from basement drains and from fixtures not able to drain by gravity to sanitary system.

b. Alternate – Grey Water System: A gray water system will collect water from all the lavatories, showers, and laundry facilities. That reclaimed water will be filtered and plumbed to serve all water closets and urinals.

This system shall be designed and built in accordance with The State of Oregon, Building Codes Division, Alternate Method Ruling No. OPSC 08-4 (ORS 455.060) issued on 9/15/2008. The gray water system shall be listed to the IAPMO IGC 207-2006 or CSA B128.1-2006 standards.

c. Code Issues: Grey water system used for toilet flushing will also need to appealed with the city of Portland, grey water use is currently allowed by code with certain requirements for testing and maintenance. The facility will need to prove to the city that these requirements for maintenance and testing will be adhered too. (Usually requires maintenance contract with approved maintenance company)

4. Storm Water Drainage and Rain Water Recovery

a. Base Scope: A roof and overflow drain system will be provided as required by code. The overflow storm drain systems (from the overflow drains) will daylight utilizing downspout nozzles at the first floor level above grade. If the Rain water recovery alternate is selected the storm water piping from the roof drains will be routed to a storm water storage tank below the basement floor slab. Means will be provided to divert (via gravity) any overflow water to the storm sewer if water storage tank is full. If it is not selected the storm drainage will be routed to outside the building for connection to civil storm water system.

b. Rain Water Recovery System (Alternate) - A rainwater recovery system consisting of a rainwater storage tank in the garage (below slab), vertical turbine transfer pump and required filtration for domestic water use will be provided to serve the domestic water system serving floors 2-3. The rainwater harvesting system will be designed in accordance with State of Oregon plumbing code for domestic rainwater use.

5. Natural Gas

a. Natural gas is not anticipated for this project unless the geothermal heating system is not utilized. Then natural gas would be provided to the HVAC boilers.

6. Piping Materials

a. Sanitary Waste and Vent, & all Storm Drain: cast iron pipe and fittings with no-hub couplings. Heavy gauge stainless steel couplings on underground piping, band type couplings conforming to CISPI 301 for above ground piping. ABS piping with a wall thickness equal to schedule 40 standard steel pipe, conforming to ASTM D2661-85a., and fittings conforming to ASTM D2661-85a and ASTM D3311-82 are acceptable for vent piping within the building.

b. Domestic Water & Reclaimed Water: Type L hard drawn copper tubing aboveground, Type K hard drawn copper tubing below grade. PEX-A-PEX tubing in accordance with ASTM F876, ASTM F877 and CAN/CDA-B137.5

c. Natural Gas: Black steel, Schedule 40 conforming to ASTM A 135 or A 53.

7. Plumbing Fixtures

a. 1st floor restrooms
Water closets: Wall hung stainless steel, elongated bowl, hinged seat, concealed sensor type flush valve, 1.6 GPF, ADA compliant height where required.

Lavatories: Wall hung stainless steel, sensor type faucet, 0.5 GPM flow rate, ADA compliant height where required.

b. Kitchen:
Grease Interceptor: Provide commercial grease interceptor.
Fixtures and equipment by kitchen equipment consultant.

c. 2nd thru 3rd floors restrooms and common areas
Water Closets: Wall hung vitreous china, elongated bowl, hinged seat, dual flush (1.6/1.1 GPF) electronic flush valve. ADA compliant height where required.

Lavatories: Countertop, vitreous china, mixing valve faucet, 0.5 GPM flow rate, grid strainer. ADA compliant height where required.

Shower: Thermostatic mixing valve with fixed temperature supply, adjustable push-button metering control, stainless steel front access panel to mixing valve, tiled shower enclosure, fixed shower head, low flow 1.75 GPM shower head, grid shower drain. ADA compliant height where required.

Mop Sink: 24”x24” molded stone mop basin with bumper guards, wall mounted service sink faucet with vacuum breaker and threaded outlet.

Clothes Washer Supply Box: Recessed supply box with individual hot and cold water shutoff valves, shock arrestors, 2” drain connection.

C. Fire Protection Systems

1. The entire building will be provided with a complete wet pipe automatic fire sprinkler and standpipe system meeting the requirements of local official having jurisdiction and building department. A 2-way flush mounted fire department connection (FDC) will be provided at the fire sprinkler room. The fire department test drain shall terminate outside of the building. A 6-inch combination standpipe (CSP) and 4-inch wet standpipes (WSP’s) will be provided at main stair landings of all required stairways.

2. Fire Pump: Current flow test data was not available from the City for this site. However, based on the City’s “fire flow availability estimate” it appears a fire pump is not required for a 3 story building. If/when a 4th floor is added a single electric fire pump will be required to provide pressure required for the 4th floor fire sprinkler system only. The Portland Fire Bureau verified that pumper truck connections will satisfy the higher pressure required at the roof for the standpipe system requirements.

3. The fire sprinkler and standpipe systems will include flow alarms, zone/floor control valves, fire department test stations, alarm bell, standpipes with hose valves, roof outlets, wall and/or post type control valves for roof outlets, and sprinkler piping and heads. All required system isolation valves shall be provided with tamper switches.

4. Each floor of each building shall be provided with a zone isolation valve with tamper switch, flow switch, fire department test station, and hose valves.

5. Sprinkler Heads: Heads to be chrome plated semi-recessed pendant type or sidewall type with polished chrome escutcheons in finished areas, and upright rough brass finish type heads in unfinished areas. Horizontal dry sidewall sprinkler heads will be provided for perimeter areas subject to freezing. Due to wood construction, sprinklers will be required above finished ceilings.

6. Those finished areas without ceilings will be provided with upright heads to protect structure and area below.

D. Controls, Commissioning and M&V

1. **Controls:** The building systems will be connected to and monitored by a central building DDC system. Carbon dioxide sensors and airflow measuring stations will be provided for each air system.

2. **Commissioning:** All of the building mechanical systems will be commissioned to meet the requirements of the LEED EAp1 and EAc3.

3. **Measurement and Verification:** The building domestic HW, solar HW and heating water energy will be monitored via flow and temperature sensors and incorporated into a measurement and verification plan that meets the LEED requirement. Rain, storm water and irrigation flow meters will be provided to monitor and record water supply and use as required by the GIF Grant Award. Separate geothermal energy usage will also be metered. Tenant electricity metering will be explored to determine energy end uses for the residents.

III. ELECTRICAL

A. Design Criteria

Load Densities: The following lighting and power load densities are used as a guide (Volt-Amperes/SF) for preliminary sizing of the power systems. As loads become more defined, the power system sizing will be reviewed and modified accordingly.

Building Area	Load Density – Lighting (VA/SF)	Load Density – Power (VA/SF)
Office/Conference	1.0	3.0
Corridors	0.5	1.0
Lobby	1.2	1.5
Dining	1.2	1.5
Restrooms	0.8	1.0
Loading Dock	1.2	2.0
Storage Rooms	0.5	0.5
Elec/Mech Rooms	1.5	2.0
Kitchen	1.2	100
Studio	1.0	4.0

B. Electrical Power Systems

1. Utility Service

a. Portland General Electric (PGE) will provide electric service to the new building from the existing underground distribution system in the area.
b. Primary service will extend from the nearest PGE switching vault to a new sub-grade transformer vault located within the sidewalk on the north side of the building on Glisan Street.
c. From the transformer vault, six (8) 5" conduits will extend to the Main Electrical Room at the north end of the Basement Level and terminate at Main Distribution Panel MDP.
d. The transformer secondary will provide 208Y/120V, 3-Phase service to Main Distribution Panel MDP.

2. Emergency Power

a. On-site emergency power generation equipment will not be provided.
b. Refer to Lighting and Fire Alarm Sections for additional requirements.

C. Electrical Distribution

1. Service Entrance Equipment

a. Main Distribution Panel MDP shall be 2,500 Amp, 208Y/120V, 3-Phase, 4-Wire, 65kAIC located at the Basement Level Main Electrical Room.
b. Floor mounted on concrete housekeeping pad, copper or aluminum bussing with copper ground bus at bottom of enclosure, full length of assembly.
c. MDP shall include:
   1. Pull/drip loop section for service entrance conductors

2. Utility metering section
3. Separate vertical section with provisions for overcurrent protection for future electric motor-driven fire pump connection
4. Main Breaker/Service Disconnect (GFP not required)
5. Molded case feeder circuit breakers
6. Surge protective device (SPD) external to switchboard assembly

d. Main and feeder circuit breakers shall be provided with integral current transformers (CT's) and stand alone metering devices (E-Mon D-Mon) for tracking of building energy use.

2. **Distribution Equipment**

a. Basement Level: Provide separate 208Y/120V branch circuit panels for mechanical, lighting, and receptacle loads, rated 400A, 100A and 100A respectively, served from the Main Distribution Panel MDP. Additionally, the Main Telecom Room shall be provided with a dedicated isolated ground branch circuit panel served from the Main Distribution Panel MDP.
   1. Mechanical distribution shall consist of two-section panel appropriately located to serve mechanical equipment at Basement and Level 1.
   2. Lighting distribution shall consist of single section panel located within Main Electrical Room to serve lighting equipment at Basement and Level 1.
   3. Receptacle distribution shall consist of single section panel located within Main Electrical to serve receptacle loads at Basement and Level 1.
   4. Main Telecom Room distribution shall consist of a single section panel with isolated ground located within the Main Telecom Room or Main Electrical Room. Panel will be served from an isolation transformer and associated secondary enclosed circuit breaker located within Main Electrical Room.

b. Level 1 Kitchen: It is our understanding the kitchen will be all electric 0 i.e. there will be no natural gas cooking appliances. Provide two (2) dedicated 208Y/120V, 400A branch circuit panels at appropriate location within the Kitchen at Level 1 served from the Main Distribution Panel MDP. One panel shall be two-section.
   1. All branch circuits serving kitchen equipment under commercial hood shall be provided with shunt trip device.
   2. Provide electrical work required to interface with commercial hood fire suppression system.

c. Studio Levels 2 and 3: Provide separate 208Y/120V branch circuit panels for mechanical, lighting, and receptacle loads, rated 400A, 100A and 100A respectively, served from the Main Distribution Panel MDP. Panels will be located at satellite electrical rooms at Levels 2 and 3.
   1. Mechanical distribution shall consist of two-section panel to serve mechanical equipment at Levels 2 & 3, as well as the Level 3 roof. This panel will be located on Level 3.
   2. Lighting distribution shall consist of single-section panel to serve lighting equipment at Levels 2 & 3, as well as the Level 3 roof. This panel will be located on Level 2.

3. Receptacle distribution shall consist of two-section panel to serve receptacle loads at Levels 2 & 3, as well as the Level 3 roof. This panel will be located on Level 2.
4. Allow feeder circuit breaker space in branch panels for future Level 4 branch panels.

d. Branch circuit panels shall be provided with door-in-door construction, copper bussing and bolt-on circuit breakers with individual lock-off devices.

D. General Purpose Power

1. Wiring Methods

a. Feeders: 600V stranded copper, type THHN or THWN.
b. Branch Circuit Wire: Copper, No. 12 minimum size, type THHN or THWN, color coded for appropriate phase.
c. Metal Clad (MC) cable with copper conductors is permissible for branch circuit wiring where routed concealed. MC cable branch circuits shall be grouped at terminal boxes and homerun to appropriate panel utilizing EMT.

2. Receptacles

a. Receptacles will be provided for all storage, equipment rooms and corridors.
b. Common Areas:
   1. Receptacles will be provided for all finished areas and equipment rooms. No location in common areas shall be more than 25ft from a receptacle.
   2. Provide receptacles adjacent to telephone, data and CATV outlets, where present.
   3. Ground fault circuit interrupter (GFCI) will be provided within restrooms, exterior, roof locations and any other areas required by the NEC. While-in-use type receptacle covers will be provided where required.
   4. Provide receptacles at all DDC equipment locations.
   5. Provide standard receptacles and special configuration receptacles at each residential floor suitable for two (2) clothes washers and two (2) electric clothes dryers.
c. Office and Conference Areas:
   1. Receptacles will be provided adjacent to all data outlets.
   2. Dedicated circuits will be provided for copiers and other office equipment as required.
d. Studios:
   1. Arc fault circuit interrupters (AFCI) integral to branch circuit breakers shall be provided for studio branch circuits supplying receptacles or lighting.
   2. Duplex receptacles shall be provided at each studio workstation.
   3. Duplex receptacle shall be provided adjacent to each CATV outlet and studio door.

3. **General Equipment and Mechanical Equipment Connections**

   a. Electrical power connections will be made to all general equipment (e.g. roll-down doors) and mechanical equipment, and shall include all electrically associated devices such as disconnect switches, contactors, magnetic or manual starters, lock-out switches, etc. which are not furnished under the Mechanical, Plumbing or Fire Protection Sections.
   b. Elevator Connection: Elevator will be served from the Main Distribution Panel directly.
   c. Kitchen Equipment: Electrical power connections will be made to all electric kitchen equipment as described by Food Service Consultant.

4. **Electrical System Grounding**

   a. A complete grounding system will be provided in accordance with Code requirements.
   b. Grounding electrodes consisting of cold water pipe at building entrance, Ufer ground and driven ground rods shall be bonded together with the appropriate size bare copper ground conductors.
   c. A copper Main Ground Bar MGB shall be provided in the Main Electrical Room and bonded to all grounding electrodes. Additionally, copper ground bars will be provided within all satellite electrical rooms.
   d. The MDP, sub-distribution panels, dry-type transformers, motor starters, panelboards, wiring systems, etc. will be effectively grounded using green insulated copper ground conductors.
   e. All ground system components including ground bar and ground rods shall be provided within utility transformer vault in accordance with PGE requirements.

5. **Telecommunications System Grounding**

   a. A complete telecommunications grounding system will be provided in accordance with EIA/TIA Standards.
   b. A Telecom Main Ground Bar TMGB will be provided in the Main Telecom Room where service enters the building, bonded to MGB in the Main Electrical Room by an appropriately sized copper ground conductor.

E. <u>Lighting and Control</u>

1. **General**

   a. For general lighting requirements and additional information, refer to Architectural Lighting Design narrative.

2. **Design Criteria**

Building Area	Ambient Illuminance (fc)	Task Illuminance (fc)
Storage	15-20	15-20
Elec/Mech Rooms	30-40	30-40
Kitchen	40-50	60-70
Stairways	5-10	5-10
Trash/Recycle	15-20	15-20
Loading Dock	10-15	10-15
Basement	10-15	10-15

Illumination levels will be appropriate for the task required and designed in accordance with IESNA recommended practices.

3. **Interior Lighting Systems**

   a. Storage, Elec/Mech Rooms, Trash/Recycle, Basement: Open or enclosed linear T5 or T8 fluorescent lamps, as appropriate. Surface or suspended mounted.
   b. Kitchen: Industrial quality recessed linear T8 fluorescent troffers with cleanable acrylic lens.
   c. Stairways: Enclosed, surface linear T8 fluorescent with integral occupancy sensor to reduce light level when stairway is unoccupied. Reduced light level shall be in accordance with minimum emergency egress illumination requirements as described herein.
   d. All fluorescent luminaires will be provided with electronic ballasts.

4. **Emergency Egress Lighting**

   a. Emergency illumination of 1 Footcandle (fc) average at the path-of-egress will be provided.
   b. A central battery inverter (approx 10kVA) located within the Main Electrical Room will provide emergency power to path-of-egress luminaires.

5. **Lighting Control**

   a. A building-wide programmable lighting control system will be provided complete with astronomical time clock, programmable time schedules, occupant warn-off and overrides, and low voltage inputs including but not limited to photocell devices, occupancy sensors, etc.
   b. A lighting control panel (LCP) will be provided in the Main Electrical Room. Satellite relay panels will be dispersed throughout the building as required to adequately serve lighting loads.

c. Lighting Control Methods

Building Area	**Control Technology**
Lobby / Dining Area	Time Clock, Low Voltage Override, Daylight Harvesting
Elec/Mech Rooms	Wall Switch at Door
Offices / Conference	Occupancy Sensor, Daylight Harvesting
Restrooms / Laundry	Occupancy Sensor
Stairways	Occupancy Sensor integral to luminaire
Public Corridors	Time Clock, Low Voltage Override
Studios	Wall Switch at Door, Daylight Harvesting
Garage / Loading Dock	Occupancy Sensor
Basement / Storage	Occupancy Sensor
Exterior / Building Perimeter	Time Clock

d. Daylight Harvesting: Where electric light is used to supplement daylight, luminaires will be provided with multiple ballasts or dimming ballasts to appropriately reduce the electric light levels in accordance with available daylight.

F. <u>Signal Systems</u>

1. Fire Alarm System

a. Fire Alarm System will be fully addressable and intelligent and shall be in accordance with all applicable codes and standards.
b. Fire Alarm System consists of control panel, remote annunciator at Fire Department point of entrance, power supplies, initiating devices, notification appliances, and control and monitoring relays.
c. Initiating devices include but are not limited to duct or ceiling-mounted products-of-combustion (smoke) photoelectric detectors, thermal detectors, manual pull stations, and sprinkler water flow and tampering monitoring.
d. Notification appliances include but are not limited to audible devices (horn/chime), visual devices (strobe) and a combination of the two.
e. Fire alarm monitoring and control of all fire/smoke dampers will be provided.
f. All fire alarm wiring will be installed in conduit.
g. Specific Application
    1. Manual pull station will be provided at Fire Alarm Control Panel location.
    2. Thermal detector will be provided within Main Telecom Room.
    3. Thermal detectors will be provided in Kitchen.
    4. Duct smoke detectors will be provided within all HVAC main return air plenums.
    5. Notification appliances will be provided throughout all public and gathering areas, including but not limited to Lobby, Dining, Kitchen, Corridors, Restrooms, Conference Rooms, Laundry, Bike Storage, Exercise, etc.
h. Residential Ventilation Option 1 (Cascading Use of Air):
    1. Provide addressable smoke detector with sounder base within all residential studio units.

2. Provide full area addressable smoke detector coverage within all residential corridors.
3. Provide duct smoke detectors at each fire/smoke damper assembly serving spaces not protected by full area smoke detector coverage.
4. Alternate: Provide full area addressable smoke detection throughout entire building. Provide sounder bases within residential studio units.

i. Residential Ventilation Option 2 (Separate Air for the studios and toilet rooms):
   1. Provide non-addressable smoke detector with sounder base within all residential studio units.
   2. Provide full area addressable smoke detector coverage within all residential corridors.
   3. Provide duct smoke detectors at each fire/smoke damper assembly.
   4. Alternate: Provide full area addressable smoke detection throughout entire building. Provide sounder bases within residential studio units.

2. **Telecommunications, CATV, Access Control, CCTV**

   a. These systems will be required. An allowance should provided until design direction is provided.

G. <u>Commissioning and Measurement & Verification (M&V)</u>

1. Commissioning: The lighting control systems, occupancy sensors and photocells will be commissioned to meet the requirements of the LEED prerequisite.
2. Measurement and Verification (M&V): The electrical plug loads, kitchen equipment loads, lighting loads and HVAC loads will be served by segregated branch panels and submetered for incorporation into a measurement and verification plan that meets the LEED requirements.