

**City and Borough of Juneau  
CONSOLIDATED PUBLIC WORKS FACILITY  
PHASE II CONSTRUCTION  
30% Basis of Design**

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*Prepared for:*  
City and Borough of Juneau  
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# CHAPTER 1

## BASIS OF DESIGN

### ARCHITECTURAL BASIS OF DESIGN

#### General Construction

Floor plans for the Maintenance Building are shown in the attached drawings. The Maintenance Building will be constructed as three structurally separate units. The Administrative Area in the core of the "L" housing support and office functions and lockers is a conventionally designed, braced frame steel structure. The wings of the building housing Streets Maintenance Bays, Fleet Maintenance Bays and Wash and Fuel Bays will utilize pre-engineered metal building systems braced with portal frames.

#### Base Bid:

It is proposed that the Base Bid for construction include:

All building construction between Grids A and E. This includes the Administration Building, Fleet Maintenance Bays and Streets Maintenance Bays. Acceptance of this plan without any other bid alternates will leave gravel as the finished condition for fuel and wash bays, with utilities stubbed up for future work.

*These items will be shown as additive alternates:*

2. Fuel and Wash bays
3. All exterior canopies.
4. Windows in the shop bays.
5. Paving of all surfaces

#### Roof:

Roof will be a single ply 80 mil reinforced PVC membrane on 4" polyisocyanurate insulation on vapor barrier on 1/2" densdeck on metal deck. Metal deck will rest on purlin system at pre-engineered building sections and on roof joists at administrative core. Entire Roof structure will be sloped at 1/2" per foot min to internal drains. Drain perimeter will be heated for an area 2 ft adjacent to the drain with heat trace. Provide scuppers through parapets.

Interior metal deck ceilings and girts and frames at the shop bays will be painted white semi-gloss.

Provide metal framed canopies above shop and personnel doors per the drawings.

#### Exterior Walls, Administrative Area:

Exterior walls will be infill 6" metal studs with R-19 batt insulation. From the outside in, construction will be:

Concealed fastener metal siding with Kynar Coating.

(2) layers 30 lb. Building paper

R-max insulated sheathing

6" metal studs with R-19 batt insulation.

Vapor barrier

5/8" type X GWB

## **Exterior Walls, Shop Bay Wings :**

From the outside in, construction will be:

Concealed fastener metal siding with Kynar Coating.

(2) layers 30 lb. Building paper

R-max insulated sheathing

Vertical metal furring strips at 16" oc

Pre-engineered metal building system girts. Girts will be filled with "energy saver" type fiberglass insulation with integral vapor barrier.

FRP covered 1/2" plywood panels on interior side of exterior shop walls areas up to 8' above finish floor.

## **Interior walls (except Wash Bays)**

Interior walls will be 4" metal studs with 5/8" type X GWB each side unless other wise noted.

Plastic laminate wainscot and WP GWB at restroom walls. Showers to be fiberglass single piece units, ADA accessible.

## **Floors**

The Maintenance Building shop floors will be sealed concrete with surface hardener. Floors will have hydronic radiant heating in shop areas.

Administrative Area floors on the first floor will be sealed concrete.

All Admin Area floor perimeter footings will have 2" rigid insulation at the perimeter.

All shop areas and wash bays will have 2" rigid insulation at the perimeter and 2" rigid insulation under all slabs with radiant heat.

## **Wash Bays:**

Roof and Ceiling: per the shop bays.

Walls: North wall will be CMU with 2" rigid insulation adhered to the inside face of the wall, vapor barrier, with concealed fastener vertical metal siding.

South Wall: Concealed fastener vertical metal siding on vapor barrier over R-max sheathing on metal studs. Wall will be on 6" curb.

## **Other Building Elements**

### ***Shop Doors***

Sectional insulated steel overhead doors. Overhead Door series 591 with electric motor with interior pushbutton operation. R-value approximately R-16. Doors sizes as noted on the plans.

Wash Bay Doors:

Due to freeze problems associated with metal doors used in wash bays, it is proposed to use insulated polypropylene doors. The sill at these doors should be heat traced to reduce freezing of the door to the sill, which could provide premature burn out of the door motor. Assume American Garage Door Supply model Survivor Gold 14'X14' with window lites. (www.carwashdoors.com)

### ***Equipment***

Lifts: Provide (1) new two-post hydraulic lift, (1) new in-ground parallelogram lift, (1) new six-post portable lift. Relocate existing four-post lift from existing facility to Fleet Bays. Relocate existing portable lift to Street Shops. See plans for capacities.

Generator: 250 KW standby generator with 200 gallon tank.

### ***Exterior Man Doors***

Insulated hollow metal with hollow metal frames, painted.

### ***Interior Doors***

Admin areas: Wood doors, birch veneer, in hollow metal frames.

Shop areas: Hollow metal with Hollow metal frames.

### ***Windows***

Thermally-broken, Kynar coated aluminum windows with double glazing.

### ***Lockers and Restrooms***

Floors in locker room: Sealed Concrete sloped to drains.

Ceilings and Walls: Water resistant GWB.

Lockers: Large, perforated, ventilated lockers with adjacent dry-off stand, with hooks and boot rack.

### ***Second Floor Offices***

Floors: Carpet tile

Walls: GWB

Ceiling: Acoustic tile

### ***Second Floor Restrooms***

Floors: Carpet tile

Walls: GWB

Ceiling: Acoustic tile

### ***Elevator***

Two-story, holeless hydraulic Thyssen Krupp AMEE 4500, or equal.

### ***Sprinkler***

Wet sprinkler system provided through-out. Dry sprinkler system at Fuel bays.

### ***Bridge Crane***

Size and capacity as noted on the plans.

### ***Furnishings:***

Cabinetry only in first floor Break Room and Laundry Room.

## **STRUCTURAL BASIS OF DESIGN**

### **Design Criteria**

- Refer to sheet S0.01 for design loads.
- Design Frost Depth is 32 inches

### **Codes and Standards**

- International Building Code, 2003 Edition.
- American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures SEI/ASCE 7-02
- American Institute of Steel Construction, Allowable Stress Design, 13<sup>th</sup> Edition.
- American Institute of Steel Construction, Seismic Provisions for Structural Steel Buildings, ANSI/AISC 341-02
- American Concrete Institute, Building Code Requirements for Structural Concrete ACI 318-02.
- Steel Deck Institute, SDI Publication 26, Design Manual for Composite Decks, Form Decks, and Roof Decks
- Steel Deck Institute, Diaphragm Design Manual.

## General Building Description

As described in the architectural section, the Maintenance Building will be constructed as three structurally separate units, sharing a concrete foundation. The core of the “L” is a two-story structure framed as follows:

- The ground floor is 4” slab on grade at the Administration Areas.
- The second floor is 2-1/2” concrete fill over 1-1/2” steel deck for a total thickness of 4”. The slab will be reinforced to control slab deflections and cracking. The floor deck will be supported by steel wide flange beams and girders. The floor deck will be composite with the beams and girders to increase the stiffness and strength of the floor systems.
- The roof deck is 1-1/2” steel decking spanning over steel open web joists. The joists will be supported by wide flange girders.
- The columns will typically be hollow structural steel sections supported on concrete footings.
- The lateral load resisting system will be special steel concentric braced frames.

The wings of the building that comprise the Streets Bays, Fleet Bays and Wash and Fuel Bays are one-story structures utilizing a pre-engineered metal building system.

- The slab on grade in the wings will be 6” thick to provide the required strength for vehicle loading and accommodate reinforcing and radiant floor system within the slab.
- The conventionally framed core structure will be isolated from the pre-engineered portions of the structure above ground level with seismic separation joints.

## MECHANICAL BASIS OF DESIGN

### Heating, Ventilating, and Air Conditioning (HVAC)

#### 1. General:

The primary energy source for heating will be either electricity or #2 fuel oil. The selection will be based on CBJ review of the separate “Energy Life Cycle Cost Analysis”. Oil has historically been the more common type of heating energy source in most of building HVAC applications, but the low cost of electricity in CBJ relative to present oil prices makes electric boilers an attractive option. There will be two boilers, each sized to handle approximately 2/3 of building heating load, connected in parallel to provide redundancy in the event of maintenance or boiler failure. The hydronic system will consist of duplex hot water circulation pumps, pot feeder for water treatment, bladder type expansion tank and other necessary hydronic components housed in the mechanical room. The heating hot water will consist of 30% propylene glycol mixture for freeze protection. There will not be any central space cooling system because the cooling design temperature in Juneau is 69 deg F which is lower than indoor cooling design temperature of 76 deg F. If necessary, split system air conditioners will be

provided where internal heat gain is estimated to exceed the cooling capacity of outside air, such as server room, electrical room or any other spaces identified by cooling load analysis. Control of the HVAC system will be through direct digital control (DDC) system, which will provide remote access and a graphical interface to items such as air flow rates, fan status, pressure differential readings in each zone, control of VFDs, etc.

2. HVAC systems by spaces:

- General office, lobby, conference rooms, administration areas and similar normally occupied spaces will utilize heating hot water generated from boilers that circulate heating hot water to a heat and vent unit for pre-heating and fan terminal units for additional zone control.
- Shop areas for vehicle repair and similar shop spaces will use heating hot water radiant floor heating. In addition, heat and vent units fitted with hot water coils will be used to provide required tempered 100% outside ventilation air of 1.5 cfm/SF. These HV units will include plate type energy recovery heat exchangers to preheat outdoor air with exhaust air.
- Maintenance bays where 100% outside air is required to meet the ventilation code specified in International Mechanical Code will require large amount of heating energy to temper outside air to comfortable range. To reduce the energy consumption while meet the indoor air quality (IAQ) requirements, indoor air quality monitoring will be specified. The IAQ monitor will have air sampling ports throughout the maintenance bays and perform real time monitoring of indoor air quality to allow DDC system to recirculate 50% of space air. According to the separate "Energy Life Cycle Cost Analysis", the cost of IAQ monitoring will be paid back in relatively short time by saving heating energy.
- Special ventilation will be provided for those processes requiring area specific ventilation such as welding area, sign shop, lube storage room and vehicle wash bays. Also vehicle tail pipe exhaust systems will remove vehicle exhaust directly from the sources when vehicles need to run in maintenance bays for testing.

3. Reference codes:

2003 International Mechanical Code

2003 International Fuel Gas Code

ANSI/ASHRAE/IESNA Standard 90.1-2004

ANSI/ASHRAE Standard 62.1-2007

## Plumbing

1. General:

A single 8" water main will be branched to serve fire sprinkler, domestic water, process water and make-up water for hydronic system. A water meter will be located in first floor mechanical room metering all domestic water usage in the building except fire sprinkler system. Isolation valves, strainer, pressure reducing valves and reduced pressure principal backflow preventers will be mounted to meet the requirements of different types of building water system. Pipe sizes will be per the International Plumbing Code. Above ground piping



will be Type L hard-drawn copper. Fittings for hard-drawn copper will conform to ANSI B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

2. Domestic Hot Water:

Domestic hot water will be generated by a plate type heat exchanger using space heating hot water generated by boilers as a heating source and stored in an insulated storage tank. Heat exchanger will be NSF certified double wall construction suitable for potable water use and installed with temperature relief valves, heat trap and expansion tank. System temperature will be set at 120°F. Small cartridge type in-line circulation pump will circulate small amount of domestic hot water throughout the first floor bathrooms for instant hot water at each fixtures. For remote fixtures with low hot water usage such as the two second floor restrooms, hot water will be furnished with instantaneous heaters to save piping and operating cost. All domestic hot and cold water pipes and all exposed traps for handicapped lavatories will be insulated in accordance with applicable codes.

3. Plumbing Fixtures:

- Water closets and urinals will be wall mounted vitreous china type with low flow flushometer.
- Sinks will be counter mounted.
- Restrooms will have floor drains fitted with automatic trap primers.
- Hose bibbs will be located in every other bay in maintenance areas. Piping serving the interior hose bibbs will have both hot and cold water available. Outside hose bibbs will be non-freeze type with locations as shown on the drawings.

4. Sanitary Sewer:

- Sanitary drain system will use cast iron soil pipe.
- Service bays will be fitted with trench drains near doors and heavy duty floor drains in each bay. Trench drains and floor drains will discharge to oil/water separators prior to connection to the sanitary sewer.

5. Reference codes:

2003 Uniform Plumbing Code

ASHEAE 90A

City and Borough of Juneau Water Utility Code

City and Borough of Juneau Sewage Works Utility Ordinance

## **Fuel Dispensing System**

The new fuel dispensing system will use a 10,000 gallon above ground diesel storage tank and a 5,000 gallon above ground gasoline storage tank. Both tanks will be UL 2085 fireguard type. If No. 2 oil fired space heating boiler is selected for space heating, 5,000 gallon gasoline tank will be replaced with 10,000 gallon two compartment tank which stores 5,000 gallons of No. 2 oil and gasoline in each compartment. The above ground storage tanks will be UL 2085 fireguard with all appurtenances included as packaged system – remote fill valves at grade level, two dispensers, tank level gauges, platform on top of the tanks with access ladders and tank vents.

The inventory control of the vehicle fueling system will be done by access card system which requires magstrip card or user's manual input.

## **Compressed Air**

- A. A duplex compressor, appropriately sized receiver and refrigerated air dryer will be provided for shop compressed air needs. The location of compressed air equipment will be in the wash equipment room to isolate noise and vibrations away from offices.
- B. Galvanized iron piping will be used for distribution of shop compressed air.
- C. Filter, Regulator, Lubricator (FRL) assemblies will be provided at locations where needed with quick connect couplings for air hose connections.
- D. Overhead reels will be provided where needed for compressed air hose drops as shown on drawings.
- E. Dry pipe portion of fire sprinkler system and vehicle wash system will be connected to central compressed air system for their compressed air needs. The connections to each system will have FRL assemblies.

## **Fluid Distribution System**

- A. A fluid distribution system using welded steel piping will be provided to distribute vehicle maintenance fluids such as chassis grease, engine oil, ATF, gear oil, engine coolant, and compressed air and electric power.
- B. Drums of above fluids to be stored in the lube storage room with air operated stub pumps to distribute the vehicle maintenance fluids to the points of use shown on drawings.
- C. Overhead hose reels mounted on trapeze type drops will be used for the end point distribution of the vehicle maintenance fluids.

## **Vehicle Lifts**

- A. A 26' 50,000 lbs capacity parallelogram lift will be provided in Fleet Bay No.4. The lift will be recess mounted so that the retracted position of the lift to be flush with the floor when not in use. The recessed portion of floor slab will have floor drains in the center. The power unit with control panel will be mounted next to the lift.
- B. A 90,000 lbs capacity 6-post portable column lift will be provided in Fleet Bay No. 3.
- C. Existing 4-post lift will be relocated to Fleet Bay No. 7.
- D. A 15,000 lbs capacity 2-post lift will be provided in Fleet Bay No. 8.

## **Vehicle Wash System**

- A. Two stage touchless wash system:  
Automated two stage touchless wash system will be provided in the large wash bay. The main advantage of this drive-through system will be the ability to wash an entire fleet of equipment, including heavy and light trucks with or without attached accessories, trailers, equipment on trailers, cars, vans, buses and any specialty fleet. The system will consists of following components:

- Reclaimed water system: Reclaimed water systems will use 95% recycled water with 20 or more gallons of fresh water introduced to the pits through fresh water rinse and soap mixing. Only small amounts of water will go out to sanitary sewer through oil/water separator.
- Chemical arches for two-step cleaning and rinsing: There will be several arches mounted with nozzles for soap spray and high pressure water cleaning. The two step cleaning will have two dedicated arches – one for low PH soap and another one for high PH soap.
- Chassis wash nozzles: There will be nozzles mounted in the pit to clean underbody of vehicles that go through the wash system
- Photo eyes and ground detection loop: To provide a system that is operable in cold weather, the wash bay will have doors with ground loop for door automation. Photo eyes will detect the vehicle position throughout the wash cycle to synchronize the various states of cleaning.
- Rain water collection for makeup water will be investigated during final design to see if the system would be feasible in terms of operation and maintenance cost versus water savings.
- Ancillary equipment – pumps, chemical tanks and control equipment.

B. Small Wash Bay:

There will be small wash bay next to automated touchless wash bay. This space will facilitate cleaning of small vehicles and equipment using plug-in type or gas engine high pressure portable washer. The bay will have water connection and electrical outlets for the pressure washer and sump in the middle of bay for sediment collection and drain. Drain will be connected to oil/water separator.

## Fire Sprinkler

1. General:

The building will be protected with a conventional wet-pipe automatic sprinkler system in conditioned spaces and dry-pipe system branch will serve unconditioned space such as fuel dispensing area. The compressed air for dry-pipe system branch will be tapped off from central duplex compressed air system. The water supply is adequate to provide 1250 gpm for Extra Hazard Group 2 requirements according to static and residual pressure information provided by the CBJ Water Utility. Hose streams will be 500 gpm for Extra Hazard Group 2 taken at the closest hydrant to the area (not the water supply source).

2. Classification of occupancies and water demand:

- Office area:  
Light Hazard  
0.1 gpm/ft<sup>2</sup>

- Maintenance Bays:  
Ordinary Hazard Group 2  
0.3 gpm/ft<sup>2</sup>
  - Fuel dispensing area  
Extra Hazard Group 2  
0.4 gpm/ft<sup>2</sup>
3. Reference codes:  
2003 International Fire Code  
2006 NFPA 13  
City/Borough of Juneau Code Title 30  
City and Borough of Juneau Code Title 32

## ELECTRICAL BASIS OF DESIGN

Following is an analysis of the projected electrical loads at the site based upon site visits to existing facilities as well as review of proposed plans. :

### Maintenance Building (proposed basic bid)

Power

- |                                    |         |
|------------------------------------|---------|
| • Mechanical Equipment             | 108 KVA |
| • Air Compressors                  | 60 KVA  |
| • Shop Equipment                   | 60 KVA  |
| • Shop Receptacles, Doors, etc.    | 12 KVA  |
| • Office/Admin/Lockers Receptacles | 35 KVA  |
| • Lighting                         | 32 KVA  |

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Total 301 KVA - Connected

200 KVA - Demand (Estimated)

### Street Maintenance Storage (future)

$(3.0 \text{ watts/sq. ft}) \times (7,515 \text{ sq. ft}) = 30.0 \text{ KVA}$

### Sand Storage (future)

$(2.0 \text{ watts/sq. ft}) \times (14,400 \text{ sq. ft}) = 29.0 \text{ KVA}$

### Street Maintenance Covered Vehicle Storage (future)

$$(2.0 \text{ watts/sq. ft}) \times (12,165 \text{ sq. ft}) = 26.0 \text{ KVA}$$

### Fleet Maintenance Vehicle Storage & Wash (bid alternates)

Fuel	(3.0 watts/sq. ft) x (2,500 sq. ft)	= 7.5 KVA
Storage	(2.0 watts/sq. ft) x (2,500 sq. ft)	= 5.0 KVA
Wash	(4.0 watts/sq. ft) x (2,000 sq. ft)	= <u>8.0 KVA</u>
		21 KVA

The total anticipated connected load is 407 KVA. The total peak estimated demand load (that which is energized at any given time) is 250 KVA.

The standby power needs of the facility can be handled by a single generator located at the Maintenance Building. A 250 KW genset is proposed. The cost difference between a smaller standby generator for just the loads needed during a power outage (75 KW) is \$45,000. However the cost to add additional standby generator panels and step down transformer is \$30,000. Therefore the net cost to the project to have the entire facility on standby power versus some lighting, some office power, and a few shop loads is \$15,000.

The electrical power distribution on-site will be provided with one underground service to the Maintenance Building. The other buildings can be fed from this building.

The service voltage will be 277/480V, 3 phase. The utility power, telephone, and TV services will be provided to the site overhead across Glacier Highway to a new utility pole at the intersection of the new access road and Glacier Highway, then underground to a transformer. The Maintenance Building will then be fed underground from the transformer. The telephone and TV services will be routed underground directly from the new utility pole.

Cut-off pole mounted site lighting will be distributed around the facility and yard. The lighting in the maintenance bays will be fluorescent high bay luminaires. These are more cost efficient as they can be turned on instantly and thus will not remain energized throughout the day for intermittent activity in the bays. The lighting in the mechanical/storage/parts areas is provided with surface wraparound fluorescent with energy efficient T5 lamps. The office areas are lit with a direct/indirect luminaire that is mounted in the suspended ceiling. It also uses T5 lamps for energy efficiency.