APPENDIX A. TECHNICAL SPECIFICATION – INFRASTRUCTURE EQUIPMENT

A.1 Towers and Infrastructure Equipment

A.1.1 Radio Communications Towers

Contractor selection and design of radio communications towers and foundations for the CBP system shall include consideration to longevity and durability, ease of use, frequency and cost of maintenance, appropriateness for the site location and permitting, and standardization. Unless otherwise noted, at a minimum, the towers and foundations shall meet all of the applicable American National Standards Institute/National Fire Prevention Association/ Telecommunications Industry Association/ Occupational Safety and Health Act (ANSI/NFPA/TIA/OSHA) standards.

A.1.1.1 Physical & Structural

(b) (7)(E)

A.1.1.2 Appurtenance Design Load

The following subsections present the appurtenance load that each furnished new tower and related foundation must be designed to accommodate. The actual initial appurtenance load to be furnished and accommodated and specific locations are specified elsewhere in this SOW. To the extent that the design load exceeds the initial load specified herein this difference provides CBP with capacity for future growth.

A.1.1.3 Design Load: Land Mobile Radio (LMR) Antennas

(b) (7)(E)

(b) (7)(E)

A.1.1.4 Design Load: Microwave Antennas

(b) (7)(E)

Design load shall account for worst-case azimuth for all antennas on the tower, protected by a falling-ice shield. Each antenna fed by 2¼ inch elliptical-waveguide or air-dielectric coaxial feedline.

A.1.1.5 Design Load: Solar Power Panels

Design load shall be based on contractor specified Solar Power panel loads where supplied by the contractor as part of the CBP proposed design load.

A.1.1.6 Design Load: Other Load Considerations

Contractor shall specify all incidental and other loads as attached to each provided tower.

A.1.1.7 Initial Furnished Appurtenance Load

The initial appurtenance load shall be specified by the contractor based upon their interconnect system, VHF system and Solar Power system (where applicable) design to meet the requirements specified in this statement of work (SOW).

A.1.1.8 Exterior Whip-Antenna Mounts

(b) (7)(E)

A.1.1.9 Climbing Devices

The structure shall be equipped with a climb ladder and a safety-cable system and shall be rated for a 10,000 pound load and designed such that it protects at a minimum two persons while climbing the tower.

A.1.1.9.1 Cable Ladder

For self-support towers the structure shall be equipped with a cable ladder for each of two (2) structure legs in the tapered portion. A single ladder is permissible in the non-tapered portion. The ladder design shall allow for supporting cables on both sides of the ladder. Ladder width shall not be less than 18-inches.

A.1.1.9.2 Bolts or Pegs

Self-support towers shall be equipped with climbing bolts or pegs on each leg.

A.1.1.10 Tower Ground Bus Bar

Furnish a tower ground bus bar and associated mounting hardware, sized as required for each tower face equipped with cable ladders to facilitate connection of the antenna feedline and waveguide ground-straps in accordance with (b) (7)(E) [redacted]

A.1.1.11 Lighting & Painting

The structure shall be lit and/or painted in accordance with Federal Communications Commission and Federal Aviation Administration requirements, as necessary.

A.1.1.12 Cable Bridge

An elevated cable bridge shall support, and protect from falling ice, LMR antenna feedlines and microwave antenna waveguides to the tower. The cable bridge shall be no less than 18-inches in width. The cable bridge shall span the length between the tower and the antenna cable entry panel and be properly supported. All antenna feedlines and waveguides shall be supported below the ice-shield.
Minimum ice-shield impact load: 50 lbs weight falling from the height of the top of the tower.

A.1.1.13 Dish Antennas –Interconnection Microwave Antenna & Accessories

The dish-antenna shall be of a solid, parabolic reflector construction. One-piece reflectors are required. At a minimum, the antenna shall have a wind survival rating of 125 miles per hour with 1-inch radial ice. Each antenna shall be equipped with a non-heated radome, manufactured of fiberglass or thermoformed plastic material. At a minimum, the radome shall have a wind survival rating of 125 miles per hour with 1-inch radial ice.

A.1.1.14 Ice Shield

All tower-mounted antennas shall be furnished with an ice shield of a lattice-mesh design. Impact load shall be 50 lbs from the top of the tower or 200 feet which ever is lower.

A.1.1.15 Dish Antenna Feedlines & Accessories

Main antenna feedlines shall be high quality foam-dielectric coaxial transmission cable, pressurized air-dielectric coaxial or elliptical waveguide transmission cable as appropriate for the frequency band and path design. Grounding and feedline lightning suppression devices shall be furnished in accordance with CBP's installation standards and practices. Snap-in feedline hangers are preferred and shall be used to the greatest practical extent.

A.1.1.16 Pressurization/Dehydration

For air dielectric lines, an automatic, integrated dry-air pressurization and dehydration (APD) unit shall be furnished for the main antenna feedline(s). It shall be powered from an external power source supplying a nominal (b) (7)(E) [redacted] The unit shall not be of the regenerative desiccant type.

At a minimum, the unit shall be sized to pressurize all the furnished feedlines at each site plus two 2 additional feedlines of the same size and length. The unit shall be equipped with a pressure relief valve.

The unit shall be equipped with alarm output capability and, at a minimum, shall alarm the following conditions: low pressure, high humidity, power fail, and excessive run-time. These conditions shall appear as separate independent outputs. The alarm output(s) shall be a (b) (7)(E) [redacted] A local visual indicator shall indicate an alarm condition.

A.1.2 Communications Equipment Shelters

Contractor selection and design of communications equipment shelters and foundations for the CBP system shall consider longevity and durability, ease of use, frequency and cost of maintenance, equipment to be housed, appropriateness for the site location permitting requirements and standardization.

The shelter will be used to house radio telecommunications equipment.

The design service life shall exceed 40 years. Unless otherwise noted, the shelters and foundations shall meet at a minimum all of the applicable ANSI/NFPA/TIA/OSHA standards for communications equipment shelters.

A.1.2.1 Shelter Size

Shelters shall be sized by the contractor. Shelters shall be of sufficient size to accommodate the contractor provided equipment (including: very high frequency (VHF) Fixed Stations, VHF combiners, interconnect, power systems) specified in this SOW including specified growth allowances and appropriate space to allow front and rear access for service personnel in accordance the applicable ANSI/NFPA/TIA/OSHA standards for communications equipment shelters.

Table A -1: Table Shelter Size

	Non-Solar Power Site Communications Equipment Shelters	Solar Power Site Communications Equipment Shelters
Additional Growth Allowance	(b) (7)(E)	
Minimum Building Size		

A.1.2.2 Construction

A.1.2.2.1 Shelter Base

Shelter base shall be fabricated of rot resistant material.

A.1.2.2.2 Floor

a. Weight Load: the greater of 750 lbs per square foot or the full equipment load providing for 100% growth.
b. Finish: Commercial grade, electro-static discharge floor tiles.
c. Fire Retardant: 1-hour rated, minimum.
d. The floor shall accommodate equipment rack anchor bolts.

A.1.2.2.3 Floor Plate

The contractor shall provide adequate rodent and insect control on the underside of the floor plate.

A.1.2.2.4 Roof

a. Minimum Weight Load: 100 lbs per square foot.

b. Minimum Impact Load: 50 lbs falling from the height of the top of the highest adjacent tower or 200 feet, whichever is lower.

c. Pitch: sloped downward for drainage.

d. Wind Load: shall be per TIA-222-G.

A.1.2.2.5 Ceiling

a. Finish: fiberglass reinforced plastic laminate.

b. Interior Height: 9-feet, minimum.

c. Fire Retardant: 1-hour rated, minimum.

A.1.2.2.6 Walls

a. Wind Load: shall be per TIA-222-G

b. Interior Finish: fiberglass reinforced plastic laminate.

c. Exterior Finish: natural stone aggregate.

d. Fire retardant: 1-hour rated, minimum.

A.1.2.2.7 Insulation

The contractor shall provide insulation values consistent with energy efficient construction and the site location.

A.1.2.2.8 Interior Electrical Service Wiring

All electrical wiring shall be continuous runs in exposed galvanized, stainless steel or aluminum conduit and/or raceways, as required.

A.1.2.2.9 Perimeter Fence System

Contractor design of the Perimeter Fence System for the CBP system shall consider of longevity and durability, ease of use, frequency and cost of maintenance, appropriateness for the site location and permitting, and standardization. The fence and associated components shall be industrial or commercial-grade rated.

A.1.2.2.10 Fence

(b) (7)(E) [redacted].

A.1.2.2.11 Gate

At a minimum the gate shall be of the swing-type, twin-leaf with keeper, members welded together, fabric same as fence. The leaf width will be five feet. The latch shall be a horizontal-bar, vandal-resistant design with integral padlock hasp.

A.1.2.2.12 Security Barrier

(b) (7)(E)

A.1.2.2.13 Gravel Layer

Layer with a minimum depth of 4-inches shall be of crushed stone of sufficient size to minimize displacement when traveled-over by a typical large-service vehicle. Gravel shall be preceded with a fabric-type, weed barrier layer.

A.1.2.2.14 Signage

Information, notice, and/or warning signs shall be furnished for each side of the fence perimeter.

At a minimum, signs shall meet Industry Standards, Municipal or Local Codes and specific requirements of the Customs and Border Protection (CBP).

A.1.2.2.15 Grounding

The perimeter fence components shall be bonded to the site ground system in accordance with (b) (7)(E)

A.1.2.3 Doors – Exterior

A.1.2.3.1 Fabrication

Heavy duty, insulated, galvanized or stainless steel, welded fabrication, minimum width: 42 inches, minimum height 8 feet.

A.1.2.3.2 Accessories

Vandal resistant, stainless steel lockset & deadbolt (replaceable cores; keyed alike), exterior padlock hasp, anti-pry plate and hinge pins. Automatic closing mechanism and wind check. Exterior overdoor shall have a corrosion resistant drip awning. The alarm type shall be shall be a (b) (7)(E).

A.1.2.4 Ground System

Insulated (green), stranded copper conductor no less than #2 American Wire Gauge (AWG). Furnish insulated standoffs as required. All furnished materials shall be in accordance with (b) (7)(E) [redacted]

A.1.2.5 Non Solar Power Communications Shelters

A.1.2.5.1 Utility Outlets

a. Quad receptacle: provide circuit breakers as required and consistent with industry standards.
b. Minimum Rating: 20-amp.
c. Wall-mounted, 24-inches above finished floor.
d. As needed, 4-feet on-center spaced evenly on all walls.

A.1.2.5.2 Lighting

A.1.2.5.3 Interior

Interior Lighting shall be via energy efficient fixtures. Fixtures shall protect bulbs. As needed to provide a minimum of 150 foot-candles of illumination at floor level. Interior, wall-mounted, 1-hour timed light switch.

A.1.2.5.3.1 Interior - Emergency

Integrated medium to heavy-duty industrial-use rated, solid-state design emergency light fixture for each doorway.

A.1.2.5.3.2 Exterior

a. Light fixture for each exterior doorway with radio or motion sensor operation.
b. Bulb: Long life, standard screw-base, 150-watt rated, minimum.
c. Shatter/tamper resistant lens.

A.1.2.5.4 Heating System

Energy-efficient baseboard electric heat strips for each room. System shall be sized to maintain an interior temperature of 70 degrees F during exterior temperature of -30 degrees F, no equipment heat loads considered.

System shall be equipped with Pre-wired thermostat, On/off visual indicator, and (b) (7)(E) [redacted]

A.1.2.5.5 Ventilation System

The ventilation shall be sized with a minimum 12-inch motorized fan for each room with wall-mounted controls and dual, parallel manually adjustable thermostats.

A.1.2.5.5.1 Intake

a. Mechanically activated louver/damper for each room.
b. Galvanized, stainless steel, or aluminum weather hood.
c. Galvanized, stainless steel, or aluminum screen to prevent insect or rodent intrusion.
d. Filtered.

A.1.2.5.5.2 Exhaust

a. Gravity-type louver/damper for each room.
b. Galvanized, stainless steel or aluminum weather hood.
c. Galvanized, stainless steel or aluminum screen to prevent insect or rodent intrusion.

A.1.2.5.6 Heat/Smoke/Carbon Monoxide Detection

Each shelter room shall be equipped with an industrially-rated heat detector, an industrially-rated smoke detector, and an industrially-rated carbon monoxide detector, as needed, and spaced for maximum coverage. Detectors shall be equipped with a (b) (7)(E) [redacted] Combination heat, smoke and carbon monoxide detectors are not acceptable.

A.1.2.5.7 Fire Suppression

Each shelter room shall be equipped with one wall-mounted fire extinguisher,

Type: Class ABC all purpose dry chemical.

Size: 10 lbs.

A.1.2.6 Solar Power Communications Shelters

Electrical power to shelter accessories will be supplied via a solar power system specified elsewhere.

Design and construction shall allow the shelter to be air lifted to the site.

A.1.2.6.1 Lighting - Interior

Lighting shall be via low-power consumption light emitting diode (LED)-type light fixtures.

Lighting shall be powered from the shelter's solar power system storage battery bank (see Solar Power System section).

Fixtures shall be spaced for maximum coverage.

Interior, wall-mounted, 1-hour timed light switch.

A.1.2.6.2 Heating System

Two 4-foot baseboard electric heat strips.

Strips shall be powered from the shelter's solar power system alternating current inverter (see Solar Power System section).

Strips shall be of a low power-consumption, high energy-efficient design.

Each strip shall be furnished with an interior, wall-mounted, 1-hour timed 'on' switch.

Strip will only be used by personnel when servicing communications equipment.

A.1.2.6.3 Ventilation System

A.1.2.6.3.1 Design

Designed and sized by the contractor as necessary.

Design shall be based on passive and/or electro-mechanical technology.

System shall operate when interior shelter temperatures exceed 75 degrees Fahrenheit (F), equipment heat loads considered.

If of an electro-mechanical design, the system shall:

- be powered from the shelter's solar power system storage battery bank (see Solar Power System section).
- be of a low power consumption, energy efficient design.
- be equipped with a dual, parallel, manually-adjustable, wall-mounted thermostats. Thermostat shall be adjustable in 5 degree increments from 75 degrees F to 90 degrees F.
- be equipped with a manually-programmable, wall-mounted, multi-interval timer to prevent continuous operation.

A.1.2.6.3.2 Intake

Louver/Damper: mechanically activated or bi-metallic strip technology.

Elevation: near floor.

Weather Hood: galvanized, stainless steel or aluminum.

Rodent/Insect Protection: galvanized, stainless steel or aluminum screen.

Filtering: re-usable filter.

A.1.2.6.3.3 Exhaust

Louver/Damper: mechanically activated, gravity-type or bi-metallic strip technology.

Elevation: near ceiling.

Weather Hood: galvanized, stainless steel or aluminum.

Rodent/Insect Protection: galvanized or stainless steel or aluminum screen.

A.1.2.6.4 Heat/Smoke Detection

The shelter shall be equipped with industrially-rated heat and smoke detectors, as needed, and spaced for maximum coverage.

The detectors shall be powered by replaceable, long-lasting, standard-size, alkaline-type batteries.

Detectors shall be equipped with a (b) (7)(E) [redacted]

A.1.2.6.5 Fire Suppression

The shelter shall be equipped with one wall-mounted fire extinguisher.

Type: Class ABC all purpose dry chemical.

Size: 10 lbs.

A.1.3 Communications Equipment Room

A.1.3.1 Electrical

A.1.3.1.1 Interior

Interior main distribution panel shall be sized for a minimum (b) (7)(E) [redacted], single-phase.

Must contain a 40-branch circuit capacity for 12' x 18' and smaller shelters, and, 60-branch circuit capacity for shelters larger than 12' x 18', equipped as needed.

A.1.3.1.2 Surge Protection - Service Entrance

Transient Voltage Surge Suppressor (TVSS), sized by contractor, adequate to protect all site equipment and loads. See section 5.13. (b) (7)(E) [redacted] shall be included.

A.1.3.1.3 Equipment Outlets – Equipment Rack Mounted

Quad receptacles shall be provided with circuit breakers consistent with industry standards.

Rating: 20-amp.

As needed, per equipment rack.

A.1.3.2 Air Conditioning System

a. Two self-contained, integrated wall mount units.
b. Units shall be of a high energy-efficient design.
c. System shall be sized to maintain an interior temperature of 65 degrees F given an exterior temperature of +100 degrees F.
d. System shall be equipped with:
   i. Auto-restart.
   ii. Economizer cycle.
   iii. Pre-wired thermostat.
   iv. Lead/lag controller.
   v. (b) (7)(E) [redacted].

A.1.3.3 Antenna Cable Accessories

A.1.3.3.1 Cable Entry Panel

a. Size: Adequate number to meet 200% of required antenna feed lines, 4-inch ports, minimum.

b. CBP prefers PolyPhaser Earthed Entrance Panel (PEEP) as manufactured by PolyPhaser Corporation, or equivalent.

c. Furnish exterior ultra violet protected weather-boots for all ports.

d. Furnish pre-punched, solid-copper ground bus bar for the interior and exterior sides of the entry panel.

e. CBP prefers adjacent Commercial Power entrance and Cable Entry Panel shelter configurations.

f. All furnished materials shall be in accordance with (b) (7)(E) [redacted]

A.1.3.3.2 Interior Cable Tray

a. Type: Ladder style, ceiling hung.

b. Width: 18-inches, minimum.

c. Length: as required to support two equipment rack rows and the cable entry panel.

d. Equipment rack row trays shall be bridged together through the use of T-shaped sections or junctions at both ends and mid-center.

e. T-shaped sections or junctions shall feature U-shaped side-rails.

A.1.3.3.3 Communication Cable Accessories

Interior Cable Tray-- Communications cables can share the interior antenna cable tray.

Termination Backboard Size shall be: 4-feet x 8-feet x 3/4 inches.

A.1.3.4 Heat/Smoke Detection

The shelter shall be equipped with a separate industrially-rated, heat, detector, an industrially rate smoke detector, and an industrially rated carbon monoxide detector, as needed, and spaced for maximum coverage.

The detectors shall be powered by replaceable, long-lasting, standard-size, alkaline-type batteries or by a combination of AC and battery power.

Detectors shall be equipped with a (b) (7)(E) [redacted].

A.1.4 Power Systems

Standby power systems are critical to reliable operations of mission critical tactical communications systems, particularly during natural and manmade catastrophic events.

To minimize power related service outages and their impacts, a multi-layer power system shall be designed and provided by the contractor as follows:

A.1.4.1 Non-Solar Power Sites

a. Commercial Power: Serves all loads.

b. DC Battery System: Services all communications, network management equipment loads and other designated critical loads.

c. Standby Generator: Serves all loads.

d. Exception: Any site where the site owner provides a protected (b) (7)(E) and space is not available for a direct current (DC) Battery System.

A.1.4.1.1 DC Power (Non-Solar Power Sites)

A single common DC power system delivering a nominal (b) (7)(E) Bidder to specify, shall be designed, furnished, installed and commissioned at each CBP non-Solar Power site unless stated otherwise. Each system shall be designed to power the following (b) (7)(E) reserve to accommodate growth:

a. All interconnect radio terminals furnished by contractor.

b. All baseband equipment furnished by contractor.

c. All network management system equipment furnished by contractor.

d. All VHF equipment furnished by the contractor.

e. Other furnished equipment or device loads deemed critical by the contractor.

The system shall be based on a vertically-stackable concept suitable for mounting in open equipment racks. The number of racks for each system shall be kept to a minimum and the racks shall not exceed a height of 84 inches.

Each rack shall be equipped with a ground system in accordance with the (b) (7)(E) standards.

A.1.4.1.2 Battery Charger/Rectifier Non-Solar Power Sites

The power system shall include a battery charge/rectifier (BCR).

The BCR shall:

a. Be based on an expandable, front-access, modular design.
b. Be capable of being expanded or serviced without interrupting power to the load.
c. Be sized to accommodate reserve/future growth load of [redacted].
d. Be of an N+1 design.
e. Be equipped with the necessary fuses, circuit-breakers, power-distribution and disconnect hardware.
f. Be equipped with automatic high voltage and low voltage disconnects.
g. Be equipped with front-panel visual alarm indication with an [redacted].

At a minimum, the BCR shall alarm the following conditions via a [redacted]

[redacted]

A.1.4.1.3 Battery Bank (Non-Solar Power Sites)

The power system shall be augmented with a storage battery bank. The bank shall:

a. Be based on a vertically-stackable, front-accessible, space-saving, modular-cell design.
b. Be sized to provide [redacted] of standby power for the furnished DC powered equipment at an interior shelter temperature of 77 degrees F.
c. Be sized to accommodate reserve/future growth load of [redacted].
d. Be equipped with the necessary fuses, circuit-breakers, power-distribution hardware, and rack-mounted battery bank disconnect.
e. Be of a front-access cell design.

The batteries shall:

f. [redacted]
g.
h.

A.1.4.1.4 AC Inverter (Non-Solar Power Sites)

If critical loads cannot be powered directly by the DC power system, and if the critical loads are best supported by uninterruptible power, then the DC power system shall be equipped with an AC inverter. The inverter shall be sized by the contractor to meet the needs of the facility plus allow for a minimum of (b) (7)(E) [redacted] growth.

A.1.4.2 Solar Power Sites

a. Solar Power System including a DC Storage Battery System: Serves all loads.
b. Supplementary Charging System: Serves all loads.
c. Battery Systems provided for Solar Power Sites have the same nominal voltage.
d. Contractor design and selection of power systems and power system components for the CBP system shall consider to longevity and durability, ease of use, frequency and cost of maintenance, appropriateness for the site location, and standardization.

A.1.4.3 AC Surge Protection

All DC power systems installed at sites with existing shelters or equipment rooms shall be protected by an AC Transient Voltage Surge Suppressor (TVSS). The TVSS shall be mountable in the DC power system or radio equipment open rack.

A.1.4.4 Standby Power Generator

The generator shall be rated for industrial/commercial use.

The generator shall be sized by the contractor to service the CBP load plus a 100% reserve for future growth.

A.1.4.4.1 Output Requirements

At a minimum the generator shall provide:

(b) (7)(E)

A.1.4.4.2 Engine

a. The engine shall be of the propane internal combustion type (diesel may be acceptable in some warmer climate sites).
b. The engine shall be stationary and mounted on a heavy-duty steel skid base.

c. The engine shall be mounted on vibration isolators or dampers that are either integral or external to the skid base.
d. The engine shall be equipped with a thermostatically-controlled engine block heater.
e. Maximum rated speed: 1,800 Revolutions per Minute (RPM)

A.1.4.4.3 Starting System

Starting system minimum requirements include:

a. Electric, (b) (7)(E) negative ground, sourced from storage batteries mounted to the generator unit
b. A constant voltage/current limiting float/equalize battery charger mounted to the generator unit.
c. At a minimum, the charger shall be equipped with the following:
    i. On/Off Switch
    ii. DC Voltmeter
    iii. DC Ammeter
    iv. Equalizer-Charger Timer

d. The equalizer timer shall provide for a minimum of 12-hours of equalization time.

A.1.4.4.4 Lubricating Oil System

a. Shall be capable of using either petroleum or synthetic motor oils.
b. Shall include an oil level dipstick.
c. Shall be equipped with an automatic oil level maintaining system.
d. The system shall include an oil supply tank sized to supply oil for 15-days of continuous operation.
e. The tank shall include a see-thru oil level gauge and include a shutoff valve.

A.1.4.4.5 Cooling System

a. Shall be liquid-cooled using a fan radiator.
b. The generator unit shall be equipped with the necessary ducts, flanges, adapters, and/or other hardware to allow ducting of heated air to the outside.
c. The generator unit shall be equipped with the necessary controls to activate motorized ventilation louvers or dampers.

A.1.4.4.6 Exhaust System

a. A critical muffler shall be supplied with the unit.
b. The connection between the muffler and the exhaust manifold shall be of the flexible type.
c. The muffler shall be equipped with a condensation trap with a manual drain valve.

A.1.4.4.7 Fuel System

a. Aspirated air (external air source) shall be filtered through a replaceable dry-element filter.
b. The system shall include all necessary accessories for full functionality including, but not limited to fuel lines, gauges, level-sensors, valves, fittings, filters, piping, insulation, wiring, and pumps, as necessary.

A.1.4.4.8 Engine Controls and Alarms

A.1.4.4.8.1 Control Panel

All controls, indicators, meters and alarms specified herein shall be consolidated into a control panel capable to being installed at a remote location and shall be available for remote monitoring and control via the Network Management System (NMS).

One remote panel shall be furnished for installation within the shelter's generator room.

A.1.4.4.8.2 Run/Stop Switch

A manual run/stop switch shall be provided.

A.1.4.4.8.3 Gauges & Meters

The unit shall be equipped with the following:

a. Oil pressure gauge.
b. Temperature gauge.
c. Charge rate ammeter.
d. Running time meter.
e. Output-frequency meter.

A.1.4.4.8.4 Governor

The unit shall be equipped with a governor to maintain speed regulation to within 5% from no-load to full-load output.

A.1.4.4.8.5 Automatic Shutdown

The unit shall be equipped for automatic engine shutdown for critical operating parameters to prevent engine damage.

A.1.4.4.8.6 Fault Reset

The unit shall be equipped with a manual reset switch to allow engine restart after any fault condition shutdown.

A.1.4.4.8.7 Condition Indicators

At a minimum, the following visual indicators shall be available on each control panel furnished:

a. Generator running.
b. Over Crank shutdown.
c. Over Speed shutdown.
d. Under Speed shutdown.
e. Low oil pressure alarm/indicator
f. Low oil pressure shutdown.
g. High temperature alarm/indicator
h. High temperature shutdown.
i. Low fuel level

A.1.4.4.8.8 Remote Monitoring and Control

The alarm and control function specified in the following sections shall be available for remote monitoring and activation via the Network Management System. Interconnection to the NMS may be via (b) (7)(E) [redacted].

A.1.4.4.8.9 Alarms

a. A generator running condition shall activate a (b) (7)(E) [redacted]
b. (b) (7)(E) [redacted] shall be activated, at a minimum, by any one of the following alarm conditions:
c. Low oil pressure indicator.
d. Low oil level.
e. Low fuel tank.
f. High temperature.
g. (b) (7)(E) [redacted] at a minimum, by any one of the following alarm conditions:
    i. Over Crank shutdown.
    ii. Over Speed shutdown.
    iii. Under Speed shutdown.
    iv. Low oil pressure shutdown.
    v. Low oil shutdown
    vi. High temperature shutdown.

A.1.4.4.8.10 Controls: Remote Activation

The following control functions shall be available for remote activation:

a. Run/Stop Switch
b. Over Crank shutdown
c. Fault Reset

A.1.4.4.9 Main Fuel Storage Tank

A.1.4.4.9.1 Size & Type

a. The tank shall be sized by the contractor to provide for 7 days of continuous operation at the generators full design load.
b. Tank shall be suitable for exterior, above-ground installations.
c. Tanks shall be cylindrical shaped tanks.
d. All fixed installation fuel tanks shall be of the horizontal type.
e. Tank manufacture shall comply with local, CBP and federal guidelines.
f. Tanks shall include warning and information signs on all sides as required by codes, laws, and/or CBP policy.

A.1.4.4.9.2 Features & Accessories

The storage tank features and accessories are as follows:

a. Shall be equipped with a lockable fuel cap.
b. Shall be equipped with a tank-mounted fuel gauge.
c. Fuel gauge levels shall also be monitored from an interior on-site location such as an equipment shelter.
d. The tank shall be equipped with a low fuel level sensor.
e. Activation of the low level indicator shall trigger a (b) (7)(E) [redacted] Contacts shall be remoted to an interior on-site location.
f. The tank shall include all necessary accessories for full functionality including, but not limited to fuel lines, gauges, level sensors, valves, fittings, filters, piping, insulation, wiring, and pumps, as necessary.
g. The fuel line to the engine shall be equipped with a manually-controlled, emergency fuel-shutoff valve. The valve shall comply with all applicable codes.
h. Fuel lines to the engine shall be of sufficient size to meet the engine's vaporization requirements in ambient outside temperatures as low as - 30F.

A.1.4.4.10 Switchgear - Transfer, Bypass & Isolation

The transfer switch shall be of the automatic type. Bypass and isolation switchgear shall allow the system to be serviced and tested without disrupting power to the critical loads.

A.1.4.4.10.1 Size

The contractor shall size the switchgear to accommodate the requirements of this contract. All switchgear shall be contained within a single or multiple, key-lockable, U.L.-listed, indoor wall-mount cabinet(s).

The transfer switch shall be equipped, at a minimum, with the following:

a. AC line under-voltage sensor.
b. Time delay on-start.

c. Time delay on-transfer.
d. Time delay on-retransfer.
e. Time delay on-stop.
f. Exerciser Clock.

A.1.4.4.10.2 Exerciser Clock

The exerciser clock shall be equipped, at a minimum, with Day-of-week setting, Time-of-day setting, and Duration-of-exercise setting. The initial exercise setting shall be for each Wednesday at 9:00am local for 15 minute duration.

A.1.4.4.11 Monitoring and Control Sub-System

a. The system shall be equipped with a monitoring and control sub-system capable, at a minimum, of accessing the generators and transfer switches.
b. The sub-system shall allow for local and remote access.
c. The sub-system shall be microprocessor and Internet Protocol network based.
d. At a minimum, the sub-system shall be capable of:
    i. Monitoring system performance and fault conditions
    ii. Display and annunciation of alarms
    iii. Controlling system functions
    iv. Real-time data collection, retention and report generation

The system shall be remotely accessible via the NMS via an (b) (7)(E) [redacted].

A.1.4.4.12 Grounding & Lightning Protection

Contractor design of the grounding and lightning protection systems for the CBP system shall consider longevity and durability, ease of use, frequency and cost of maintenance, appropriateness for the site location, and standardization.

This section describes the standards of grounding for communications facilities for the CBP. This section is to be used, in conjunction with engineering judgment, for the design, modification, retrofit, installation and maintenance of communications site ground systems associated with this project.

The ground system shall consider site-specific information such as cost, site location, relative lightning risk, soil conditions, existing communications facilities, adjacent communication facilities and other pertinent information to design the optimum ground system for each site.

All metallic objects in the communications facility which enclose electrical conductors, or that are likely to have electrical currents flow in them, shall be grounded.

These objects include, but are not limited to the following: towers, transmission lines, conduits, raceways, structural and architectural steel components, shelters, generators, fuel-storage systems, fences, Solar Power arrays and equipment cabinets and racks.

Grounding shall be adequate for personnel safety, fire hazard reduction, protection of the equipment and protection of the equipment's electronic performance from circuit faults, electrostatic discharge and lightning. All electrical and electronic equipment within the building shall be grounded.

The internal building ground system shall be a single point ground system with a single point connecting to the external ground system. This is to assure electrical isolation from fault currents and for electrical noise reduction.

The interior building ground system and exterior site ground system shall be integrated into a common, single-point ground system that meets (b) (7)(E) standard.

A.1.4.4.13 Intermodulation Suppression

Each station, except those at Solar Power sites, shall be equipped with a dual-circulator intermodulation suppression device. The device shall include dummy loads and harmonic filter. The device can be either an integral part of, or externally mounted to, the transmitter. If these devices are not an integral part of the transmitter, they shall be mounted on a panel or tray or incorporated with combiner/multicoupler systems.

A.1.4.4.14 Pass-Reject Duplexer

Each repeater station, except those at Solar Power sites or with combiner/multicoupler systems, shall be equipped with a dual pass-reject cavity duplexer. At a minimum, duplexer shall provide 90 decibel (dB) of isolation between transmitter and receiver. Pass-selectivity and reject-notch shall be adjustable in the field. The duplexer shall be supplied with brackets for mounting on either vertical or horizontal surfaces.

A.1.4.4.15 Transmitter Combiner/Receiver Multicoupler/Preselector

These types of devices shall be furnished at those sites where multiple base stations/repeaters will be used. To the greatest extent, these devices shall be mounted on a single (b) (7)(E) [redacted].

A.1.4.4.16 Transmitter Combiner

The device shall be of a design that can be easily expanded in the field. The combiner shall be suitable for mounting in (b) (7)(E) [redacted]. The combiner shall be furnished with all necessary cabling, mounts and necessary hardware for a complete installation.

A.1.4.4.17 Wattmeter - Transmitter Combiner

The output of the combiner shall be equipped with an external wattmeter capable of monitoring forward and reflected power, and voltage standing wave ratio (VSWR). At a minimum, the wattmeter shall provide an adjustable set-point for low forward power and an adjustable set-point for high VSWR. The set-points shall drive an (b) (7)(E) and/or a (b) (7)(E) [redacted] suitable for interfacing to an external remote terminal unit. The wattmeter

shall be of the true average power measurement type. The wattmeter shall be suitable for mounting in (b) (7)(E) [redacted].

A.1.4.4.17.1 Receiver Multicoupler

The use of tower-top type of pre-amplifiers is not acceptable. The device shall be of a design that can be easily expanded in the field. The device shall be equipped with a pre-selector filter. The multicoupler shall be suitable for mounting in (b) (7)(E) [redacted]. If the device is of an active design, the unit shall be equipped with either a (b) (7)(E) [redacted] alarm output capability suitable for interfacing to an external remote terminal unit