APPENDIX 10A

Civil Engineering Design Criteria

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Civil Engineering Design Criteria and Civil Design Criteria

10A1 Introduction

Control of the design, engineering, procurement, and construction activities on the Project will be completed in accordance with various predetermined standard practices and project-specific practices. An orderly sequence of events for the implementation of the Project is planned consisting of the following major activities:

- Conceptual design
- Licensing and permitting
- Detailed design
- Procurement
- Construction and construction management
- Startup, testing, and checkout
- Project completion

The purpose of this appendix is to summarize the codes and standards and standard design criteria and practices that will be used during the Project. The general foundation and civil engineering design criteria defined herein form the basis of the design for the foundation and civil systems of the Project. More specific design information will be developed during preliminary and detailed design to support equipment procurement and construction specifications. It is not the intent of this appendix to present the detailed design information for each component and system, but rather to summarize the codes, standards, and general criteria that will be used.

Section 10A2 summarizes the applicable codes, standards laws and ordinances and Section 10A3 includes the general criteria for foundations, design loads, and, general site information.

10A2 Design Codes, Standards, Laws and Ordinances

The design and specification of work will be in accordance with all applicable laws and regulations of the federal government, the State of California, and with the applicable local codes and ordinances. The following laws, ordinances, codes, and standards have been identified as applying to civil engineering design and construction.

The edition and/or addenda to a law, ordinance, code, or standard that has been adopted and is in place at time of plant design and construction will apply to work performed for this Facility.

A California Professional Engineer stamp is required on design documents.

10A2.1 State and Local Building Codes, Standards and Ordinances

- Code, Rules and Regulations of the State of California
- California Building Standards Code (CBSC)
- Uniform Building Code (UBC)
- California Electrical Code
- California OSHA (CALOSHA)
- Local ordinances, regulations, and requirements

10A2.2 U.S. Government Codes, Ordinances, and Standards

- Occupational Safety and Health Act (OSHA)—29 CFR 1910, 1926
- Federal Aviation Agency (FAA)— Obstruction Marking and Lighting AC No. 70/7460-IJ)
- Environmental Protection Agency (EPA) —40 CFR 423, 40 CFR 60, 40 CFR 72, 40 CFR 75, 40 CFR 112
- Appendix A to Part 36, "American Disability Act Accessibility Guidelines for Buildings and Facilities (applicable only to administrative and control room areas).

10A2.3 American National Standards Institute

The following standards of the American National Standards Institute (ANSI) will be followed:

- B16.1 Cast Iron Pipe Flanges and Flanged Fittings
- B16.5 Steel Pipe, Flanges, and Fittings
- B16.34 Steel Valves
- B30.17 Overhead and Gantry Cranes

If comparable international standards to ANSI standards are proposed by Contractor, the Contractor has full responsibility to confirm the international standards are equal or better than ANSI standards, and that the deliverables are acceptable per the codes, standards, and permits of the site.

10A2.4 Industry Standards

Applicable standards issued by the following industry organizations:

- American Association of State Highway and Transportation Officials (AASHTO)
- American Concrete Institute (ACI)
- American Gas Association (AGA)
- American Institute of Steel Construction (AISC)
- American Iron and Steel Institute (AISI)
- American Petroleum Institute (API)
- American Society for Nondestructive Testing (ASNT)
- American Society for Testing and Materials (ASTM)
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
- American Water Works Association (AWWA)
- American Welding Society (AWS)

- Crane Equipment Manufacturer's Association of America (CMMA)
- Metal Building Manufacturers Association (MBMA)
- National Association of Corrosion Engineers (NACE)
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- Steel Structures Painting Council (SSPC)
- Thermal Insulation Manufacturers Association (TIMA)
- Welding Research Council (WRC)

If comparable international standards to above U.S. industry standards are proposed by Contractor, the Contractor has full responsibility to confirm the international standards are equal or better than the U.S. industry standards, and that the deliverables are acceptable per the codes, standards, and permits of the site.

10A3 Design Criteria

10A3.1 Site Preparation

Site preparation will consist of clearing and grubbing and the placing and compaction of fill with slopes and embankments designed in such a fashion as to be stable and capable of carrying anticipated loads from either equipment or structures constituting part of the Project.

Materials from clearing and grubbing operations will either be removed from the jobsite and be properly disposed of or, if suitable, reused on site.

Erosion and sediment control measures will be taken on a site-wide basis to prevent or minimize erosion and sediment transportation associated with the new construction. Measures will be in accordance with Applicable Laws.

Root mats will be removed to a depth of not less than 6 inches below existing grade, and holes will be refilled with material suitable for embankment and compacted.

10A3.2 Geotechnical Investigations

A detailed soils investigation, which will be the basis for plant foundation work, will be performed. The results of the investigation and recommendations will be documented in an engineering report certified by a geotechnical engineer who is familiar with the various types of soils that exist in the area of the Project, including the geologic and seismic conditions.

The site preparation work and foundation selection will be engineered to mitigate any effects of soil shrinkage and expansion and settlements. If necessary, soil stabilization, remediation, and/or piles will be provided in the power block areas and other areas as required to ensure settlements, and differential settlements are acceptable with respect to all settlement sensitive equipment including, but not limited to, the engines.

The soils investigation will also determine whether the soils are corrosive to buried ferrous metals. The Project will include appropriate corrosion protection for all buried pipes in accordance with good engineering practice and this specification.

10A3.3 Surveying

A certified survey indicating property boundaries, easements, right of ways, existing features, known underground utilities, wetlands delineation, and site topography will be developed. The survey will include the establishment of permanent benchmarks.

10A3.4 Site Development and Earthwork

The site will be developed as required for both the initial construction and the final operating conditions of the Project. The initial earthwork services will be performed based on the results of the geotechnical investigations and topographical surveys. However, the final site work will meet all minimum requirements of the detailed plant layout. Site preparation will consist of clearing and grubbing and the placing and compaction of fill with slopes and embankments designed in such a fashion as to be stable and capable of carrying anticipated loads from equipment or structures.

10A3.5 Temporary Construction Facilities

Temporary facilities required to construct the Project, as noted below, will be provided. All temporary facilities will be removed as required or upgraded to meet the final plant requirements.

- Installation and maintenance of construction parking and construction laydown areas
- Construction trailers and facilities as required by construction, testing, inspection, engineering, supervision, management, and other personnel
- Improvements to existing roads to transport equipment to the site, either temporary for construction purposes or permanent to support plant maintenance and operation activities.
- Construction of temporary drainage facilities
- Providing temporary erosion control during earthwork
- Final grading and cleanup after the Project is essentially complete

Restoration of all areas affected by the construction of access road, parking, and laydown areas following project completion. Adequate space will be provided for temporary trailer(s) for construction and operation staff. Trailers will be equipped with temporary furnishing, HVAC, and set up for phone and high-speed internet access during plant construction and commissioning until Substantial Completion. The trailers will be located on site, in close proximity to the power block construction.

10A3.6 Project Grading

Project grading will include the following items:

- Shape the natural grade as required to accommodate permanent Project equipment and construction facilities while minimizing earthwork.
- Obtain proper cross section, longitudinal slopes, and curvature for roads.

- Raise grade if necessary to eliminate flooding from external water courses due to the 100-year rainfall. The 100-year runoff from uphill drainage areas will be diverted around the Project and returned to the natural drainage course in a manner acceptable to the permitting agency.
- Construct adequate in-plant surface drainage to discharge the 10-year runoff without flooding roads and the 50-year runoff without flooding plant facilities.
- Prepare excavation for storm water pond dikes.
- Obtain proper area slopes to provide drainage without ponding.
- Construct stable, erosion-resistant earthen side slopes.
- Prepare sub-grade for foundations, including consolidation, soil remediation, mass excavation and backfill, pile driving, etc. as required to mitigate unacceptable settlements and to provide sound bearing for the facilities. These provisions will meet or exceed the requirements noted in the geotechnical report.
- Prepare sub-grade to receive fills, where required.
- Prepare site grading that will incorporate site slope, site drainage, road and erosion protection.
- Remove root mats to a depth of not less than 6 inches below existing grade; holes will be refilled with material suitable for embankment and compacted.
- Protect identified environmentally sensitive areas as required by Applicable Laws.

10A3.6.1 Earthwork

Excavation, grading, backfilling, and compaction will be performed as dictated by the soil characteristics of the site, the geotechnical study, the Project design criteria, and Applicable Standards. Earthwork will be performed in accordance with Applicable Laws and Applicable Standards.

The work will include removing and disposing of unsuitable materials such as organic matter from areas on which fill is to be placed, and excavating and deposing of materials from areas where existing grade is to be raised. Grading of cuts, fills, and drainage ditches will be provided as required.

At no time will filling operations proceed when the ground or fill material is water soaked.

10A3.6.1.1 Grading

Graded areas will be smooth, compacted, free from irregular surface changes, and sloped to drain.

The final grade adjacent to equipment and buildings will be at least 8 inches below the finished floor slab unless otherwise specified and will be sloped away from the building to maintain proper drainage.

Finish site grading will be adequately established to deter surface pooling and promote surface drainage away from equipment and structures.

10A3.6.1.2 Backfilling

Areas to be backfilled will be prepared by removing unsuitable material and rocks. The bottom of an excavation will be examined for loose or soft areas. Such areas will be excavated fully and backfilled with compacted fill.

Backfilling will be done in layers of uniform, specified thickness. Soil in each layer will be properly moistened to facilitate compaction to achieve the specified density. In order to verify compaction, representative field density and moisture-content tests will be taken during compaction.

Granular load-bearing backfill will be sound, durable crushed rock, clean sand and/or gravel.

Selected suitable backfill material will be available at the site or borrowed as required to satisfy Project design criteria.

Trench bedding material will be clean sand, as required.

Where it is necessary to remove only a portion of the unsuitable materials and backfill, the backfilling operation will begin by stabilizing the existing materials to enable proofrolling or normal construction equipment to operate thereon.

10A3.6.1.3 Compaction

Structural fill supporting foundations, roads, and parking areas will be compacted to a minimum of 95 percent of the Modified Proctor maximum dry density in accordance with ASTM D1557. Embankments, dikes, and backfill surrounding structures will be compacted to a minimum of 90 percent. General backfill will be compacted to at least 85 percent.

Areas compacted by hand-operated mechanical tampers will be compacted to the same minimum compaction as the rest of the fill. Care will be taken so that the fill in these areas is integral with the rest of the fill.

10A3.6.2 Clearing and Grubbing

Areas to be graded will be cleared of all vegetation. Waste from clearing will be disposed offsite in accordance with applicable laws.

10A3.6.3 Stripping

All topsoil and other organic materials will be stripped from the areas to be graded before starting earthwork. Topsoil will be placed in a temporary stockpile for later recovery and use for landscaping the site. The stockpile will be provided with temporary erosion control facilities.

10A3.6.4 Disposal of Unusable Soils

Disposal of unusable soils will be accomplished in accordance with all applicable laws.

10A3.6.5 Erosion Control

Temporary facilities will be provided for control of erosion and turbid runoff during earthwork operations and from graded areas until they are stabilized. Temporary facilities

will be in accordance with Applicable Laws and Applicable Standards. The Contractor will be responsible for obtaining any necessary erosion control permits.

Permanent erosion control facilities for surface runoff as required for ditches and slopes, such as riprap, headwalls, grass, rock surfacing and slope pavement, will be provided and be acceptable to regulatory agencies.

All excavations will be carried out and supported in such a manner as to prevent flooding or ponding of water and damage or interference to structure, services, or stored equipment/materials.

Excavations for foundations will be sealed with a concrete mud mat or seal slab, if required, as soon as possible after being excavated and inspected.

Fill materials will be suitable for the intended purpose and will not include materials hazardous to health, material susceptible to attack by ground or groundwater chemicals, material susceptible to swelling or shrinkage under changes in moisture content, highly organic or chemically contaminated materials, or any other unacceptable materials.

Compaction of fill materials will be carried out as soon as practicable after deposition of fill materials. Fill will be compacted to the densities appropriate to the design requirements, fill type, and depth of layers.

10A3.6.6 Existing Underground Facilities

Existing underground lines, utilities, obstructions, etc. will be identified and redesigned, relocated, or removed as necessary.

10A3.7 Access

The Contractor is responsible for the heavy haul route and for any necessary improvements. The Contractor will coordinate this work with other entities as required and with Owner for access onto Owner's property.

10A3.8 Drainage Systems for Clean Storm Water, Sanitary Wastewater, Oil-Contaminated Wastewater and Process Wastewater

The Project will be provided with the following drainage systems:

- Clean storm water drainage system
- Sanitary wastewater system
- Oil-contaminated wastewater system
- Process wastewater system

10A3.8.1 Clean Storm Water Drainage System

Clean storm water runoff is runoff from Project areas not subject to contamination. Clean storm water will be collected via a new storm water drainage system and discharged to the Buhne Slough via the existing storm water outfall point at the Buhne Slough.

Surface drainage systems inside the Project will be sized to discharge the 10-year, 24-hour runoff without flooding roads and the 50-year, 24-hour storm event without flooding the Project and equipment. (The storm events will be as defined by U.S. Department of

Commerce, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, or local regulations if more stringent.)

An open ditch system is not allowed. The storm drainage system includes catch basins for collecting stormwater and an underground piping system with manholes at all junction points and turns.

Effluent will be conveyed and discharged into the drainage system in accordance with 40 CFR Part 43 and the requirements of the Project's NPDES permit. Provisions for obtaining a grab sample at the outfall point will be provided.

The entire property area affected by the Project will be equipped with provisions to drain clean storm water runoff into the clean storm water drainage system.

The storm water runoff system will be designed and constructed in accordance with ASCE Manual No. 77, "Design and Construction of Urban Storm Water Management Systems."

Roof drains from the administration/control/maintenance building will discharge directly into a storm water drainage system and not flow over parking lots, ground slabs, etc.

When culverts are utilized, the inlets and outlets will be provided with permanent erosion protection.

10A3.8.2 Valved Storm Water Containments

Spill containment basins around outdoor chemical and oil containing equipment and tanks will have a sump with valved outlet(s) for draining collected rainwater to the clean storm water drainage system. The valve(s) will be designed to close automatically after use, so as to eliminate the possibility of being accidentally left open. Provisions will be provided in such containments to conveniently visually inspect the contained liquid and conveniently obtain a grab sample prior to release to storm water system.

Unless greater volume is required by the applicable codes, these outdoor containments will be capable of holding 100 percent of the volume of oil or chemicals contained within, plus the rainfall of the 25 year, 24-hour storm.

10A3.8.3 Sanitary Wastewater System

Sanitary wastewater will be collected by gravity, discharged to a lift station if required, and pumped to the site's existing sanitary waste piping system. Sanitary lines will be of PVC pipes and will meet all Applicable Standards.

10A3.8.4 Oil-Contaminated Wastewater System

An oil-contaminated wastewater sewer system will be provided to collect discharges from areas that have potential for oil contamination, including the following:

- Floor and equipment drains with the potential for contamination with oily wastes
- Engine area floor and equipment drains
- Maintenance shop area (including air compressor room/area)
- Storage area (lube oil drums)
- Drains, overflow etc. from oil unloading, storage and handling areas

All equipment and piping having the potential to spill or leak oil and not buried underground will be contained in a curbed area in order to contain the oil. Areas where only minor oil leakage is possible will have equipment-skid-attached containment for local collection and subsequent cleanup, when required.

Oil-contaminated runoff will be directed by gravity to an oil separator. The oil separator will be provided with provisions for periodic oil removal by truck. The following will be provided:

- One double-wall steel oil separator
- Coalescing plates providing 15 mg/L effluent quality
- Packaged effluent lift station with two 100 percent capacity pumps
- Pipeline to transport effluent to the outfall point.

Any areas that potentially can receive fuel oil leakage (e.g., distillate) will be specifically addressed in the design. That is, either the oil separator will be designed to process fuel oils, or the containment system for fuel oils will be segregated from other oily wastes and designed for periodic manual removal of the fuel oil waste.

Effluent from the oil separator will be combined with cleaned up process wastewater effluent, and discharged to the sanitary sewer system.

Provisions for periodic quality monitoring and obtaining a grab sample of oil separator effluent will be provided.

Underground gravity lines carrying oily wastewater will not require double containment piping.

10A3.8.5 Process Wastewater

Discharges to the process wastewater sewer system will be non-oily wastewater with a potential for chemical contamination. These include equipment drains such as engine drains and area or building drains that contain potentially chemical contaminated runoff. These areas will be collected using floor drains, trenches, or sumps and piped to the wastewater sump. At a minimum, the following areas will be included:

- Water treatment floor and equipment drains
- Chemical bulk storage area building drains
- Chemical tank spill containment area drains
- Chemical truck spill containment area drains
- Sample panel building drains
- Chemical lab sink drain

All equipment and piping having the potential to spill or leak chemicals will be contained in a curbed area in order to contain the chemicals. Process wastewater, including blowdown and equipment drains, will be collected in a wastewater sump and cleaned up prior to discharge. Provisions for periodic quality monitoring and obtaining a grab sample of cleaned up process wastewater effluent will be provided.

The following will be provided:

- Packaged effluent lift station with two 100 percent capacity pumps

- Pipeline to transport effluent to the outfall point.

Cleaned up process wastewater effluent will be combined with oil separator effluent, and discharged to the sanitary sewer system.

10A3.9 Roads, Parking Lots, and Walkways

The plant roads will be asphalt concrete on sub-base of properly stabilized soil aggregate mixture. The paving and sub-base thickness will be based on design and construction traffic loads. The main plant road will be a minimum of 25 feet wide. The road inside of the switchyard area may be rock surfaced only. All road surfaces will be designed and paved to allow for proper drainage (puddling of water is not acceptable) and to allow transportation of heavy equipment and materials throughout the plant.

10A3.9.1 Project Roads

The main Project access road will be connected to an existing terminal point of an adjacent public access road to the Project. Similarly, a secondary (emergency) plant access road will also be provided and connected to an alternate public access road. These intersections and roads will meet all Applicable Laws.

A looped interior Project road will be provided around the power block area. Other interior Project roads will be provided where access is required to equipment, pump structures, or entrances to buildings or enclosures.

Roads will have minimum overhead clearance requirements to enable movement of equipment for removal or maintenance.

10A3.9.2 Road Width and Clearance Requirements

The minimum road widths are shown in Table 10A-1:

TABLE 10A-1
Minimum Road Widths

Road	Total Width (feet)	Paved Width (feet)	Shoulder Width (feet)
Access Roads	33	25	4
Interior Roads	26	20	3
Entrances to Enclosures	22	16	3

Clearance requirements over roads will be a minimum of 22 vertical feet from the high point of the road to the bottom of the lowest overhead obstruction. Side clearance, from the centerline of road to any significant off-road obstruction, will be 20 feet.

10A3.9.3 Road Pavement

Road pavements will be designed for AASHTO H-20 truck loads and loads of the heaviest piece of equipment transported or removed from the site.

Parking lot pavement and all accessible areas of the power block will be designed for passenger cars and light trucks.

Design life of the asphalt pavement will be 10 years.

10A3.9.4 Parking Lots

The existing Humboldt Bay Power Plant parking lot will be used for plant personnel and visitors.

10A3.9.5 Chemical Unloading

Chemical unloading areas including truck pads will be contained to prevent releases from entering the environment. Appropriate coatings will be provided inside the containment areas.

10A3.9.6 Project Area Surfacing

Final area surfacing will be provided as shown in Table 10A-2.

TABLE 10A-2
Final Project Area Surfacing

Type	Minimum Thickness	Location
Reinforced concrete	8 inches	All chemical truck unloading and spill containment areas for water treatment chemicals and other hazardous chemicals
		20-foot width in front of all roll-up doors
		Maintenance pads around equipment required for maneuvering and positioning cranes, fork lifts and other wheeled-vehicles
		Access areas to equipment (see below)
Wire mesh reinforced concrete	4 inches	5.0-foot wide sidewalks between building doors
Base material or crushed rock area surfacing (well graded material with maximum size of 1 inch) (ASTM D2940, ASTM D448, Size No. 57 or similar)	Design cross section providing adequate load bearing capacity for equipment and vehicular traffic	All unpaved areas outside the loop road with the potential to support maintenance equipment, mobile cranes, fork lifts and other wheeled vehicles
		Interior of the switchyard (if allowed)
		Unpaved access pathways from loop road to equipment, enclosures
Base material or crushed road area surfacing (well-graded material with maximum size of 1 inch, ASTM D448, Size No. 57 or similar. Color or gradation to be distinguishable from drivable surface areas).	4 inches	All areas loop road not requiring vehicular access
		Areas requiring vegetative control, if required
Crushed rock area surfacing (ASTM D448, size no. 3)	Design cross section providing adequate load bearing capacity for equipment, 8-inch minimum	25-foot minimum on all unpaved sides of the cooling tower or width as required to run cranes used to remove fans, blades and motors.

TABLE 10A-2
Final Project Area Surfacing

Type	Minimum Thickness	Location
Seeding or other appropriate ground cover	N/A	All disturbed areas outside of the power block or otherwise unpaved or surfaced
		Ditches
Asphalt		Parking areas, and adjacent to parking areas
		All areas around and under equipment within the power block
Crushed rock	Good Engineering standard	Construction laydown areas

10A3.9.7 Surfacing Plan

The paving plan including cross-section will be drawn on a copy of the general arrangement drawing.

Space will be available and identified on the Project site for maintenance laydown. This space will be indicated in the paving plan.

10A3.10 Fencing and Signage

The plant property lines will be identified with appropriate signage and fence.

Security fencing will be provided around the entire Project area with separate security fencing around the entire switchyard.

Site perimeter fencing will be 6-foot-high chain link topped by an extension arm holding three strands of barbed wire at 45° facing out. (Fencing will have pipe line posts at maximum 10'-0" centers, and a top and bottom tension wire.) The chain link fence, holding three strands of barbed wire, will be recessed 1'-0" minimum inside the property line.

All posts, rails, fabric, wire, and gates will be galvanized. Interior road gates and secondary plant access gates will be 6-foot high by 25-foot wide manually operated double swing gates. A secondary gate with lock will be provided. The secondary gate location will be reviewed and accepted by the Owner.

The fencing will be grounded.

The gate across the main access road to the Project will be a motor-operated slide gate designed for use as a gate for an industrial Project. Gate will be designed to be operated both from the control room and locally using a card reader. A permanent goose-neck-mounted card reader, standard-mounted lighting fixture, an intercom, and a fixed camera for viewing persons using the card reader/intercom will be provided at the main gate. A remotely operated gate (from administration building) will be provided with video and voice communications.

The storm water pond will be isolated and locked separately, if required by local building officials.

The switchyard fencing will be 8 feet high and will be considered independent of the Project. The gates entering the switchyard will be manually operated gates. Fencing layout, including gates, will be shown on the design drawings.

The fence will be grounded to limit step potentials below the permissible touch levels of IEEE 80.

Rights-of-way will be marked as required by Applicable Laws.

10A3.11 Buildings

The Project will include the following buildings: administration/control building, reciprocating engine/power house, warehouse/maintenance shop building, electrical switchgear building, and such other buildings as required for the Project.

Power generation equipment (reciprocating engines) will be placed inside a building(s) and will be suitably protected from the environment conditions at the site and maintenance work can be safely and efficiently performed.

These buildings may be pre-engineered buildings, provided all specified design criteria are satisfied including overhead cranes as well as requirements by local, state, and federal building codes, and permitting agencies. Pre-engineered buildings will be designed as partially enclosed in accordance with the requirements of the MBMA Low Rise Building Systems Manual.

The miscellaneous electrical equipment enclosures for the CEMs, switchgear, MCCs, power distribution centers (PDCs), fire water pump, etc. may be modular, insulated weather-tight structures purchased with the equipment, provided all specified design criteria are satisfied in appropriate sections of this specification.

10A3.11.1 Location and Footprint of Buildings

The control room, warehouse, file storage, lunch room, and maintenance areas will be located in a centralized area in close proximity to each other.

Project buildings will be designed to accommodate no less than the specified number of employees as determined in the plant pro forma.

Project buildings will be sized appropriately for a 30-year plant service life.

Adequate chemical storage space will be provided for 30 days of operation.

Buildings will be adequately sized and designed for ease of removal of large equipment (including such features as roll up doors, overhead crane, and trolleys).

10A3.11.2 Building Requirements and Sizes

The Control/maintenance and power house, buildings may be combined and will be arranged to provide sufficient space for plant operations and maintenance activities. These areas may be combined into one building (and may be one or two stories with a high-

bay/low-bay arrangement). The maintenance areas will be designed with 20-foot (minimum) eave height. The control room, electrical switchgear room, battery room, instrument and electronics area will have minimum 14-foot eave height.

The buildings will house areas including the administration areas, control room, control equipment room, battery room, electrical equipment, communications room, and maintenance area (including an I&C area). These buildings will be enclosed, weather tight buildings. The high-bay areas will contain the plant maintenance area and will include a roll-up steel door(s) to accept large pieces of equipment. The low-bay areas will contain the station control room, battery room, electronics room, offices, and washroom and locker area.

The control and maintenance, building will be provided with power receptacles, and telephone and communications connections, as required and applicable. The power house and maintenance areas will be provided with service and instrument air drops, service water drops, and welding stations.

The offices, control, and maintenance areas will be designed to meet the requirements of Applicable Laws. Space allocation for the various buildings and work areas are noted below. Building and work areas sizes are approximate and will be finalized during the detailed design phase of the project. Individual room sizes may vary but the building will have a minimum of the total square footage indicated in Table 10A-3.

TABLE 10A-3
Minimum Total Building Square Footage

Buildings and Work Areas	Size (Square Feet)	Minimum Inside Height (feet)
Buildings		
Control/Maintenance Building	5,000	10
Power House	Approx. 25,500	33
Black Start Power Generator Building	As required	16
Electrical Switchgear Building	As required	10
Control/Maintenance Building Rooms		
Control Room	800	10
DCS/PLC Room	400	10
Communication Room	150	10
Men's Locker Room and Restroom	200	8
Women's Locker Room and Restroom	200	8
Lunch Room & Kitchen	250	8
File Room	200	8
Conference Room	400	8
Production Supervisor's Office	200	8
Two Staff Offices (size per office)	150	8
Janitor's Closet	40	8
Storage Closet	40	8
I&C Area	250	8
Maintenance Area	1,000	18

10A3.11.2.1 Control/Maintenance Building

The Control/Maintenance Building will include the control room, office space, and area facilities for all plant employees.

The control room will be sized for complete access to the control equipment and direct access to the site for operations. The room will be equipped with a false ceiling. The room will have incandescent lighting placed to reduce glare on the computer screens. Windows will be provided with window treatments and located to allow viewing of the power block area. Wiring for the control equipment will be behind walls or under the floor. Exposed conduits will not be allowed in the control room. Electrical panels located in the control room will be wall-mounted units. Conduits and wiring will not be exposed. Work space will have an ergonomic design.

The building will include offices for plant personnel, janitorial closet, storage closet, file room, lunch area, conference room, kitchen (with cabinets, fixtures, and appliances), maintenance area including I&C area, and men's and women's restrooms and locker rooms. The control room area will include the control room, DCS/PLC room, and communications room.

The Project will include personnel doors and two sixteen-foot high by twelve-foot wide electric roll-up doors. The roll-up doors will be located to facilitate truck and forklift access to the maintenance area. Translucent panel skylights will be provided.

Reinforced concrete grade slabs in the maintenance area and I&C area will be treated with a floor hardener and oil-resistant sealer to accommodate maintenance or laydown. Interior partitions will be gypsum wallboard on metal studs. The walls between maintenance area and I&C area will be CMU material. The maintenance building will be an exposed structure, but the walls will have 10′ high interior liners to protect insulation.

Floor drains will be provided in the maintenance area, I&C area, and restrooms. The men's and women's restrooms will be tiled and will be provided with full-size lockers (20 for men and 10 for women), benches, and showers.

10A3.11.2.2 Power House

Walls surrounding the engine-hall area and the auxiliary areas will be of non-combustible materials. The power house will be designed to house all the engine generator sets, and provided with adequate operation and maintenance facilities.

Adequate catwalks and service platforms will be provided for engine and generator maintenance.

Adequate sound proofing and noise attenuation will be provided to meet site boundary noise requirements.

Reinforced concrete grade slabs in the will be treated with a floor hardener and oil-resistant sealer to accommodate maintenance or laydown. Floor drains will be provided to eliminate any standing water. The floor drains will be plumbed to the oily water separator.

Adequate lay down space will be provided such that simultaneous engine overhauls can be accommodated.

A minimum of 15-foot by 15-foot reinforced concrete foundation, curbed and drained to the oil water separator, will be provided adjacent to the building for a drum storage area. The building foundation will have a grating covered trench which slopes to sump. The sump and trench should be drained to the oily waste sewer system.

The fire pump house portion of the building will house the one electric fire water pump, one diesel fire pump, and one jockey pump. Access doors will be provided for maintenance of the pumps.

10A3.11.2.3 Electrical Switchgear Building

The electrical switchgear will be housed in a building, preferably located near the control room. Access to the electrical room will be provided by one 12-foot-high by 10-foot-wide roll-up door and double, hollow-metal fire-rated doors to the outside. All areas will have an exposed structure with 10-foot wall liners to protect the insulation. The DC battery system will be located in the electrical switchgear building.

10A3.12 Painting and Coatings

The HBRP is located in a highly corrosive marine environment adjacent to the Pacific Ocean. Painting and coatings will be appropriate to provide environmental protection to the painted and coated items and provide for very low maintenance. Paintings and coatings will be suitable for 25 years.

Painting and coating system will include uniform color coordination for system designation. All exposed surfaces of the facilities will receive a protective coating system. All interior surfaces not coated will be painted. Concrete will be coated as required to protect against environmental conditions and chemical exposure.

All outdoor structural and miscellaneous support steel will be galvanized in accordance with ASTM A123, ASTM A153, and ASTM A385. Steel in high moisture areas, grating, embedded anchor bolts, assemblies, nuts, washers, plates, and assemblies are to be galvanized. Miscellaneous embedded plates will also be galvanized.

Indoor structures, such as building columns, will be painted. All paint coating systems will consist of surface preparation, a prime coat, and a finish coat. The Contractor will submit for approval and use high-quality paint products as manufactured by Ameron, Briner, Carboline, Ceilcote, DuPont, Glidden, Porter, Sherwin Williams, Tnemec, or ZRC. Surface preparation and paint system application will be in accordance with the paint system manufacturer's recommendations. The primer, intermediate coat, and finish coat will be from the same manufacturer.

The following protective coating systems will be used:

a. Exposed structural steel, steel piping, and equipment will have a surface preparation as recommended by the paint manufacturer, a primer coat (2-4 mils DFT) of two-component inorganic zinc and a finish coat (4-6 mils DFT) of semi-gloss polyurethane paint.

b. Steel areas where chemical exposures (acidic, neutral, or alkaline) are anticipated to occur will have a surface preparation as recommended by the paint manufacturer, a

primer coat (4-6 mils DFT) of polyamide epoxy paint, and a finish coat (2-3 mils DFT) of acrylic aliphatic polyurethane paint.

c. Externally exposed metal surfaces with service temperatures of 450°F to 750°F will receive a SSPC SP10 surface preparation, a primer coat (2-2.5 mils DFT) of inorganic zinc silicate paint, and a finish coat (1.5 mils DFT) of silicone aluminum paint.

d. Environmentally controlled areas with interior concrete and concrete masonry components requiring painting will have a surface preparation that is clean, dry, and free of contaminants, a primer coat (thickness rate per paint manufacturer) of masonry filler, an intermediate coat (2-3 mils DFT) of low-gloss acrylic latex, and a finish coat (2-3 mils DFT) of low-gloss acrylic latex.

e. Exterior and non-environmentally controlled areas with concrete and concrete masonry components requiring painting will have a surface preparation that is clean, dry, and free of contaminants, a primer coat (thickness rate as recommended by the paint manufacturer) of masonry filler, an intermediate coat (2-3 mils DFT) of water-borne acrylic paint, and a finish coat (2-3 mils DFT) of water-borne acrylic paint.

f. All drywall areas will have a smooth, clean, and dry surface preparation, a primer coat (0.5 to 3.0 mils DFT) of sealer or thinned finish coat as recommended by the paint manufacturer, and intermediate coat (1-2 mils DFT) of low-gloss acrylic latex paint, and a finish coat (1-2 mils DFT) of low-gloss acrylic latex paint.

g. The interior surfaces of steel tanks for the storage of potable and service water will have a SSPC SP5 surface preparation, and two coats of epoxy polyamide (each coat 4-6 mils DFT) meeting or exceeding the requirements of ANSI/NSF Standard 61 for potable water tanks.

h. The interior surfaces of steel tanks for the storage of high purity water will have a SSPC SP5 surface preparation, a primer coat (4-6 mils DFT) of two-component zinc-filled epoxy, and a finish coat (4-6 mils DFT) of alaphatic amine epoxy.

i. The exterior surfaces of steel tanks will receive a primer coat (4-6 mils DFT) of two-coat zinc-filled epoxy and finish coat (4-6mils DFT) of polyurethane paint.

j. Building exterior finish coatings will be applied to all roof and wall panels and decks, wall louvers, flashings, gutters, trim, and other exposed galvanized surfaces.

10A3.13 Design

The design will conform to Applicable Laws and Applicable Standards. The design will be based on the CBSC, and other applicable local or state building code, the American Concrete Institute (ACI), and American Institute of Steel Construction (AISC). All buildings, structures and equipment will be designed and built in accordance with Applicable Laws and Applicable Standards.

Strength design will generally be employed for reinforced concrete structures, and allowable stress design or load and resistance factor design employed for steelwork.

Wind, snow, and earthquake loading will be in accordance with Applicable Laws and Applicable Standards.

The design will take account of all applied loads, including dead, live, impact, thermal, dynamic, settlement, movement, and seismic, and other loading conditions where appropriate. Temporary loads during maintenance and erection will be considered.

Platforms will be designed for a minimum live load of 100 pounds per square foot (psf). Platform design will employ the use of grating in lieu of checkered plate unless required for containment purposes. All handrail, toe plate, ladders, cages, gates, etc., will be in accordance with OSHA Standard Rules and Regulations.

Pre-engineered building rafters will be designed for the appropriate collateral loading from roof supports, HVAC ducts, cable tray, and piping.

Grade slabs (engine equipment laydown) will be designed, at a minimum, for 300 psf. Ground floor slabs for shops and auxiliary buildings will be designed, at a minimum, for 150 psf. Storage areas will be designed for actual weight of material but no less than 150 psf.

Vendor-generated structural steel details, concrete reinforcing details, and erection drawings are to be reviewed and approved by the Contractor's Professional Engineer, registered in the state where the Project is located.

Access doors and hand rails will be designed and located for easy access for maintenance and inspections. Adequate hand railing and fall protection barriers will be installed for maintenance activities.

10A3.14 Construction

Working methods will ensure the construction of stable structures able to withstand all applied loadings during construction and for the design life of the Project without collapse, failure, or excessive deformation such as to cause any damage, loss of function, or durability problems.

A permanent Project benchmark will be established on the Project site by the Contractor based upon USGS vertical datum. Settlement monitoring points will be provided, with a minimum of four points for each end of the bank of engines. The existing elevation at each point will be inscribed on an embedded brass marker before setting of equipment.

All welding will be performed by welders qualified in accordance with AWS D1.1, using only procedures qualified in accordance with AWS D1.1.

10A3.15 Testing and Inspections

A program for testing soils during earthwork and when underground utilities and foundations are installed will be utilized.

The minimum moisture and density testing requirements for structural fill will be one test per 75 cubic yards with at least one test under each foundation greater than 15 square feet.

In-place representative field density tests will be performed in accordance with ASTM D 1557.

If a compacted area fails to meet the specified compaction requirements, two additional tests will be performed for that area. If the results of either of the two additional tests-prove unsatisfactory, the area will undergo additional compaction and testing until test results meet the minimum compaction requirements.

Records of inspection and testing of soils to ensure compliance with design assumptions will comply with Applicable Standards. If pile-supported foundations are to be used, the Contractor will conduct a pile load test program.

Testing and inspections of structures will be in accordance with Applicable Standards.

Concrete test cylinder sets will be taken at the minimum rate of one set per day but not less than once for each 150 cubic yards for slabs, foundations, or walls. Concrete test cylinder sets for paving will be taken at the minimum rate of 1 set per day but not less than once for each 150 cubic yards, nor less than once for every 5,000 square feet. As a minimum, one set of cylinders will be taken for each equipment foundation, with exception that one set of cylinders may be made for each concrete truck load where multiple small foundations are poured from a single load. Test procedures will be in accordance with the appropriate ASTM standards. Copies of test data will be provided to the Owner.

The Contractor will utilize a system to validate type and grade of high-strength bolts by sampling and metallurgical testing.

A testing program of high-strength bolts and nuts will be conducted by the Contractor to ensure that each bolt shipment meets the appropriate ASTM standards for dimensional tolerances and material quality.

All structural welds will be subject to inspection in accordance with weld quality requirements provided in AWS D1.1. Critical welds will be inspected as required, and all other welds will be subject to random inspection.