AK DOT: HAINES MAINTENANCE & OPERATION STATION

DESIGN NARRATIVE

REPORT RSI-14034AN-MO_HAINES

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TABLE OF CONTENTS

1.0 BACKGROUND: 6

2.0 PRIMARY GOALS AND OBJECTIVES 6

3.0 DESIGN CRITERIA 7

4.0 GENERAL ARRANGEMENT / ARCHITECTURAL DESIGN 7

4.1 GENERAL DESCRIPTION 7

4.2 BUILDING DESIGN CRITERIA 8

4.3 BUILDING LAYOUT 8

4.4 EQUIPMENT 9

4.5 MATERIALS 9

4.5.1 Exterior Walls: 9

4.5.2 Interior Partitions: 9

4.5.3 Ceilings: 9

4.5.4 Roofing: 9

4.5.5 Doors & Windows: 10

4.5.6 Floors: 10

4.5.7 Interior finishes: 10

4.6 CODE ANALYSIS 11

5.0 STRUCTURAL DESIGN 21

5.1 Code & Occupancy 21

5.2 Vertical Load Summary 22

5.3 Wind Load Summary 22

5.4 Seismic Load & Design Summary 23

5.5 Performance & SERVICEABILITY Criteria 25

5.6 Foundation Design Criteria 25

6.0 CIVIL DESIGN 25

6.1 GENERAL DESCRIPTION 25

6.2 existing site conditions 26

6.3 SITE DEMOLITION 26

6.4 SITE DESIGN CRITERIA 27

6.5 base bid civil design 27

6.6 m&O office space addition (alternate 1) 31

6.7 FUTURE SAND STORAGE FACILITY (alternate 2) 31

6.8 35% DESIGN EVAPORATION LAGOON – NOT USED 31

6.9 OWNER COORDINATION ITEMS 32

7.0 ELECTRICAL DESIGN 33

7.1 CODE REFERENCES AND STANDARDS 33

7.2 GENERAL 33

7.3 LIGHTING 33
7.4 UTILITY DISTRIBUTION 33
7.5 Main Building Power Service 34
7.6 General Power 34
7.7 Mechanical Equipment 34
7.8 Headbolt Heater Outlets 34
7.9 Fueling Station 34
7.10 GROUNDING 35
7.11 CLASSIFIED AREAS 35
7.12 TELECOM 35
7.13 FIRE ALARM SYSTEM 35
7.14 SECURITY 35

8.0 MECHANICAL DESIGN 35

8.1 DESIGN CRITERIA 36
8.2 DESIGN CONDITIONS 36
8.3 PLUMBING SYSTEMS 36
8.3.1 Fixtures 36
8.3.2 Hose Bibs 36
8.3.3 Lavatory/Faucets 36
8.3.4 Water Closet 36
8.3.5 Shower 36
8.3.6 Kitchen/Break Room Sink 36
8.3.7 Clothes Washer Box 37
8.3.8 Laundry Sink 37
8.4 Piping Material 37
8.5 Domestic Hot Water 37
8.6 Floor Drains 37
8.7 Trench Drains 38
8.8 Wash Bay 38
8.9 Oil/Water Separator 38
8.10 Emergency Equipment 38
8.11 COMPRESSED AIR 38
8.11.1 Materials 38
8.11.2 Air Compressor 39
8.11.3 Distribution Points 39
8.12 PETROLEUM OIL LUBE (POL) 39
8.12.1 8-module lube oil racks will be provided in maintenance bay at designated locations 39
In addition to the 9 POL bulk fluids, each station will be provided with a compressed air hose reel. 39
8.12.2 Separate stations 39
8.13 FUEL OIL DELIVERY AND STORAGE 39

8.13.1 Vehicle Fuel Dispensing....39
8.13.2 Heating Fuel Storage....39
8.13.3 Day Tank and Fuel Pump Set....39
8.13.4 Piping and Valves....40
8.13.5 Generators: No emergency electrical generator is planned for this facility....40
8.14 HEATING SYSTEM....40
8.14.1 Heat Generation....40
8.14.2 Liquid Heat Transfer....40
8.14.3 Distribution....40
8.14.4 Heating System Components....40
8.14.5 Radiant Floor System....40
8.14.6 Hydronic Terminal Units....41
8.14.7 Installation....41
8.14.8 Used Oil Heater....41
8.15 EXHAUST SYSTEM....41
8.15.1 General....41
8.15.2 Vehicle Exhaust System....41
8.15.3 Garage General Exhaust....42
8.15.4 Equipment Warm Storage and Wash Bay Exhaust....42
8.15.5 Restroom Exhaust....42
8.15.6 Clothes Dryer Exhaust....42
8.15.7 POL and Hazmat Storage....42
8.16 VENTILATION SYSTEMS....42
8.16.1 General....42
8.16.2 Garage Ventilation....43
8.16.3 Garage Destratification....43
8.16.4 Office Ventilation....43
8.16.5 Boiler Room Ventilation....43
8.16.6 Mechanical Cooling....43
8.16.7 Humidification....43
8.17 WELDING....43
8.17.1 General....43
8.17.2 Materials....43
8.17.3 Welding Room Exhaust....44
8.17.4 Portable Welding Fume Extractor....44
8.18 CONTROL SYSTEM....44
8.19 Sand Storage Build....44
8.19.1 Plumbing system:....44
8.19.2 Heating System:....44
8.19.3 Exhaust system:....44

APPENDIX A - SOIL MANAGEMENT PLAN 45
APPENDIX B – CIVIL CUTSHEETS 46
APPENDIX C – MECHANICAL CUTSHEETS 47
APPENDIX D – ELECTRICAL CUTSHEETS 48

LIST OF TABLES

TABLE	PAGE
Table 1 - Code and occupancy requirements.	21
Table 2 – Floor load summary, vertical.	22
Table 3 – Wind load summary.	22
Table 4 – Seismic Force Resisting Systems Summary	23
Table 5 - Seismic Response Spectra for ASCE 7-16 and ASCE 7-22.	24
Table 6 – Serviceability, story drift, and seismic performance requirements	25
Table 7 – Foundation design criteria	25

LIST OF FIGURES

FIGURE	PAGE
Figure 1 - Location of the planned structure.	7
Figure 2 – Two period seismic response spectra per ASCE 7-16 and ASCE 7-22 for reference	24

1.0 BACKGROUND:

The existing DOT&PF Maintenance Station at Haines is located east of the 6th Avenue and Main Street intersection. The original shop building used by DOT&PF was constructed in 1957, most likely to support the Haines-Fairbanks pipeline and local road construction. The shop underwent repairs/upgrades in 1988 due to fire damage. Only minor repairs to maintain the facility have been performed since the 1988 project. Currently, a lot of time is spent on building maintenance to keep the facility in operation.

There are constant electrical problems, furnace issues, and roof leaks. Maintenance personnel have a difficult time keeping the existing electrical wiring operational. The floor in the existing shop is uneven and the new-style road equipment barely fits into the facility. In a nutshell, the building is well past its service life and is creating an unsafe work environment.

In anticipation of constructing a new maintenance facility the State acquired an adjacent lot directly to the north. The intent is to build the new facility on the north lot and make best use of the combined lots for operation; equipment cold storage, fuel tanks, sand storage, etc.

In addition to the need for a new maintenance shop for the above stated reasons, the existing shop is reported to contain exposed asbestos and lead. The ground underneath the building is also contaminated, as classified with the ADEC. The current project does not anticipate the inclusion of such efforts, but it is recommended that a future phase provide for the safe demolition of the existing building and remediation of the site. Future efforts will include environmental site assessments to characterize the type and extent of contamination.

2.0 PRIMARY GOALS AND OBJECTIVES

The primary goal is to develop a design for a new maintenance shop to replace DOT&PF's existing shop building at the Haines Maintenance Station. The conceptual building design closely follows the layout of the shop designed at the Jim River Maintenance Station. The building design is intended to integrate User Group requirements related to typical maintenance operations to create a functional and versatile facility housed within an efficient building. The floor plan layout attempts to coordinate spatial adjacency concerns with adequate circulation areas for vehicles and maintenance personnel. The schematic drawings and discipline narratives have been developed to allow the State to review and provide input.

3.0 DESIGN CRITERIA

The replacement building will be located near the intersection of 6th & Main Street Haines, Alaska, see Figure 1. The Maintenance Shop will be a structural steel building with matt concrete foundation. The roof will be supported by a metal deck over wide flange beams spanning between heavy steel girders beams along major column lines. The lateral force resisting system will consist of a metal deck welded to roof structure to form a horizontal diaphragm. The roof diaphragm will transfer lateral wind and seismic loads to perimeter collector beams and into concentric braced frames along eave end walls and moment resisting frames along the gable end walls. These frames will transfer the lateral forces down to foundation elements and distribute them into the soil. Horizontal girts will span between perimeter columns to support wall panels. The columns along each side of the shop area will be designed to support the added gravity and lateral loads from the 10 ton capacity overhead traveling bridge crane. The second floor framing will consist of steel beams spanning between girders supported from center columns. A reinforced concrete slab over steel form deck will span between floor beams.

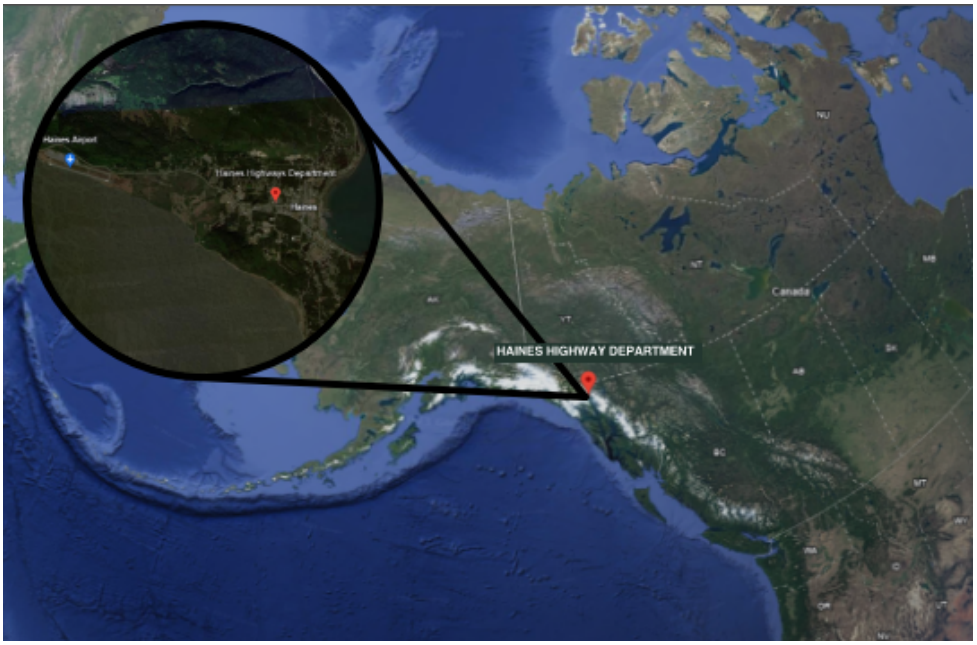

Figure 1 - Location of the planned structure.

4.0 GENERAL ARRANGEMENT / ARCHITECTURAL DESIGN

4.1 GENERAL DESCRIPTION

The new building will provide the Haines M&O Station with a shop designed and equipped to perform all maintenance and repair work on their heavy equipment and to provide a warm storage area for DOT&PF's vehicles and equipment used for highway maintenance and snow removal operations.

4.2 BUILDING DESIGN CRITERIA

The design of the Maintenance Shop will comply with applicable building codes including any amendments enforced by local jurisdictions and governing authorities. Design criteria will meet with the approval of State agencies while conforming to Federal requirements. The garage design will meet the provisions of the following references:

- International Building Code, 2021 Edition
- International Fire Code, 2021 Edition
- Americans with Disabilities Act, ADA Accessibility Guidelines for Buildings and Facilities
- National Fire Protection Association (NFPA) 101, Life Safety Code

4.3 BUILDING LAYOUT

The floor configuration of the new 17,065 SF shop building contains both a 23-10-foot and a 25-foot-wide by 103-8-foot-long drive-through equipment bays, a 25-foot-wide by 103-8-foot-long warm storage bay and a 23-10-foot wide separated wash bay. The two drive-through shop bays are divided from the warm storage area by a 20-foot-wide band that includes spaces for offices and a break/conference room, toilet facilities, lockers, parts storage and a small vehicle bay. Adjacent to the equipment bays is another 20-foot-wide by 90 foot long bay includes spaces for welding, Lube Storage, a Machine shop, a tire shop and a light duty bay with lift. Storage, boiler/pump and a fan room are located upstairs.

Structural building columns are confined to a grid pattern throughout the project except at grid 3 allowing free access between adjacent bays. On the shop side of the facility there is an overhead bridge crane to assist with lifting operations involving heavy equipment. The opposite side of the building contains a 25-foot by 103-8-foot area to be used as an equipment warm storage garage. The washbay will provide additional warm vehicle storage space when not in use.

The partitioned area between the garage and shop will house the offices, a break/conference room, toilet facilities, lockers, a unisex toilet room and a separate unisex toilet and shower room which will be designed to comply with ADA requirements. A small vehicle bay is located at the end of this area between Grids 4 and 5 and A and B. A stair next to the parts room will allow access to a second floor area located 14 feet above grade level. The second floor will contain storage, boiler/pump and a fan room. Man doors for individual rooms and along the building perimeter will be located and configured to comply with building code exiting requirements.

The building will be of Type II-B non-rated construction and will not be sprinklered. The building area was calculated based on the most restrictive occupancy in the building, the S-1 Group occupancy (moderate hazard). With an area increase for building frontage, the total allowable area per floor is 30,625 SF. The total area of the proposed building footprint is 17,065 SF. In order to avoid sprinklering the building, rated separation walls will be required to separate the vehicle repair and storage bays into separate fire areas. Please refer to the detailed code review in Section F for more information.

4.4 EQUIPMENT

The shop and garage areas will have central trench drains between equipment bays with an oil separator and wastewater holding tank. The shop will be equipped with a 10-ton capacity overhead traveling bridge crane, a sub-floor mounted vehicle lift, compressed air, ventilation systems for welding and vehicle exhaust, deep sink, water hose bibs, pressure washer, emergency eye wash/shower, petroleum lube station, HazMat storage locker, and welding table. Additional equipment for this facility will include a workbench, steel shelving units, and portable fire extinguishers.

4.5 MATERIALS

The different buildings on the site will share a palette of materials and colors. This will ensure a 'family' appearance between the buildings and provide a unified overall look. Building assemblies and materials are discussed in detail below:

4.5.1 EXTERIOR WALLS:

Preformed insulated 24" wide wall panels with a factory finished 22 gage metal exterior face with striated pattern, interior 26 ga liner panel, and foamed-in-place 4" insulation core. A protective 8-foot-high treated plywood wainscoting painted white will be installed at interior wall surfaces in all shop and garage areas. The insulated metal panel thermal envelope will be protected by an exterior wainscot of nominal 4" thick hollow split-face CMU with metal cap flashing, exterior corners at building and to utilize L-corner blocks.

4.5.2 INTERIOR PARTITIONS:

Metal studs with gypsum wallboard sheathing each side and fiberglass batt insulation as required to limit sound transmission.

4.5.3 CEILINGS:

The offices, toilet, shower, locker rooms, training and crew areas shall have drop ceilings of gypsum board or suspended acoustical tile per reflected ceiling plan. The mechanical rooms and parts room will be open to the floor framing above. The shop/garage areas and second floor will be open to the structural framing above. Structural decking shall be painted white to maximize light within the space. Major exposed support beams and columns to be painted an accent color.

4.5.4 ROOFING:

The roof shall be designed with a standing seam insulated metal roofing panel of R-40.5 ci thermal performance over structural framing. The metal roof will have a minimal pitch to limit building height and reduce wind resistance. Eave ends will extend 8 ft and be fully enclosed.

4.5.5 DOORS & WINDOWS:

The doors and frames shall be of hollow metal construction, insulated at exterior locations and fire rated as required at interior rooms. All doors to the exterior shall have independently supported canopies (3' deep by 4' wide minimum) to protect personnel from falling ice and snow. Door openings to allow vehicle access into the shop and garage areas shall be 16 feet wide by 16 feet high at all pull-through bays and 12 feet wide by 10 feet tall at the small vehicle bays. The vehicle access will be insulated steel sectional overhead doors with thermal glazing at eye level, electric operators with push button stations and remote operators, and a backup manual chain hoist. Exterior windows shall be insulated fiberglass frames with 1-inch insulated glazing units provided in the offices only. Insulated translucent fiberglass sandwich panels, thermally broken with minimum 4" thickness and certified system U-Factor of 0.16 minimum will be located above each overhead sectional door.

4.5.6 FLOORS:

The floors for the garage and shop areas shall consist of reinforced concrete slabs-on-grade, sloped towards a central trench drain, and finished by treating with a harder and sealer. The second floor will consist of sealed concrete slab over metal decking to provide a strong and durable surface of fire-resistant construction for storage applications and equipment support. Offices and training rooms shall have Luxury Vinyl Tile flooring with 20 mil wear layer minimum and rubber base. Toilet room floors shall be tile with a tile cove base.

4.5.7 INTERIOR FINISHES:

- Wash bay to have moisture and corrosion proof panels installed to 20' high above finished floor. Backing at interior walls to be waterproof membrane and vented wall cavity at exterior walls.
- Locker rooms to have full welded lockers 12" wide x 15" deep, by 72" tall.
- The main bathrooms to have tiled walls. The alternate 1 bathroom to have rigid vinyl sheet wall protection on all walls 4' high and paint finish above with one wall painted an accent color. Showers to be prefabricated ADA compliant insert. Above each sink an 18" x 36" channel frame mirror shall be provided.
- Break Room to have melamine thermoset panel cabinets with laminate faces and 3mm PVC edging and solid surface countertops with ADA accessibility at double bowl sink. One wall to have an 8' white board with marker tray and cork tack strip above. The adjacent wall to have 50" flat screen TV with data and power. Floors to be LVT with rubber base. Door to have integral half lite.
- Crew Area open to bays shall have melamine thermoset panel cabinets with laminate faces and 3mm PVC edging and solid surface countertop and backsplash adjacent to Commercial grade washer and dryer units. Where open to bays, half height walls to have solid surface wall caps. Floors to be LVT with rubber base and painted walls with one accent painted wall.

- Offices to have LVT flooring with rubber base and painted walls with one accent painted wall. Doors to have integral half lites.
- Metal fabricated stair to be painted and have abrasive treads with accent painted handrail and guardrail.
- All exterior corners to have 8' high 3" mechanically fastened metal corner guards.

4.6 CODE ANALYSIS

International Building Code (IBC) 2021 Edition, International Fire Code (IFC) 2021 Edition

Chapter 1 - (Administration) Not Applicable

Chapter 2 - (Definitions) Not Applicable

Chapter 3 - Use and Occupancy Classification

Section 303.1.2 (Assembly Group A) – An assembly space accessory to a Group B occupancy is not required to be classified as a separate Group A space, provided that it meets the requirements of Exceptions 1 or 2 by:

a) Having an area smaller than 750 SF, or
b) Having an occupant load of less than 50 people

The break room may be classified as part of the surrounding B occupancy.

Section 304.1 (Business) The offices would be classified under the B occupancy group.

Section 307 (High-Hazard Group H) – Per Table 307.1, a building may contain a certain maximum amount of hazardous materials, such as flammable or combustible liquids, without having to store those materials in a separate H group occupancy. The code permits these materials to be stored in a *control area* that has less strict requirements than a true H occupancy.

Per Table 307.1, the maximum allowable amount of flammable/combustible liquids *per control area* is as follows:

Combustible Liquid		
Class II	Class IIIA	Class IIIB
120 Gallons	330 Gallons	13,200 Gallons

Flammable Liquid		
Class IA	Class IB	Class IC
30 Gallons	120 Gallons	120 Gallons

The Table allows increases of the maximum quantities if the materials are in a sprinklered building, or they are stored in approved storage cabinets or containers. This building will not be sprinklered, but if the increases for approved storage cabinets are applied, the maximum amounts increase as indicated below:

Combustible Liquid		
Class II	Class IIIA	Class IIIB
240 Gallons	660 Gallons	26,400 Gallons

Flammable Liquid		
Class IA	Class IB	Class IC
60 Gallons	240 Gallons	240 Gallons

The hazardous materials expected to be used in the building are hydraulic fluid, engine lubricant oil, and anti-freeze products for vehicle engines. The typical flashpoint for hydraulic fluid is between 300 and 400 degrees Fahrenheit. The typical flashpoint for automotive or diesel engine oil is 425 to 460 degrees Fahrenheit. Antifreeze products typically have a flashpoint of about 240 degrees Fahrenheit. All three of these products would be classified by the IBC as Type III B combustible liquids. Per the chart above, the building users could store a total of 26,400 gallons of a Class III B combustible liquid using all four control areas allowed for the first floor.

Section 311 (Moderate-Hazard Storage Group S-1) - The occupancy that most closely resembles the use of the maintenance and wash bays in the building is an S-1 occupancy.

Chapter 4 – Special Detailed Requirements Based on Use & Occupancy

Section 414.2 (Control Areas) – In a non-sprinklered building, a certain amount of hazardous materials may be stored in a building without creating a separate Group H space. Provided the building users do not store a greater quantity of hazardous materials than allowed by Table 307.1, the hazardous materials may be stored in a control area. This control area is essentially a room defined by one or two hour-rated construction at floor/ceiling and walls.

Per Table 414.2.2, the building may have up to four control areas on the first floor. Each of these control areas may contain 100 percent of the maximum amount of hazardous materials allowed per control area by Table 307.1 The same table requires that these control areas would need to have one hour-rated walls and ceiling to separate them from other spaces beside or above them.
Number of control areas allowed (First Floor): 4 control areas
Minimum wall and ceiling/floor assembly rating: 1 hour

Using the maximum allowable amount of hazardous materials permitted from Table 307.1, the theoretical total amount of hazardous materials that could be stored on the first floor without creating a special H group occupancy is as follows:

Combustible Liquid		
Class II	Class IIIA	Class IIIB
240 Gallons/control area	660 Gallons/control area	26,400 Gallons/control area
X 4 control areas	x 4 control areas	x 4 control areas
= 960 Gallons total	= 2,640 Gallons total	= 105,600 Gallons

Flammable Liquid		
Class IA	Class IB	Class IC
60 Gallons	240 Gallons	240 Gallons
X 4 control areas	x 4 control areas	x 4 control areas
= 240 Gallons total	= 960 Gallons total	= 960 Gallons total

Note that this is an 'either X or Y' situation. The owner could store up to 960 gallons of Class II, or 2,640 Gallons of Class IIIA, or the maximum allowable amount of one of the other types of materials, but not all of them at once. Only four control areas total are allowed on the first floor. It would be possible to store a combination of different hazardous materials in each control room.

For purposes of the building code, a group of maintenance bays may be considered a control area if they are separated from surrounding spaces by the required one hour-rated construction. The entire building could also potentially be considered a single control area for the purposes of the IBC.

Chapter 5 - General Building Heights and Areas

Section 504-506 - (General Height and Area Limitations) - Per Tables 504.3, 504.4, and 506.2, the following are the maximum allowable areas per floor and building heights for each occupancy group in the building, assuming Type II-B nonsprinklered building construction:

Group S-1:	17,500 SF	2 stories	55 Feet
Group B:	23,000 SF	3 stories	55 Feet

Section 506 (Building Area Modifications) – The code permits the allowable area of the building to be increased if it has access to a public way, or the building is sprinklered throughout. Using the most restrictive of the occupancy groups (S-1) the allowable area per floor would be as follows:
Total Allowable Area = Allowable Area per story (Aa) + (Aa X If) + (Aa X Is)
Total Allowable Area = 17,500 SF + (17,500 SF X 0.75) + (17,500 SF X 0*) = 30,625 SF per floor
Total Actual Area of proposed building (first floor) = 17, 065 SF
Total actual area is less than the maximum allowable area per floor.
(*See Section 506.3 below for sprinklers.)

Section 506.3 (Frontage Increase) - Per Section 506.3 - Every building which has more than 25 percent of its perimeter on a public way or open space having a minimum of 20 feet in width shall be allowed to increase its allowable area per floor based on the formula below:
If = [F/P - 0.25]W/30
If = [440 Ft/440 Ft - 0.25]30/30
If = .75 or 75%

Table 506.2 (Automatic Sprinkler Increase) A building protected throughout with an approved automatic sprinkler system may increase its allowed area by 200 percent for a building with more than one story. This area increase will not be used, as the building will not be sprinklered and the allowable area will be sufficient for the footprint required.
Section 508.3 (Nonseparated Occupancies) – The code permits the area of the allowable area of the building to be determined using the most restrictive of the occupancies present in the building. If the requirements are met for this occupancy, no separation is required between the occupancy groups under this section.
Section 508.4 (Required Separation of Occupancies) – Per Table 508.4, no separation is required between an S-1 and a B occupancy.

Chapter 6 - Types of Construction

Table 601 - Per Table 601, fire resistance rating requirements for Type II-B building elements are as follows:

Structural Frame - 0 hrs
Nonbearing Walls and Partitions (Exterior) - 0 hrs where building is ≥ 30 feet from a property line.
Floor construction - 0 hrs
Roof construction - 0 hrs

Section 603 - (Combustible Material in Type I and II Construction) - Per Section 603.1, combustible materials area allowed in buildings of Type I or II construction in particular applications. These include:
1.-1.3) Fire retardant treated wood in roof construction, including girders, trusses, framing and decking,
2.) Thermal and acoustical insulation, other than foam plastics, with a flame spread index of not more than 25,
13.) Mastics and caulking materials applied to provide flexible seals between components of exterior wall construction, and
15.) Nailing or furring strips as permitted by Section 803.4.
21.) Sprayed fire-resistant materials and intumescent and mastic fire-resistant coatings, determined on the basis of fire resistance tests in accordance with Section 703.2 and installed in accordance with Sections 1705.15 and 1705.16, respectively.

Chapter 7 - Fire Resistance Rated Construction

Section 707 – (Fire Barriers) Per Section 707.3.9, fire barriers separating different occupancy groups shall have a fire-resistance rating of not less than that required in Table 508.4.

Per Section 707.3.10, fire barriers separating a single occupancy into different fire areas must have the rating required in Table 707.3.10. The Table requires a 3 hour-rated fire barrier to divide up S-1 fire areas. The Table requires a 2 hour-rated fire barrier to divide up S-2 fire areas. Where a fire barrier is separating fire areas of mixed occupancy, the fire resistance rating shall be the highest value required by Table 707.3.10 for the occupancies under consideration.

Example: If a fire barrier is separating an S-1 from an S-2 fire area, the fire barrier must have a 3-hour rating, even though Table 508.4 would normally require only a 2 hour rating.

Per Section 707.5, fire barriers shall extend from the top of foundation or floor to the underside of the floor or roof above and be securely attached to it.

Per Section 707.6, openings in a fire barrier must be limited to a maximum aggregate width of 25% of the length of the wall. The maximum area of any single opening shall not exceed 156 SF. Under Exception 3, these limits do not apply if the opening protective has been tested in accordance with ASTM E 119 or UL 263 and has a minimum fire rating not less than the fire-resistance rating of the wall.

Per section 707.9, voids created at the intersection of a fire barrier and a non-fire-resistance-rated roof assembly shall be filled.

Chapter 8 - Interior Finishes

Section 803 - (Wall and Ceiling Finishes) Per Table 803.9, Group S and B occupancies without sprinklers must have the following classes of interior finishes:

Group S-1: Exit enclosures and passageways - Class B (Flame spread 26-75; smoke developed 0-450)
Corridors - Class B
Rooms and enclosed spaces - Class C (Flame spread 76-200; smoke developed 0-450)

Group B: Exit enclosures and passageways – Class A (Flame spread 0-25 ; smoke developed 0-450)
Corridors – Class B
Rooms and enclosed spaces – Class C

Chapter 9 - Fire Protection Systems

Section 903 - Automatic sprinkler systems are to be provided in new buildings and structures according to the provisions of this section. Per Section 903.2.9, buildings with Group S-1 fire areas over 5,000 square feet for the storage of commercial trucks or vehicles must have sprinklers throughout. Per Section 903.2.10.1, a Group S-1 fire area used for the repair of commercial trucks or buses where the fire area is over 5,000 square feet must have sprinklers throughout the building.

Buildings shall also have sprinklers throughout if the combined area of all Group S-1 fire areas on all floors exceeds 24,000 square feet. Rated fire barrier walls will be required to divide the S-1 group occupancy into fire areas smaller than the 5,000 square foot threshold for sprinklers.

According to Section 903.2.9.1, a sprinkler system is required through buildings used for storage of commercial trucks or buses where the fire area is larger than 5,000 square feet.

Section 906 (Fire Extinguishers) - Portable fire extinguishers shall be provided in occupancies and locations according to the International Fire Code. Per Section 906.1 of the IFC, portable fire extinguishers shall be required in new and existing Group S occupancies. Per Table 906.3, maximum travel distance to a fire extinguisher in an ordinary hazard occupancy shall be 75 feet.

Per Section 907.2 of the IFC, an approved manual, automatic or manual and automatic fire alarm system installed in accordance with NFPA 72 shall be provided in new buildings and structures in accordance with Sections 907.2.1 through 907.2.23, unless other requirements are provided by another section of the code. These provisions are not applicable to an S occupancy that is less than three stories in height per 907.2.10. The number of occupants in the B occupancy is below the amount that would require a manual fire alarm system under Section 907.2.2. No alarm system is required.

Chapter 10 - Means of Egress

Section 1004 (Occupant Load) The occupant load for the building is determined by the maximum floor area allowances per occupant under Table 1004.5. The following factors for area are used:
Parking garage – 200 Gross SF per occupant
Accessory storage/ mechanical equipment room – 300 Gross SF per occupant
Business area – 150 Gross SF per occupant

<u>First Floor</u>
S-1 maintenance bays
10,446 SF / 200 Gross SF per occupant = 54 occupants.
S-1 parts & tool storage area
279 SF / 300 = 1 occupants
S-1 lube, machine shop, tire shop & welding
1,992 SF / 200 = 12 occupants
Break Room/Conference
579 SF / 150 SF per occupant = 4 occupants
Offices
234 SF/ 150 SF per occupant = 2 occupants

First Floor Total = 73 occupants

Add Alternate #1
Break Room/Conference
200 SF / 150 SF per occupant = 2 occupants
Offices/Workroom
466 SF/ 150 SF per occupant = 4 occupants

Total w/Add Alt #2 = 79 occupants

Second Floor

Boiler space
328 SF / 300 Gross SF per occupant = 2 occupants
Fan room
466 SF / 300 SF per occupant = 2 occupants
Storage
963 SF / 300 SF per occupant = 4 occupants
Second Floor Total = 8 occupants

Section 1005 (Minimum Egress Width) The minimum egress width in a building is as follows: 0.3 inches per occupant at stairways and 0.2 inches per occupant at all other egress components.

Exiting Width Calculation
First Floor
79 occupants x .2 = 15.8 inches of required egress width for doors
Second Floor
8 occupants x .3 = 2.4 inches of required egress width for stairway

Section 1008 (Means of Egress Illumination) The means of egress, including the exit discharge, shall be illuminated at all times the building served by the egress is occupied. Per Section 1008.3.1, in the event of a power supply failure, an emergency electrical system shall automatically illuminate exterior landings for exit discharge doorways in buildings required to have two or more exits.

Section 1010 (Doors Gates and Turnstiles) Means of egress doors shall provide a minimum of 32 inches of clear egress width. The height of doors shall not be less than 80 inches. There shall not be projections into the clear width lower than 34 inches above the floor or ground. Projections into the clear opening width between 34 and 80 inches above the floor or ground are not to exceed 4 inches. Doors are to swing in the direction of egress travel where serving an occupancy of 50 persons or more. Per Section 1010.1.4, there shall be a floor or landing on each side of a door at the same elevation on each side of the door. Per Section 1010.1.5, Landings shall have a width not less than the width of the stairway or door. When a landing serves and occupancy of 50 or more, doors in any position shall not reduce the landing to less than one half its required width. Per Section 1010.1.6, thresholds at doors shall not exceed .5 inches in height.

Section 1011 (Stairways) The minimum width of stairs shall be 44 inches. Per exception 1, stairs serving an occupant load < 50 shall have a minimum width of 36 inches. Stairway shall have a minimum head height of 80 inches (6 feet 8 inches). Stair risers shall be a maximum of 7 inches and a minimum of 4 inches tall. Stair treads shall be a minimum of 11 inches deep.

Stairway landings shall be provided at the top and bottom of each stairway. The width of the landings shall not be less than the width of the stairways they serve. Each landing shall have a

minimum dimension measured in the direction of travel equal to the width of the stairwell. Enclosures under stairs shall be protected by construction with a minimum fire resistance rating of 1 hour, or the same rating as the stairway enclosure, whichever is greater.

A flight of stairs shall not have a vertical rise of more than 12 feet between floor levels or landings. Stairways shall have handrails on both sides that comply with Section 1014.

Section 1013 (Exit Signs) – Exit signs are required to be placed such that no point in an exit access corridor is more than 100 feet from the nearest visible exit sign. Per Section 1013.1, Exception 1.) Exit signs are not required in rooms or areas that require only one exit or exit access.

Section 1014 (Handrails)
Handrails shall be positioned not less than 34 inches or more than 38 inches above the stair as measured to the nose of the stair tread. Handrail gripping surfaces shall be continuous, without interruption by newel posts or other obstructions. Handrails shall return to a wall, guard, or the walking surface, or be continuous to the handrail of an adjacent stair flight. Where handrails are not continuous, the handrails shall extend horizontally at least 12 inches beyond the top riser, and continue to slope for at least one tread depth beyond the bottom riser. The handrail shall extend in the same direction as the stair flight.

Section 1016.2 (Exit Access) – Egress through intervening spaces is acceptable in a Group H, S or F occupancy when the adjoining or intervening rooms or spaces are the same or a lesser hazard group occupancy

Section 1030.8 (Common Path of Egress Travel)
Exception 1 – For areas serving less than 50 occupants, the common path of egress travel shall not exceed 75 feet.

Section 1006.3.4 (Exit and Exit Access Doorways) - Per Table 1006.3.4, areas with the following maximum occupant loads may have a single exit:
B occupancy – 49 occupants
S occupancy – 29 occupants

Section 1017 (Exit Access Travel Distance) - Per Table 1017.2, in a nonsprinklered S, or B occupancy, the maximum allowable distance to access an exit is as follows:
S – 200 Feet
B – 200 Feet

Section 1006 (Number of Exits and Continuity) - Per Table 1006.3.3, a building story with an occupant load of 1-500 requires a minimum of 2 exits, except as modified by Table 1006.3.4.

Per Table 1006.3.4, stories with the following maximum occupant loads may have a single exit:
First story
B occupancy – 49 occupants & 75 feet travel distance

S occupancy – 29 occupants & 75 feet travel distance
Second story
B occupancy – 29 occupants & 75 feet travel distance
S occupancy – 29 occupants & 75 feet travel distance

Note: Travel distance to an exit from the second story has been interpreted by the Fire Marshal to mean the distance from the remotest point on that story to the first floor level – *including the length of the stairway.*

Section 1023 (Exit Enclosures) – Interior exit stairways and exit ramps shall be enclosed with fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 711, or both. Exit enclosures shall have a fire resistance rating of not less than one hour where connecting less than four stories.
Under Exception 1, a stairway in other than Group H or I occupancies is not required to be enclosed if it serves an occupant load of <10 and the stair is not open to more than one story above its level of exit discharge. The occupant load of the second floor is 8 occupants. The stairway is not required to be enclosed under this section.

Section 1028 (Exit Discharge) - Exits shall discharge directly to the exterior of the building. The exit discharge shall be at grade or provide direct access to grade.

Chapter 11 Accessibility

Section 1103 - Per Section 1103.2.3 - Spaces and elements within employee work areas shall only be required to comply with Sections 907.9.2, 1007 and 1104.3.1, and shall be designed and constructed so that individuals with disabilities can approach, enter and exit the work area.

Chapter 12 Interior Environment

Section 1204 - Lighting - Every space intended for human occupancy shall be provided with natural or artificial light adequate to provide an average illumination of 10 foot candles over the area of the room at a height of 30 inches above the floor level.

Section 1208 - Occupiable spaces, habitable spaces and corridors shall have a ceiling height of not less than 7 feet 6 inches.

Chapter 13 Energy Efficiency - Section 1301 ties the International Energy Code into the IBC by reference.

Chapter 14 Exterior Walls

Section 1403.2 - Exterior walls shall provide the building with a weather-resistant exterior wall envelope. The exterior wall envelope shall include flashing designed to prevent moisture from entering the wall or redirect it and the exterior wall envelope shall be designed in such a way as to prevent the accumulation of water within the wall assembly.

Chapter 15 Roof Assemblies and Rooftop Structures

Section 1505 - Per Table 1505.1, the minimum roof covering classification for II-B building construction is Class C (light fire-test exposure.)

Chapter 16 Structural Design - Standard code required minimum design values
Chapter 17 Structural Tests and Special Inspections - Standard code required test procedures
Chapter 18 Soils and Foundations - Standard code required minimum design values
Chapter 19 Concrete - Standard code required material properties and tests
Chapter 20 Aluminum - Standard code required material properties and tests
Chapter 21 Masonry - Not Applicable
Chapter 22 Steel - Standard code required material properties and tests
Chapter 23 Wood - Not Applicable
Chapter 24 Glass and Glazing - Not Applicable
Chapter 25 Gypsum Board and Plaster - Not Applicable
Chapter 26 Plastic - Not Applicable
Chapter 27 Electrical
Chapter 28 Mechanical Systems
Chapter 29 Plumbing Systems
The IBC includes standards for the minimum number of fixtures required, but the Authority Having Jurisdiction (AHJ) for this project is the Alaska State Fire Marshal. The state refers to the Uniform Building Code 1997 Edition to determine the minimum number of required fixtures. (Appendix 29, Table A-29-A)

Table A-29-A calculates the minimum number of fixtures according the number of occupants in each occupancy group. The minimum number of fixtures would be as follows:

IBC 2021 Table 2902.1:

Business	Water Closets	Lavs	Drinking Fountains
Men/Women	1: 25 2:50 >55, +1:50	1:40	1 per 100

Storage	Water Closets	Lavs	Drinking Fountains
Men/Women	1: 100	1:100	1 per 1000

Group B (100 SF / occupant)

Group B First Floor
Break Room
580 SF / 100 SF per occupant = 6 occupants
Offices
235 SF/ 100 SF per occupant = 3 occupant

Total of 9 occupants = 1 WC, 1 lav

Group S (200 SF / occupant)

Group S First Floor
S-1 maintenance bays
10,983 SF / 200 Gross SF per occupant = 55 occupants.
S-1 parts & tool storage area
276 SF / 300 = 1 occupants
S-1 lube, machine shop, tire shop & welding
1,583 SF / 200 = 8 occupants

Group S Second Floor
Boiler space
325 SF / 300 Gross SF per occupant = 2 occupants
Fan room
465 SF / 300 SF per occupant = 2 occupants
Storage
965 SF / 300 SF per occupant = 3 occupants
Second Floor Total = 7 occupants

Total of 71 occupants = 1 WC, 1 lav

Total Required Fixture Count: 2 WCs, 2 lavs = 2 unisex restrooms

Section 2902.4.1 - In occupancies other than covered malls, the path of travel to the required facilities may not exceed 500 feet.

Chapter 30 Elevators and Conveying Systems - Not Applicable
Chapter 31 Special Construction - Not Applicable
Chapter 32 Encroachments in the Public Right of Way - Not Applicable
Chapter 33 Safeguards during Construction - Standard code required job site safety measures
Chapter 34 Existing Structures - Not Applicable

5.0 STRUCTURAL DESIGN

5.1 CODE & OCCUPANCY

The building configuration will be roughly 16,800 SF and contain multiple equipment bays. The equipment bays will contain hazardous materials, which played a role in determining the building occupancy classification.

Table 1 - Code and occupancy requirements.

Code Requirements	Description
Governing Building Code	2021 IBC & Local Amendments
Occupancy Category	S-1 Moderate-Hazard Storage Group

Risk Category		II – Normal risk
Importance Factors	Snow - I_s	1.0
	Ice - I_i	1.0
	Wind - I_w	1.0
	Seismic - I_e	1.0

5.2 VERTICAL LOAD SUMMARY

Superimposed dead loads are in addition to the self-weight of the structure (framing and floor or roof deck), see the detailed calculations for derivation. The snow loading is based on the ASCE 7-16 requirements and site-specific snow load research conducted by UAA and peer reviewed by the SEAAK snow load committee. Additional loading at the building eaves caused by overhanging snow, curling over the eaves, is likely to occur. A summary of the vertical loads is provided in Table 2.

Table 2 – Floor load summary, vertical.

Load Type	Location / Variable	Area Load	Concentrated Load
Superimposed Dead	Roof	15 psf	-
	Mezzanine	10 psf	-
	Exterior Walls (total dead load)	10 psf	-
Live	Roof	20 psf	-
	Stairs & Landings	100 psf	0.3 kip
	Second Floor Mezzanine	125 psf	2 kip
	Crane Loads	-	10 Ton
Snow	Ground (P_g)	185 psf	-
	Balanced Roof	143 psf	-
	Eave & Overhang Roof	156 psf	-
	Unbalanced Snow	188 / 43 psf , Over 32 ft from ridge	
	Snow curling at eave perimeter	600 plf	

5.3 WIND LOAD SUMMARY

Wind loading is based on the ASCE 7-16 design standard. The ultimate wind speed is used to evaluate the Main Wind Force Resisting System. Story drift under wind loading is evaluated with the 25-year MRI wind speeds.

Table 3 – Wind load summary.

Wind Criteria	Description	Reference
Wind Speed (ult)	125 mph (3-second gust)	ASCE Hazard Tool
Wind Speed (25MRI)	96 mph	ASCE Hazard Tool

Exposure Category	C	Surface roughness C
Enclosure Classification	Enclosed	ASCE 7-16 Chapter 26
Topographic Factor (K_{zt})	1.00	ASCE 7-16 Chapter 26, Google Earth
Wind Pressures	See detailed calculations for MWFRS & C&C wind pressures	

**MRI = Mean Recurrence interval*

5.4 SEISMIC LOAD & DESIGN SUMMARY

Seismic loading is based on the ASCE 7-16 design standard. The soil site class is unknown and Class D-Default was used in calculations. A summary of the seismic loading information is provided in Table 4, and the seismic response spectrum is shown in Figure 2.

Table 4 – Seismic Force Resisting Systems Summary.

Seismic Criteria	Description	Reference
East – West Direction: *Moment Frames*		
Response Modification Factor, R	4.5	Intermediate Moment Frames, ASCE 7-16 Table 12.2-1
Overstrength Factor, Ω_o	3.0	
Deflection Amplification Factor C_d	3.0	
Redundancy Factor, ρ	1.0	Sufficient frames are present on the exterior perimeter
North - South Direction: *Braced Frames*		
Response Modification Factor, R	3.25	Ordinary Concentrically Braced Frames, ASCE 7-16 Table 12.2-1
Overstrength Factor, Ω_o	2.5	
Deflection Amplification Factor C_d	3.25	
Redundancy Factor, ρ	1.3	This may change to 1.0 when we finalize the design

Table 5 - Seismic Response Spectra for ASCE 7-16 and ASCE 7-22.

Wind Criteria		Description	Reference
Site Soil Class		E	Geotechnical report & ASCE 7-16 Section 11.4.3
Seismic Design Category		D	ASCE 7-16 Table 11.6-1 & 2
Short Period	F_a	1.2	ASCE 7-16 Table 11.4-1 & Section 11.4.8 Exception 1
Long Period	F_v	2.4	IBC 2021 Table 1613.2.3.(1) & ASCE 7-16 & Section 11.4.8
Spectral Parameters	S_s	1.11 g	ASCE Seismic hazard tool, USGS Seismic Design Maps, ASCE 7-16
	S_1	0.55 g	
	S_{DS}	0.89 g	ASCE 7-16 EQ 11.4-4 with Exceptions per 11.8.4
	S_{D1}	0.89 g	
	S_{DS}	1.05 g	ASCE 7-22, 2-Period response spectra
	S_{D1}	1.05 g	
	$S_{a\ (East-West)}$	1.16	ASCE 7-22, Multi-Period response spectral acceleration
	$S_{a\ (North-South}$	0.90	East-West = Moment Frames & North South = Braced Frames
	PGA	0.5 g	ASCE Seismic hazard tool, USGS Seismic Design Maps
	PGA_M	0.6 g	

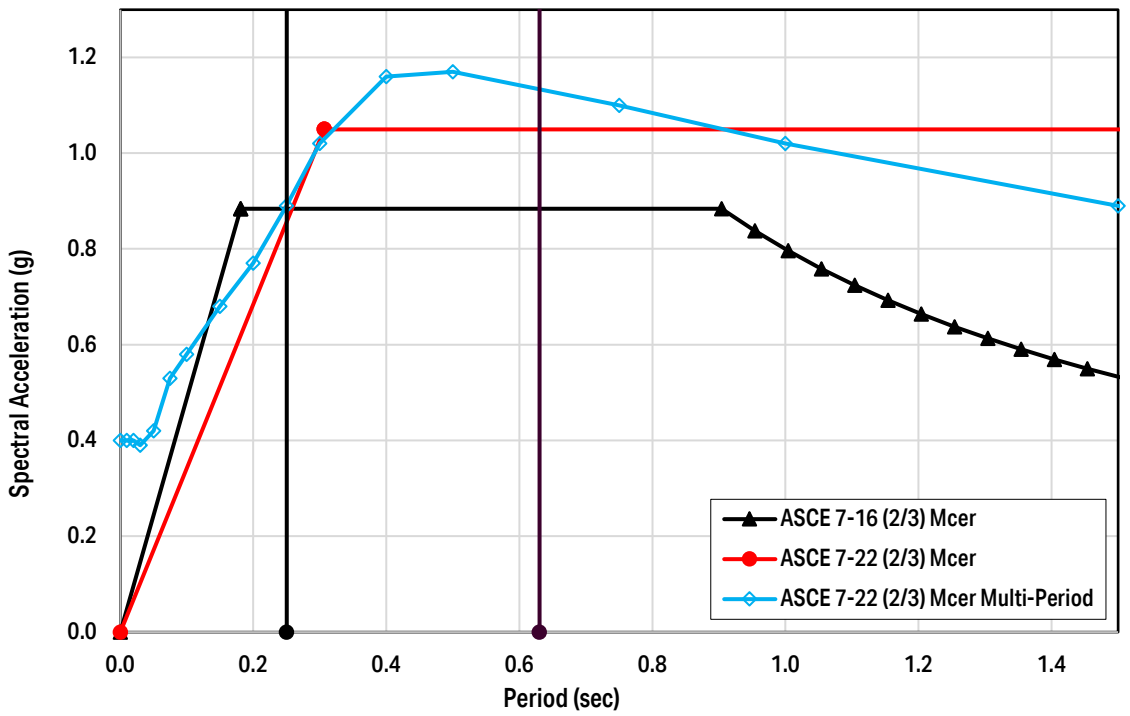

Figure 2 – Two period seismic response spectra per ASCE 7-16 and ASCE 7-22 for reference

5.5 PERFORMANCE & SERVICEABILITY CRITERIA

The deflection criteria are based upon the standard IBC requirements. The seismic performance goals for the Seismic Force Resisting System is based on the standard requirements for a Risk Category II structure. A summary of the deflection, and performance requirements is provided in Table 6.

Table 6 – Serviceability, story drift, and seismic performance requirements.

Building Component		Live	Snow or Wind	Dead + Live or Snow
Roof Members		L / 240	L / 240	L / 180
Floor Members		L / 360	-	L / 240
Crane Rails Beams		L / 600	-	-
Seismic Story Drift		2.0% of Story Height		
Wind Story Drift		0.25% of Story Height at 25-year MRI wind speeds		
Seismic Performance	Design *(2/3) MECr*	Life Safety	Structural performance goals for Risk Cat. II buildings designed to the 2021 IBC.	
	MCEr	Collapse Prevention		

5.6 FOUNDATION DESIGN CRITERIA

The foundation design criteria is based on the geotechnical recommendation by Shannon and Wilson. The foundation will be a 2ft mat slab that will distribute building loading uniformly across the poor clay rich soils below. The mat slab will bear directly on at least 4ft of structural fill. Soil improvements consist of a surcharge loading the site for a min of 2 years prior to construction with 12ft of sand.

Table 7 – Foundation design criteria.

Foundation Design		Description	Reference
Bearing Capacity	Static	1,200 psf	Project Geotechnical Report by Shannon & Wilson
	Transient	1,600 psf	
At-Rest Pressure		56 pcf	Equivalent fluid pressure
Active Pressure		35 pcf	
Passive Pressure		400 pcf	
Coefficient of friction		0.4	Between CIP concrete & soil
Unit Weight – Structural Fill		135 pcf	Structural fill

6.0 CIVIL DESIGN

6.1 GENERAL DESCRIPTION

The project includes a base bid and two additive alternates. The base bid work is the proposed DOT&PF Maintenance & Operations (M&O) building, also referred to as M&O Shop and will be constructed on the

property north of the existing Haines M&O Station facilities. Additive Alternate No. 1 includes the addition of office space to the south side of the proposed M&O building. Additive Alternate No. 2 includes the construction of a Sand Storage Facility on the south side of the property, east of the existing DOT shop.

6.2 EXISTING SITE CONDITIONS

Background

The project is bounded on the west and north by Union Street, on the east by Sawmill Creek and on the south by the M&O Station. A geotechnical subsurface investigation, specifically for the M&O Station, was completed in October 2023 by Shannon & Wilson. Geotechnical recommendations for the M&O foundation system, earthwork for the foundation and vehicle parking area were provided.

In February 2024, a geotechnical field investigation memo was completed by Landslide Technology. A copy of this memo was provided to RESPEC by DOT&PF. Part of this work included a soil boring along Sawmill Creek, at the existing M&O Main Street driveway. Soil and groundwater conditions discovered at Sawmill Creek were similar to what was found during Shannon & Wilson's field investigation. Locations of the Shannon & Wilson soil borings and the soil boring logs are shown in the 95% Design Submittal plan set.

Soil Conditions

In general, the building site is overlain with 3 to 6 feet of cobbles, gravel, and sand fill material followed by silt to a depth of up to 22 feet below ground surface (bgs). Below silt a very soft clay occurs to bottom of the deepest soil boring, 44 feet bgs. At Sawmill Creek the flood damage assessment project drilled one soil boring, LT-1. Very soft clay is present from 13 feet bgs to 48 feet and, is underlain by clayey gravel to gravelly clay to very stiff clay to bottom of the boring, 76 feet bgs. From 13 feet bgs to bottom of the boring, soil is described as marine deposit.

Groundwater Conditions

During the October 2023 Shannon & Wilson field work, groundwater was observed at depths of 5 and 9 feet bgs. The depth to the groundwater corresponds to Sawmill Creek channel elevation. Sawmill Creek is approximately 160 feet east of the proposed M&O Shop's east wall and flows from north to south.

Stream Setback

Sawmill Creek is a State of Alaska Department of Fish and Game catalogued anadromous fish stream and, unless a variance is obtained, development within 25 feet of the existing Sawmill Creek channel edge is not allowed. Haines Borough Ordinance 18.60.010 defines the stream setback.

6.3 SITE DEMOLITION

The site demolition includes two phases. This allows the DOT maintain their operations without interruption throughout the duration of the project. The phases are summarized below:

Phase 1

This phase of work includes the removal and disposal of headbolt heater outlet posts, asphalt pavement removal and disposal to connect to the existing sewer main in Union Street, concrete slab on grade removal and disposal, clearing and grubbing, removal and disposal of the 18" CMP driveway culvert, removal and disposal of the perimeter fence, removal and disposal of stop signs and the M&O sign, removing and reinstalling the antenna tower from the existing shop, and the removal and salvage of the existing loading ramp and returning it to DOT.

Phase 2

Phase 2 is not to begin until the new M&O is complete and accepted by the Owner. This includes the removal and disposal of the existing Haines shop including the utility services, above ground fuel storage tank, concrete aprons, and headbolt heater outlet posts. According to the NESHAP Compliant Hazardous Materials Assessment Report by EHS Alaska Inc, dated March 2024, the existing Maintenance and Operation Station has potentially hazardous materials that will be affected by the demolition. The materials include asbestos, lead, polychlorinated bi-phenyls (PCBs), mercury, and radioactive materials. The removal of these materials is highly regulated and should be performed by a qualified contractor to safely remove and dispose of the hazardous building materials. The contractor shall review specification section 02 26 00 – Hazardous Materials Assessment for additional information, recommendations and requirements.

6.4 SITE DESIGN CRITERIA

The civil design for this facility will be developed in accordance with applicable standards and design criteria, include following:

1. State of Alaska Department of Environmental Conservation Water Regulations, November 13, 2022.
2. State of Alaska Department of Environmental Conservation Wastewater Regulations, October 1, 2023.
3. Haines Borough, 18.60.010, P. Anadromous Fish Stream Setbacks.
4. Geotechnical Recommendations, Haines ADOT&PF M&O Facility, Shannon & Wilson, April 2024.
5. Traffic Simulation for Design Vehicles:
    - Semi-Tractor with low-boy trailer.
    - Mack 64F Chassis with Sand Box and Plow.
    - Volvo G700 Series Motor Grader with Snowplow

6.5 BASE BID CIVIL DESIGN

The base bid civil design includes connection to the Haines Borough water and sewer system, power and telecom utilities, excavation, site grading, site drainage, 18" corrugated polyethylene pipe (CPP) installation, reinforced concrete aprons, asphalt surfacing, guardrail and headbolt heater outlet systems, perimeter fencing, a concrete fueling station, protection bollards, and a fuel tank slab. The design is further described below:

Building Location

Vehicle traffic simulation with the design vehicles was a critical part of verifying the new M&O Shop location and yard area shown. The building has been shifted 10' to the south to provide additional space on the north side of the building, and to provide for a more direct route into the garage bays for the operators. Traffic simulations showing vehicles leaving each bay have been modeled to confirm that operators can make fluid movements while exiting the garage bays and then leaving the site.

The building's 8-foot roof eave overhang is approximately 20 feet above finished floor elevation and will not interfere with yard vehicle traffic.

Water Service

Water service for the proposed M&O Shop will consist of a 2-inch diameter, SDR11, high density polyethylene (HDPE) pipe connecting to an existing 2-inch service stub-out located along Union Street. This water service stub-out was constructed in 2007 as part of a new 8-inch PVC water line installation. Dennis Durr, Water and Sewer Department Supervisor, Haines Borough, confirmed that this stub-out exists and it should be in good condition for the Shop water service hook-up. Two-inch HDPE pipe is available in a coil roll up to 500 feet in length meaning except for the riser, just inside the building line, a continuous length of pipe can be installed between the water main and building line without fusing. Fire water service for the M&O facility is not needed and, therefore water demand can be met with a 2-inch water service.

Minimum soil cover over top of water pipe for frost protection is 6' in Haines. Similar to the sewer service, the water pipe will lie beneath snow free areas and experience deeper, localized frost depth. To eliminate the risk of a frozen line a 2-inch layer of polystyrene rigid board insulation over the pipe is provided.

Sewer Service

The sanitary sewer service consists of a 4-inch PVC gravity flow pipe that will tie into an existing 8-inch polyvinyl chloride (PVC) Haines Borough sewer main located along the north side of Union Street. PVC is typically used by utilities in Southeast Alaska. Because the service sewer main connection fitting is under Union Street pavement, a restrained joint will be used for this fitting. While pullout at the saddle fitting is uncommon, it does happen. A restrained joint eliminates the risk of pullout.

An oil water separator (OWS), located in the Shop, provides treatment of non-domestic wastewater from the M&O facility before discharging to the City sewer. Interior plumbing combines OWS discharge with domestic wastewater upstream of the building's 4-inch sewer service and downstream of the OWS. Domestic wastewater is defined as water borne waste from human sanitation fixtures. Non-domestic wastewater at the M&O facility is from the vehicle bay floor drains. Dennis Durr was contacted to confirm, after pre-treatment with an OWS, the combined domestic and non-domestic Shop wastewater can be discharged to the Borough's sewer collection system.

The service is approximately 230 feet long and has one 45 degree bend downstream of the building cleanout. A 4" sanitary sewer cleanout is located at the 100' distance from the shop building and at the angle point for maintenance purposes.

Minimum soil cover over sewer pipe for frost protection is 5' in Haines. Because the pipe route will lie beneath snow free areas and experience deeper, localized frost depth, a 2-inch layer of polystyrene rigid board insulation over the pipe is provided.

Power & Communication Utilities

Power and telecommunication lines will be routed underground and installed by each of the utilities. Considering site vehicle traffic transformer location shown on the civil site plan is the preferred location.

Heating Oil Tank

A 4,000 gallon above ground heating oil tank will be installed on a reinforced concrete slab on the south side of the M&O facility, adjacent to the pedestrian door. The tank will be protected with concrete filled galvanized steel bollards on the three sides not facing the building. If alternate 1 is awarded, three bollards will be omitted from the west side of the tank as the tank will be protected by the additional office space added in the alternate.

Site Grading & Drainage

The proposed finish floor elevation is 51.0-feet. This finish floor elevation considers the 5 foot wide reinforced concrete aprons at the garage bays sloping away from the building at 1.75%, the aggregate surface course sloping at a 3%± slope from the aprons on the east and west sides, 3%± slope on the north side, 5%± slope on the south side. This finish floor elevation maintains yard elevation above Sawmill Creek's stream channel and allows the new grading to merge with the existing yard to the south and the Union Street entrance.

The existing 18" CMP driveway culvert will be replaced with a new 18" CPP culvert. CPP culverts are the standard that is used for storm drainage culverts in the southeast Alaska region. To get the recommended minimum soil cover of 1 foot over the new 18" CPP culvert, the inverts of the pipe will be lowered from the existing invert elevations.

The site drainage improvements include reditching 461LF of ditch from a high point on the north side of the property, east to the inlet of the new 18" CPP driveway culvert and from the outlets of the 18" CPP driveway culvert, downstream to the inlet of the existing 24" CMP culvert. This will include the removal of existing vegetation, reshaping of the ditch, and placement of 4" rock.

The site will include a 500LF biofiltration swale beginning at the high point of the ditch and will convey stormwater to the east and then south, eventually meeting Sawmill Creek. The biofiltration swale will allow surface drainage from the east side, and a portion of the north side to flow into the swale, reducing the sediment load prior to draining into Sawmill Creek.

The reditching will allow for 12" minimum of cover over the new 18" CPP culvert. Both the ditch and biofiltration swale will allow for the aggregate surface to have 3%± slope away from the facility and will allow a clear path for the storm water to sheet flow to a ditch or swale which will ultimately convey the stormwater away from the property.

Site Surfacing

Earthwork recommendations are provided in the Shannon & Wilson geotechnical site investigation. Earthwork recommendations for locations outside the building line are as follows:

- Separation geotextile installed at bottom of excavation over the subgrade.
- Where utility trenches occur under pavement, provide a 1.5H:1V slope at the subgrade excavation face.
- Asphalt Pavement Section:
  - 4" Asphalt
  - 4" D1 Base
  - 24" Subbase
- Aggregate Driving Surface Section:
  - 6" E-1
  - 12" Subbase
- Building Vehicle Aprons
  - 6" Portland Cement Concrete
  - 24" Subbase

Based on the standard practices used in the Southeast Alaska region, civil has revised the asphalt and concrete sections as follows:

- Asphalt Pavement Section:
  - 4" Asphalt
  - 6" D1 Base
  - 24" Subbase
- Building Vehicle Aprons
  - 12" Portland Cement Concrete
  - 6" D1 Base
  - 24" Subbase

Site Parking & Headbolt Heater Outlet System

The design includes space for thirteen (13) 10'x18' parking stalls along the west fence line, south of the vehicle access gate. The design includes a guardrail between the fence and parking stalls. There will be taller posts spaced every 20' to accommodate headbolt heater outlets. Each headbolt heater outlet will serve two vehicles. This differs from the previously shown individual posts in the 65% submittal. The heater locations will serve M&O office staff of 6 and overflow parking needs. Due to road maintenance vehicle traffic to and from the shop and around the building perimeter, and snow fall from roof, no staff parking is shown at the building perimeter.

The design includes seven parking spaces for road equipment south of the M&O facility. A similar guardrail and headbolt heater outlet system will be used in this area.

Site Fueling Station

The fuel station will be located to southwest of the new M&O facility. The station will include a reinforced concrete slab for the 500 gallon above ground gasoline storage tank and the 5,000 gallon diesel above ground storage tank (AST) and dispenser. The tanks will be protected by bollards on all four sides. The fuel station will include a 10" thick reinforced concrete slab for operators to drive on to fuel their equipment.

Site Fencing, Gates and Signage

The 8' tall perimeter fence will be installed along all sides of the property per DOT&PF standard detail F-01.04. Also included in the design is a 30' wide vehicular gate at the Union Street entrance and a 30' wide vehicular gate at the Main Street entrance. Both entrances will also have pedestrian access gates.

The vehicular gates will be motorized double leaf vertical pivot gates. This differs from the previously shown sliding gate in the 65% submittal. Each gate will have its own operator. The operators will be protected with steel bollards. The vehicle gates will have a 30' wide clear opening. This was determined by modeling the turning movements of the largest vehicle that will be operated out of the M&O facility. A stop sign will be mounted near the driveway, adjacent to the street at each vehicular gate. A Haines M&O sign will be mounted at the Union Street entrance as the new main entrance for the M&O Facility.

6.6 M&O OFFICE SPACE ADDITION (ALTERNATE 1)

The 95% Design submittal includes the addition of office space on the south side of the M&O facility. The addition of this space requires the addition of an accessible parking spot. The accessible parking spot will include an accessible stall, asphalt surfacing and striping, concrete sidewalk to connect the parking space with the building, accessible parking sign, and a concrete wheel stop.

If Alternate 1 is awarded, there will be three protection bollards that will be omitted from the bollards surrounding the heating oil tank on the south side of the building. The building will serve as protection for the west side of the heating oil tank, omitting the need for protection bollards on that side.

6.7 FUTURE SAND STORAGE FACILITY (ALTERNATE 2)

The 95% Design submittal includes a 4,000 square foot sand storage facility that is included in the project as Alternate 2. The alternate includes the following:

- 4,000 SF sand storage facility
- Concrete apron for vehicle access.
- Concrete door landing for staff access.
- Fuel storage tank on concrete slab with protection bollards.
- Protection bollards adjacent to the vehicle door and at the corners of the building.
- Excavation, structural fill placement, base course placement
- Gravel drainage swale & rock energy dissipator
- Aggregate surface course placement

6.8 35% DESIGN EVAPORATION LAGOON – NOT USED

An evaporation lagoon was included with the 35% Design Submittal. This lagoon was intended for treating non-domestic wastewater from the M&O Shop. The lagoon is removed from the design because the City of Haines accepts the Shop's wastewater after pre-treatment of the non-domestic portion, using an oil water separator.

6.9 OWNER COORDINATION ITEMS

The following is a list of items discovered during 95% design development that the Owner can provide direction on.

1. Is there a State of Alaska standard sign reference for the Maintenance Station facility sign?
2. Confirm if a motorized gate are wanted by DOT.

7.0 ELECTRICAL DESIGN

7.1 CODE REFERENCES AND STANDARDS

1. NFPA 70 - National Electrical Code, 2020
2. NFPA 30A – Motor Fuel Dispensing Facilities and Minor Repair Garages, 2018
3. IESNA – Illumination Engineering Society of North America, 10th Edition

7.2 GENERAL

The existing facility's electrical system is over 50 years old and has exceeded its designed life expectancy. During the May 2022 site visit Respec observed deficiencies in the service and distribution equipment, including installations out of compliance with the current NEC. Lighting seems to be appropriate and adequate, but the fixtures are outdated.
The existing shop's electrical service will remain in service under this phase of work and will be demolished as determined by the State at a later date.

7.3 LIGHTING

All lighting fixtures will be LED, both interior and exterior. Lighting levels will meet recommendations as determined by IESNA lighting standards; lighting in some areas may exceed minimum recommendations based on anticipated use or layout of the area.
Emergency lighting will be located throughout the building where required by code to allow egress in the event of power failure and will be powered from internal batteries. The wall-mounted lights over personnel doors will be powered by an inverter system in the case of power failure, providing egress lighting on the exterior of the building. UL 924 switching devices will be used to automatically switch over to battery power upon power failure. Exit signs will be placed along egress path where required by code.

In addition to general illumination and emergency lighting, two forms of wall-mounted task lighting will be provided: downward-facing task lighting in the shop areas, and outward-facing vaportight luminaires in the washbay to illuminate the sides and undersides of vehicles being washed.

Lighting in bays will be controlled with push-button switches via a contactor. Other interior lighting will controlled by a local switch. Exterior lighting will be controlled with a photocell.

7.4 UTILITY DISTRIBUTION

The existing overhead utility line passes over the lot, and very close to the new building. RESPEC proposes that the utility add a pole along Union Street and make a minor rerouting of the overhead line to keep it along the street and away from the building. A new pad-mounted service transformer will be installed at the base of the existing pole; alternatively the service transformer could be installed close to the west side of the building, in the area between the overhead doors.

7.5 MAIN BUILDING POWER SERVICE

The utility service entrance conductors will feed a main building circuit breaker disconnect on the outside of the building. The service for the new building will be three-phase, four-wire 208 volt; the estimated service size will be 600 amps at this time. The main building disconnect will feed a 600 Amp main distribution panel (MDP – Square D I-Line or similar). The MDP will feed nine 225 amp lighting and branch circuit panels, two headbolt outlet panels, one branch panel in the Sand Storage Facility, and large shop equipment such as an overhead crane. The MDP will be located in the boiler/pump room, with branch panels distributed throughout the facility nearest the point of load.

7.6 GENERAL POWER

The maintenance bays and Equipment Warm Storage will be supplied with 20 amp, 120 volt, NEMA 5-20R GFCI-protected, industrial grade duplex receptacle surface mounted every 20 feet minimum around the periphery of each bay. The receptacles will be mounted 48 inches above the floor, except in the wash bay, where weatherproof receptacles will be mounted at 36 inches in order to deconflict with the wall-mounted lights. Circuiting will be such that a maximum of 4 receptacles will be on a single circuit, with special considerations for use of space and special equipment.

The shop areas will include 20 amp, 120 volt, NEMA 5-20R, industrial grade duplex convenience receptacles on each wall. Spacing and location will be considered by the expected use of each space. All convenience receptacles in washrooms and around sinks will be GFCI type.
In addition to general power receptacles listed above, special equipment power will be provided:

- 208V/3PH power for Welders .
- 208V/3PH power for Commercial Dryer.
- 208V/3PH for Crane.

7.7 MECHANICAL EQUIPMENT

Mechanical equipment is described in the Mechanical narrative section. Power will be provided to all mechanical equipment as needed. Large motors (greater than 1HP) should be 3 phase and be powered from VFDs depending on local electrical utility requirements.

7.8 HEADBOLT HEATER OUTLETS

Headbolt heater outlets (HBO) will be provided in the general parking area and the outdoor equipment parking area. All 20 amp headbolt heater outlets will be energy efficient IPLC type. IPLCs will be supplied by GFCI circuit breakers. IPLCs save energy by adjusting the power output of the plug depending on the outside air temperature.

7.9 FUELING STATION

Power will be provided for the vehicle fueling and equipment station as needed for dispensing and lighting.

7.10 GROUNDING

No unusual grounding requirements are anticipated for the Haines site. Grounding will be done in accordance with NEC requirements to include copper ground rods, concrete-encased electrode ground (Ufer ground), the building steel, and main building water service (if metallic). The telecom systems will be connected to the main building ground.

7.11 CLASSIFIED AREAS

The shop and bay areas will be treated as Class 1 Division 2 areas up to 18 inches from the floor. In general, fixed mounted electrical switches, receptacles, controllers, and lighting fixtures are mounted at least 36 inches above the floor. The oil-water separator and drainage trenches will be regarded as Class 1 Division 1 spaces; electrical circuits are not planned in these areas, but, if provided, wiring in these areas will have to be suitable for the classification, or be downstream of an intrinsically safe barrier.

Rooms adjacent to the classified areas are not treated as classified areas because of mechanical ventilation at a rate of more than four air changes per hour. Areas in and around the fueling station dispensing will be considered classified in accordance with IAW NFPA 30A.

7.12 TELECOM

The Haines site has telephone service that is routed on the adjacent power poles. A new underground telephone cable will be routed to a telephone backboard located in the storage room. EMT conduits will be installed between the communication rack and telecom receptacles throughout the building. The telecom receptacle will be located adjacent to a convenience receptacle in the offices. The shop area will include telecom outlets, located as appropriate based on use of the room. Internet will be provided to computers in offices, parts room, and elsewhere as appropriate.

The radio equipment & antennae (ALMRS and local dispatching) currently located with the existing station will be salvaged and re-located to the new M&O building. The antennae, currently tower-mounted next to the building, will be mounted to a mast attached to the wall of the building at the west end. Radio equipment will be located and installed in a first floor office or according to customer preferences.

7.13 FIRE ALARM SYSTEM

A fire alarm system is not required and will not be provided for this project.

7.14 SECURITY

The entry gates on Union and Main Streets will be provided with electric operators and remote opening option so maintenance personnel can enter with minimal disruption.

8.0 MECHANICAL DESIGN

8.1 DESIGN CRITERIA

- International Mechanical Code (IMC) – 2021.
- Uniform Plumbing Code (UPC) – 2018.
- International Building Code (IBC) – 2021.
- International Fire Code (IFC) – 2021.
- ASHRAE Handbooks and Standards.
- Local Code Amendments.

8.2 DESIGN CONDITIONS

- Winter Design Temperature: 1°F.
- Indoor Design Temperature: 60°F.
- Indoor Office Design Temperature: 70°F.

8.3 PLUMBING SYSTEMS

8.3.1 FIXTURES

All plumbing fixtures shall be of commercial quality. Water closet, urinal, and lavatory will be vitreous china; counter top sink will be stainless steel construction. Plumbing devices will be low water consumption type where applicable. Plumbing fixtures and their installation shall conform to the Americans with Disabilities Act access requirements.

8.3.2 HOSE BIBS

Outside hose bibs will be freeze-proof with integral vacuum breaker and inside will be standard single faucet with 3/4-inch hose connection and vacuum breaker. Interior hose bibs in the equipment bay will be located away from overhead doors and other potential freezing locations.

8.3.3 LAVATORY/FAUCETS

Wall hung, vitreous china, concealed arm supports, faucet holes on 4-inch centers with single handle faucet with pop-up drain. Provide offset drain and ADA insulation. Point of use ASSE 1070 tempering valves will be provided in accordance with the UPC.

8.3.4 WATER CLOSET

Wall mounted vitreous china water closet with elongated siphon action bowl and rim at 16-1/8 inches above finished floor with white plastic open-front seat, exposed 1.6 gpf flush valve.

8.3.5 SHOWER

Showers will be modular stalls with pressure balanced anti-scald shower valves with high-limit stops, 2.0 gpm shower head with 6 ft flexible hose.

8.3.6 KITCHEN/BREAK ROOM SINK

Counter mounted double compartment 18 gauge stainless steel sink with self-rimming edge, sound deadening, 4-hole punching for faucet, 6-1/2 inches deep. Faucet to be 2.0 gpm, single handle, swing spout with integral handheld spray. Provide offset drain with basket strainer. No garbage disposal or "insta-hot". Provide insulation on hot and cold supplies and drain unless supplies and waste are concealed in casework.

8.3.7 CLOTHES WASHER BOX

A commercial clothes washer and dryer will be provided for the facility. A washer box with integral water hammer arrestors will be provided at the location.

8.3.8 LAUNDRY SINK

A stainless steel laundry sink will be provided with a wall mounted double handle faucet.

8.4 PIPING MATERIAL

All above grade domestic water piping will be Type L copper tubing conforming to ASTM B88 with ANSI 16.22 fittings. Below grade domestic water piping shall be HDPE matching that of the water service, piping shall be continuous where it is located beneath or in the slab.

Valves will be full-port bronze ball with a minimum pressure rating of 150 lb. class. Branch isolation valves will be provided for maintenance and repair. All fixtures and water supply equipment will be provided with isolation valves at the fixture or equipment.

Below-slab waste piping will be service weight CISPI 301 cast-iron hub and spigot with rubber gaskets, or no-hub with hubless joints with neoprene gaskets and stainless steel clamping bands. Piping underground exterior to the building will be service weight CISPI 301 cast iron hub and spigot with rubber gaskets, or no-hub with hubless joints and MG couplings. Above-ground waste piping will be cast iron with no-hub fittings, neoprene gaskets, and stainless steel clamping bands. Vent piping will be cast iron with no-hub fittings with neoprene gaskets and stainless steel clamping bands. Vent piping will terminate 24 inches above the roof surface.

Compressed air piping shall be ASTM A53 black steel with ASME B16.3 MI or ASME B16.11 steel screwed fittings.

8.5 DOMESTIC HOT WATER

Domestic hot water will be provided by a indirect-fired hot water generator utilizing boiler-supplied hot water with double walled heat exchanger. For the construction office a small point of use tank type will provide hot water to the restroom.

8.6 FLOOR DRAINS

Floor drains will be provided in the toilet room, boiler room, and fan room. Floor drain waste will be routed directly to the sanitary waste main. The floor drain traps will be protected by an automatic trap primer device or water closet drop tube.

8.7 TRENCH DRAINS

Trench drains will be located in the Garage and in the Equipment Warm Storage. Equipment Warm Storage trench drains are provided to capture snow and ice melt off from the vehicles.

Trench drains will be cast in place concrete with heavy duty steel or ductile iron grates. The drain line from the sand trap will slope at 1/8 inch per foot and will route to a sand trap collection sump. The effluent will gravity drain through the oil-water separator.

8.8 WASH BAY

A separate bay will be provided for manual vehicle wash down. Trench drains will be provided with sand traps. The effluent will be routed through the oil/water separator, but DOT purchasing will need to purchase soaps that will not affect the stored oil.

Two pressure washer stations will be provided. Water will not be heated.

8.9 OIL/WATER SEPARATOR

A 25 GPM, above ground oil water separator will be provided for this facility. A below grade collection basin before the oil water separator will also be provided to accommodate any surge flows from the trench drains and wash bay before being pumped into the oil water separator.

The oil water separator shall be an above grade, gravity displacement type separator capable of 25 GPM continuous flow. The effluent discharge shall not exceed 10 PPM of free oil and grease concentration. Oil storage capacity shall be approximately 30% of the total volume.

The effluent discharge of the oil water separator will also be routed into city sewer system.

8.10 EMERGENCY EQUIPMENT

A combination emergency shower and eye wash will be provided in the maintenance bays. The unit will be ANSI Z358.1 compliant, barrier free, free standing, with overhead deluge shower actuated by pull rod. The face wash will consist of a metal bowl, four spray heads with dust covers and be actuated by push flag.

Additional emergency face wash units will be located in other parts of the facility that cannot get to the shower unit per OSHA regulations.

Emergency showers and face washes will be fed from a central tempering valve located in the boiler room, next to the water heater.

8.11 COMPRESSED AIR

8.11.1 MATERIALS

The compressed air will be delivered to points of use by Schedule 40 black iron threaded pipe. Points of use will be hose reels with 50 feet of hose.

8.11.2 AIR COMPRESSOR

The air compressor will be located in the Tire Shop. Compressed air will be cooled and dehumidified by an air-cooled after-cooler.

8.11.3 DISTRIBUTION POINTS

Each vehicle bay will have access to compressed air as well as stationary maintenance equipment/tools such as POL dispensers, tire changing station, and hydraulic lifts. Additional points of connection with quick disconnects will be located at tool benches and other areas per the client's direction. Point of use oilers will be provided where appropriate.
No paint booth or sand blasting station is planned for this site.

8.12 PETROLEUM OIL LUBE (POL)

A central POL bulk storage station will be provided with pneumatic driven pumps. Distribution piping will be threaded black steel. Station will be designed to accept 55 gallon drums provided by the local POL supplier. POL bulk fluid storage will include 9 different lubricants/fluids.

8.12.1 8-MODULE LUBE OIL RACKS WILL BE PROVIDED IN MAINTENANCE BAY AT DESIGNATED LOCATIONS.

In addition to the 9 POL bulk fluids, each station will be provided with a compressed air hose reel. Locations for POL station includes at each light vehicle bay, one at each heavy equipment lift bay, and at 2 heavy equipment non-lift areas. Racks will be positioned between bays to maximize availability.

8.12.2 SEPARATE STATIONS

Separate Locations will be provided for storing closed containers for used POL/hazardous waste.

8.13 FUEL OIL DELIVERY AND STORAGE

8.13.1 VEHICLE FUEL DISPENSING

Two packaged Fire Guard tanks with dispensing hoses and pumps will be located outside of the facility. One 500 gallon tank will be provided for gasoline and one 5,000 gallon tank for diesel. They will require a new foundation system and electrical power at each tank. No card readers are required.

8.13.2 HEATING FUEL STORAGE

The facility building heating fuel tank will serve the building boilers only. All tanks will be sized for approximately 30 days of storage during peak demand. All tanks will be welded steel, above grade double-wall self-contained tanks equipped with anti-siphon and overfill prevention hardware, OSHA ladder, vents, emergency vents, visual level gauge, and spare bung ports.

8.13.3 DAY TANK AND FUEL PUMP SET

A fuel pump set will be provided to deliver fuel to the day tank located in the boiler room. The day tank will be provided with integral secondary containment vessel, level floats, return pumps, and alarms. A fuel oil filter will be installed between the storage tank and day tank.

8.13.4 PIPING AND VALVES

All above-grade fuel oil piping will be ASTM A53 Schedule 40 threaded black steel.
Single pipe systems will be distributed from the day tank to the boilers, B-1A and B-1B. Burner trim will include fuel oil rated ball valves, unions, oil safety valve, fusible valve, and Tigerloop deaerator. Burner Final connections to burners will be through stainless steel braided hoses.

8.13.5 GENERATORS: NO EMERGENCY ELECTRICAL GENERATOR IS PLANNED FOR THIS FACILITY

8.14 HEATING SYSTEM

8.14.1 HEAT GENERATION

The building heating system will make use of two cast iron, sectional oil fired hydronic boilers, B-1A and B-1B. The two boilers will each be sized for 66 percent of the full building heating load to provide semi-redundant system in the case of a boiler failure. The full building heating load is based on building skin loss, infiltration, and outside air requirements for the ventilation system with a 20 percent safety factor. Boiler flues will be double wall stainless steel and be routed within the building, through the roof.

8.14.2 LIQUID HEAT TRANSFER

A 30 percent propylene glycol heating solution (based on volume) shall be used as the heat transfer fluid throughout the building. The hydronic heating system shall operate at 180°F at design conditions. Lower temperatures will be achieved through outside air reset schedules.

8.14.3 DISTRIBUTION

A single distribution system will be provided to supply glycol/water thermal heating fluid to unit heaters, air handler coils, and the radiant slab. Duplex circulating pumps will be used (primary and stand-by). Distribution piping will be Type L ASTM B88 copper for 3 inches and smaller and will be ASTM A53, grade B Schedule 40 steel for 4 inches and larger. Two inches of piping insulation shall be standard for all distribution mains. Hydronic Piping in the wash bay will be fully jacketed to protect against water damage.

8.14.4 HEATING SYSTEM COMPONENTS

Additional heating plant components include an inline air separator, bladder type expansion tank, and a packaged glycol make-up tank.

8.14.5 RADIANT FLOOR SYSTEM

The Garage will be provided with a radiant floor heating system. PEX tubes will be placed in the concrete slab. The radiant floor supply temperature will be tempered with a three-way valve at each manifold and circulated through the floor by small circulators located nearby. Mains will be routed to PEX distribution manifolds mounted exposed in the vehicle bay. Manifolds will be covered with heavy duty galvanized metal shrouds for protection.

The radiant floor will provide basic heating for the building to cover envelope heat loss. Instantaneous heating loads from opening overhead doors will be picked up by the hydronic unit heaters. Radiant tubing layout shall be a delegated design.

8.14.6 HYDRONIC TERMINAL UNITS

Hydronic terminal units consisting of unit heaters and duct heating coils shall be used throughout the building. Overhead hydronic unit heaters will be used in the Garage and Equipment Warm Storage areas and horizontal units provided in utility and storage rooms. Heating coils will warm the supply and make-up air to the space.

8.14.7 INSTALLATION

All piping shall be exposed in unfinished areas and areas without ceilings and concealed but accessible in finished areas. Valves and specialties shall be provided as required for proper system operation and to enhance maintenance and repair.

8.14.8 USED OIL HEATER

A packaged used oil heater will be located in the Garage. The unit will consist of a storage tank at the floor level and an overhead oil fired furnace.

8.15 EXHAUST SYSTEM

8.15.1 GENERAL

All building areas will be provided with exhaust to meet IMC and ASHRAE 62.1 requirements to remove contaminated air. Airflow will generally travel from clean areas to dirty areas.

Ductwork shall be of galvanized steel construction constructed and installed in accordance with SMACNA guidelines. All equipment and specialties shall be accessible. Exhaust ducts will be insulated within 10 feet of the exterior termination point. Outside air ducts shall be insulated.

8.15.2 VEHICLE EXHAUST SYSTEM

A central vehicle exhaust system will be provided that consists of an exhaust fan, welded galvanized steel exhaust distribution mains, hose reels, and individual vehicle hose drops.
Each vehicle bay in the Garage will be provided with a flexible vehicle exhaust hose drop for connecting to the vehicle exhaust pipe. Hose diameters and airflow rates will depend on anticipated equipment (light vs heavy equipment bays). Exhaust hoses will be constructed of high temperature, flame retardant fabric with an external galvanized steel helix rated for continuous temperatures of 1,200º F. Flexible exhaust hoses will be connected to motorized overhead hose reels that will extract the hose into the roof structure when not in use. Vehicle exhaust rated control dampers will be provided at each hose reel so that air is not exhausted when that station is not in use. Hose reels will have a controller that lowers and raises the hose and a separate activation button that opens the control damper.
Hose reels and ductwork will be coordinated with overhead crane paths.

The central vehicle exhaust fan will be a utility set type unit rated and constructed to handle vehicle exhaust. The fan will be sized assuming a 60% diversity factor in active bays. The fan will be provided with a Variable Frequency Drive (VFD) to allow reduction of airflow to match the number of active vehicle exhaust drops.

8.15.3 GARAGE GENERAL EXHAUST

General exhaust in the Main Shop will be activated by nitrogen dioxide (NO2) sensors, carbon monoxide (CO) sensors, and 0-60 minute spring-wound timers located throughout the Main Shop. When activated, the general exhaust system will provide 0.75 CFM/SF of exhaust. Sensing system basis of design shall be TOXAlert.

The exhaust system will pull air from within 18 inches of the floor.

8.15.4 EQUIPMENT WARM STORAGE AND WASH BAY EXHAUST

General exhaust in the Warm Storage and Wash Bay rooms will be activated by nitrogen dioxide (NO2) sensors, carbon monoxide (CO) sensors, 0-60 minute spring-wound timers, and humidity sensors located throughout the facility. When activated, the general exhaust system will provide 0.75 CFM/SF of exhaust.
The exhaust system will pull air from within 12 inches of the floor to remove pollutants.

8.15.5 RESTROOM EXHAUST

Restroom exhaust in the office area will be provided through the heat recovery ventilator (HRV) serving the office space.

8.15.6 CLOTHES DRYER EXHAUST

Clothes dryer exhaust will be provided to the outside of the building in accordance with the IMC.

8.15.7 POL AND HAZMAT STORAGE

Stand-alone exhaust fans will be provided for POL storage and warm hazardous waste storage rooms to maintain a negative pressure compared to adjacent spaces.

8.16 VENTILATION SYSTEMS

8.16.1 GENERAL

Minimum outside air and ventilation rates will be provided as required by the IMC and recommended by ASHRAE 62.1-2010. Air will be distributed to meet the individual requirements of each space. Sound level design for office spaces is NC 35. Sound levels for mechanical spaces are determined by OSHA requirements.
Ductwork shall be of galvanized steel construction constructed and installed in accordance with SMACNA guidelines. All equipment and specialties shall be accessible. All outside air ductwork will be insulated. Exhaust/Relief air ducts will be insulated within 10 feet of the exterior termination point.

8.16.2 GARAGE VENTILATION

Supply air will be provided by a modular make-up air unit that will be used to provide 100% outside make-up air for the various exhaust systems in the room. The unit will include a summer filter, winter filter, and hydronic heating coil.

The unit will be provided with a VFD to allow reduction of airflow to match exhaust air rates. Airflow will be set to ensure that the Office spaces have positive pressure in comparison to the shop areas. Variable air volume boxes will be provided such that each bay can be ventilated independently following the VOC alarms.

8.16.3 GARAGE DESTRATIFICATION

The Garage will have overhead ceiling fans to provide destratification as well as assist in thawing out vehicles and evaporating water accumulation on the floor. Basis of design will be Greenheck, large diameter industrial fan, such as the DS or DC model.

8.16.4 OFFICE VENTILATION

The offices will be served by a 100 percent outside air heat recovery unit. Supply air will be delivered to the office spaces and exhaust pulled from the restrooms and break room. A hydronic duct heating coil will be provided on the discharge as required to temper the air if needed.

8.16.5 BOILER ROOM VENTILATION

An engineered combustion and ventilation fan assembly will be provided for the boiler room. The ventilation fan assembly will mix outside and return air to discharge 55 degree air into the space. The engineered combustion air opening will consist of an unobstructed upturned elbow that will provide combustion air during equipment operation and also function as a relief air opening when the ventilation fan is operating.

8.16.6 MECHANICAL COOLING

Mechanical cooling will not be provided.

8.16.7 HUMIDIFICATION

Humidification and dehumidification will not be provided.

8.17 WELDING

8.17.1 GENERAL

A designated area for welding will be provided in the facility.

8.17.2 MATERIALS

Exhaust duct to be welded steel or galvanized steel.

8.17.3 WELDING ROOM EXHAUST

General exhaust in the welding room will be activated by nitrogen dioxide (NO2) sensors, carbon monoxide (CO) sensors, amd 0-60 minute spring-wound timers. When activated, the general exhaust system will provide 0.75 CFM/SF of exhaust.
The exhaust system will pull air from within 12 inches of the floor to remove pollutants.

8.17.4 PORTABLE WELDING FUME EXTRACTOR

A packaged portable welding fume extractor will be provided to allow welding on equipment in the vehicle bay. The unit will be wheeled and have an articulating arm hose, fan, and disposable HEPA filter.

8.18 CONTROL SYSTEM

A comprehensive Direct Digital Control (DDC) based system will be provided for monitoring and control of all mechanical systems. The mechanical HVAC control systems will be microprocessor-based system employing distributed processing. Networked DDC control panels shall accomplish local control. Packaged, stand-alone controls will be used sparingly.
The system will have web-based, remote access to allow for remote troubleshooting and service. This will lower operation and maintenance costs associated with getting a technician to the site.
Energy monitoring will be incorporated into the control system to monitor electricity usage. Additional meters and monitoring points, such as for water and fuel oil, can be added to the system at the direction of the client.

8.19 SAND STORAGE BUILD

8.19.1 PLUMBING SYSTEM:

No plumbing is expected to be provided in this building.

8.19.2 HEATING SYSTEM:

The building will be heated via fuel oil fired unit heaters, indoor temperature will be limited to 50°F. The unit heaters shall be interlocked to the overhead door such that they will be disabled when the door is open.

8.19.3 EXHAUST SYSTEM:

General exhaust in the sand storage building will be activated by nitrogen dioxide (NO2) sensors, carbon monoxide (CO) sensors, and 0-60 minute spring-wound timers located throughout the Main Shop. When activated, the general exhaust system will provide 0.75 CFM/SF of exhaust. The exhaust fan will be located in the front of the building near the garage door. Make up air will be drawn in through a cold air trap located in the back of the building.

APPENDIX A - SOIL MANAGEMENT PLAN

APPENDIX B – CIVIL CUTSHEETS

APPENDIX C – MECHANICAL CUTSHEETS

APPENDIX D – ELECTRICAL CUTSHEETS