Oak Lodge and Gladstone Community Project - Concord Property MEP Assessment

NCPRD Concord Property Community Center, Oak Lodge and Gladstone Libraries Planning (Opsis) 2019-0467

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INTERFACE ENGINEERING

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Heating, Ventilating, and Air Conditioning (HVAC)

Existing HVAC Systems

The Building is served by a 2718 mbh cast iron natural gas steam boiler. It is common for older steam boiler systems to have heating efficiencies between 50 and 70% compared to current standard practice systems with efficiencies close to 90%. The steam system supplies heat to radiators, air handlers (AHU's), fan coils and unit ventilators. The steam also supplies a domestic hot water converter.

Rooms served by radiators do not have any outside air for code required ventilation but relies on operable windows which are not practical to be opened during cold weather. Areas served by AHU's and fan coils do not have any outside air either. Radon testing was reported to have been done and did not trigger a need for mitigation. There is no mechanical cooling for the building expect for a few small office/IT areas which use spilt systems. The space temperatures get very warm and uncomfortable.

The controls are a combination of pneumatic and DDC. DDC controls are provided by Automated Logic. The kitchen area has a sidewall mounted grease exhaust fan but does not have dedicated makeup air for the exhaust.

HVAC System Adaptations for Reuse

Since the existing system is steam based without cooling or adequate ventilation, we propose a new HVAC system be provided and the existing system be demolished. The new system will need to be integrated without affecting structural systems. The proposed system will be a variable refrigerant flow (VRF) heat pump system with heat recovery ventilators (HRV) for dedicated outdoor air. The VRF heat pumps will likely be ground mounted while the fan coils are ducted above ceilings where possible or floor mounted if necessary. The HRV's can be roof mounted or inside the building. The estimated budget cost for demo and a new VRF system is $39/SF.

Plumbing

Existing Plumbing Systems

The building is served by a 2" water service thru a pressure reducing valve supplying 90 psi to the building. The water piping throughout the building is galvanized steel. No problems with water pressure have been reported. There was some lead found in the water supply and it appears to be coming from the plumbing fixtures. An old fuel oil tank will need to be decommissioned. Waste/vent and storm water piping is cast iron. The domestic hot water is provided by a steam converter as well as a small gas water heater (summer use). The kitchen does have a grease interceptor.

Plumbing System Adaptations for Reuse

The existing domestic cold-water system could remain with new plumbing fixtures provided. A new gas hot water heater and tank for the kitchen should be provided. The following budget number should be considered:

New plumbing fixtures:	$110,000
New kitchen gas water heater:	$25,000

Fire Protection

Existing Fire Protection Systems

The building is served by a wet pipe sprinkler system which can be modified for the new program changes. The fire service is 6" and the fire main reduces to 5".

Fire Protection System Adaptations for Reuse

No changes are needed unless walls and ceilings are modified, then new/relocated heads will be required.

Electrical

Power Distribution

Existing Electrical Power Distribution System

The main electrical service is located in the boiler room, and consists of a Siemens 800-amp, 240/120-volt, 1-phase, 3-wire switchboard (photo E1) installed in 1993 and consisting of molded case circuit breakers with adjustable settings on the main breaker. Power to this service is supplied by pole-mounted transformers on a nearby PGE utility pole to the east of the boiler room (photo E3). While the switchboard is in good condition, there is minimal capacity to add additional loads, and the service is not adequate to serve a code-compliant HVAC system for ventilation and cooling for a building of this size. There is also a separate 200-amp, 3-phase open-delta 240-volt service for the elevator (photo E2).

Panelboards in the building vary in age and condition, with the newest ones being Siemens panels installed in 1993 and 1999 for classroom lights and outlets, and older load centers in poor to fair condition in the kitchen and other miscellaneous spaces. Panels and load centers that predate the 1993 remodel are questionable for the ability of their breakers to safely clear a short circuit (photo E4).

Emergency power is very limited, consisting of battery wall packs in corridors and the gym. Most of these battery packs appears to date to the 1990s, and at minimum will need their batteries replaced to ensure they can be relied upon during a power outage.

Recommended improvements

Option #1: Minimal upgrade for added outlets:

If electrical improvements are limited to adding outlets for 240-volt and 120-volt power outlets and equipment for maker spaces and workshops and supporting exhaust fans, then the existing service is adequate to serve those needs, provided that the panels pre-dating the 1993 remodel are replaced. Estimated cost: $25,000 for an allowance of up to five panelboards replaced one-for-one or added, including labor to reconnect existing circuits.

Replace battery wall-packs one-for-one with new LED types. Estimated cost: $6,000 for an allowance of up to 20 wall-packs.

Option #2: Upgrade needed for new HVAC system:

For an electrical service upgrade sized to support a new VRF system and code-required added ventilation, the recommendation is for a 208Y/120-volt, 3-phase, 4-wire switchboard, 1600-amp with a main circuit breaker. This switchboard would likely be in an NEMA 3R enclosure on the exterior of the building by the boiler room, allowing it to easily backfeed existing loads by using the old switchboard enclosure as a splicing point after the breakers and busway are removed. The outdoor switchboard would be served by an underground service lateral from a new outdoor pad-mounted utility transformer to replace the current overhead service. A buck-and-boost transformer will be needed for connecting the elevator to the new service.

For emergency power, we recommend a small 15kW diesel generator, tied to a new 125-amp open-transition automatic transfer switch and 125-amp panelboard. The panelboard would support the following loads:

- Fire alarm panel;
- Server racks providing building communications, including wifi and phones;
- Exit signs and emergency lighting;
- Security system used for lockdown;

Budgeted cost:

- New switchboard and electrical service, including reconnecting existing loads: $90,000;
- Replacing / reconnecting existing panelboards (up to six panels): $30,000;
- Connection of new HVAC system: $25,000;
- New generator and transfer switch: $15,000;

Lighting

Existing Lighting Systems

The existing lighting systems is in fair to good condition, and consists of T8-based fluorescent lighting, surface mount and suspended acrylic lensed luminaires in the corridors and classrooms, and surface mounted multi-lamp luminaires with wireguard in the gym (photo E5). Much of this lighting appears to date from the early 1990s. While relatively energy efficient, there are signs that some luminaires requiring ballast and lamp replacement. Most exit signs show signs that they need battery replacement.

Exterior lighting is in poor condition and consists of high-pressure sodium lighting with poor color rendering, and signs that the lamp and ballast require replacement.

Lighting control for the building is very simple, consisting of manual wall switches without automatic controls for interior spaces, and time clock for exterior lighting.

Lighting Systems Adaptations for Reuse

We do not recommend reusing any of the existing lighting or lighting control systems in the renovated areas. Converting all interior lighting to LED is recommended because of the substantial Energy Trust incentives of between $50 and $75 per luminaire. Upgrading the lighting control systems are recommended because the current system does not allow for code compliant occupancy and daylight harvesting controls.

LED lighting will reduce energy consumption from lighting by 30 to 50%. Occupancy sensors are required by the Oregon Energy Code would reduce energy consumption by a further 15 to 25%. Since LED lighting is typically dimming ready with 0-to-10 volt control input, an upgrade to LED lighting with a wireless lighting control system would give building occupants the convenience of manual wall dimming, and the energy savings feature of daylight harvesting through automatically lowering lighting levels as a ceiling daylight sensor detects levels of incoming natural light.

Outdoor lighting could be replaced with LED retrofit kits. Where building exterior wall packs could be added, LED lighting can be specified with integral motion sensors to allow lighting to automatically switch between high and low output lighting levels, providing added security at night as well as energy savings during hours of low activity.

Low Voltage Systems

Existing Fire Alarm and Adaptations for Reuse

The existing fire alarm system (photo E6) is in good condition and is suitable for reuse. Additional booster panels for the horn/strobe notification devices will be required within the main building because only bare bones signaling devices have been installed within the vacant areas. To accommodate the new physical education building a new fire alarm sub panel will need to be installed and connected to the main fire alarm panel.

Existing Data Cabling and Adaptations for Reuse

The existing Category 5 UTP cables and patch panels, while suitable in the early 1990s, are obsolete for modern local area networks. A full upgrade to Category 6 cabling is recommended to workstation outlets. An overhead wifi system based on Category 6A UTP or ScTP cabling would provide full wireless coverage with the added convenience of enabling laptops and tablets to communicate untethered.

The existing telecommunications service (photos E7 and E8) to the building should be replaced with single-mode fiber optic, and for a building of this size, we anticipate needing a main telecom room and one satellite wall-mounted rack connected by single mode fiber optic backbone, minimum 6-strand.

Appendix A

Mechanical Photos

Photo M1: Classroom unit ventilation

Photo M2: Fire sprinkler service


Photo M3: Kitchen grease interceptor


Photo M4: Kitchen grease fan/duct


Photo M5: Steam boiler


Photo P1: DHW Controller

Appendix B

Electrical Photos

Photo E1: Existing main switchboard in boiler room.

Photo E2: Separate three-phase, open delta service for elevator

Photo E3: Outdoor pole-mounted transformer serving electrical services

Photo E4: Example of older load centers in kitchen area

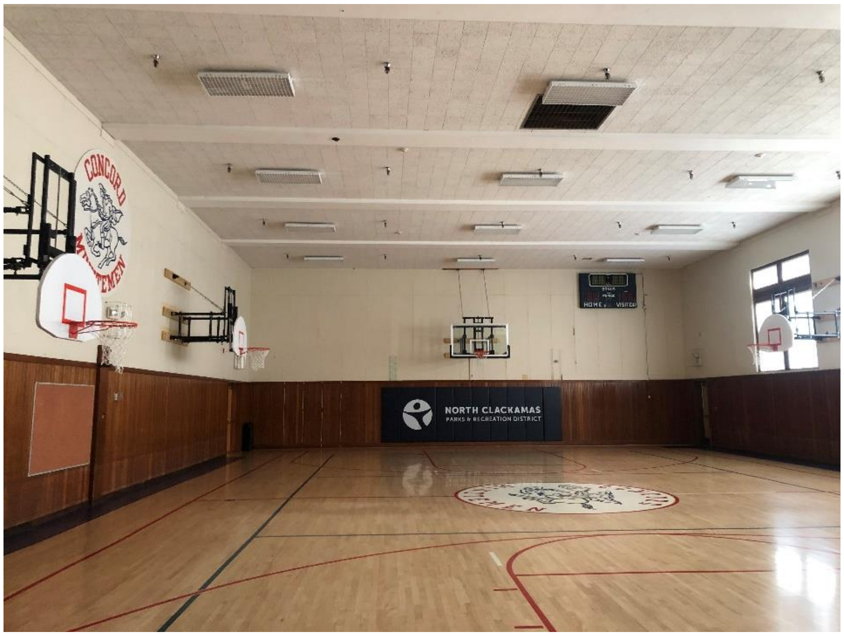

Photo E5: Gym Lighting

Photo E6: Existing Fire Alarm Panel

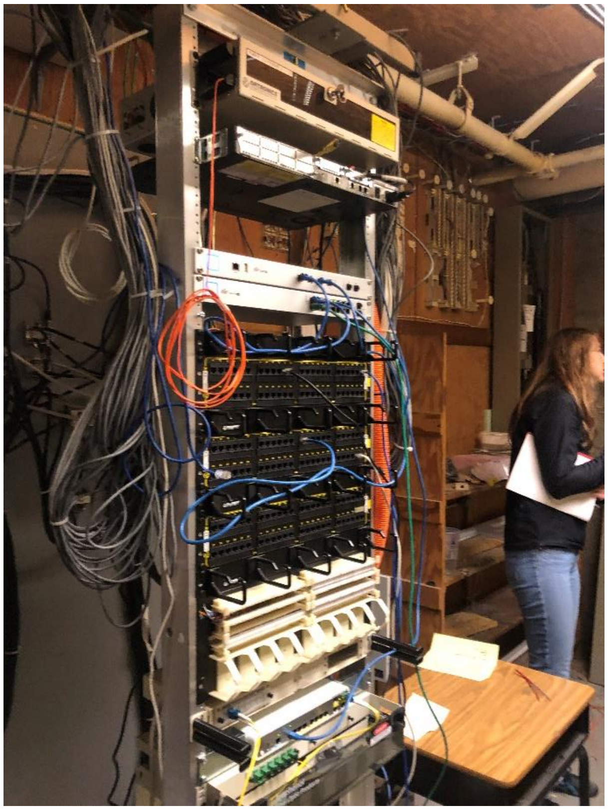
Photo E7: Existing main telecom rack