



Line	Item	TO Contractor submitted schedule	Date requirements (Business Days)
-----	Notice to proceed [NTP] (Provided by DoIT with approved purchase order)	-----	-----
1	Clearing and Grading		NTP + # Days
2	Shelter foundation poured		NTP + # Days
3	Shelter Delivery		NTP + # Days
4	Final Grounding (will trigger request for R56 and punch list inspection)		NTP + # Days
5	Site Completion (to include punch list and R56 corrections)		NTP + # Days
6	Closeout documents submitted for state review		NTP + # Days
	TO Contractor Signature		

Instructions: TO Contractors will submit this document with their signed/sealed bid proposal. Construction completion will be used to compare and evaluate supplied bids. The submitted schedule will also serve as the contractor's binding schedule for the project. Projects not completed within the scheduled completion shown on the schedule will be subject to an assessment for liquidated damages.

The TO Contractor will write the number of days past the NTP in the boxes provided.

Maryland Department of Transportation State Highway Administration

STATEWIDE OPERATIONS CENTER EQUIPMENT SHELTER AND FOUNDATION – FURNISH and INSTALL

TORFP # _____

PROJECT SPECIFICATIONS

1. Summary

This specification is for the purchase and turnkey installation of one (1) 12x38ft concrete foundation, and one (1) 12x38x10-foot equipment shelter with a 75kw natural gas fueled backup generator for the Maryland State Highway Administration (SHA) at the following location:

MDOT SHA - STATEWIDE OPERATIONS CENTER (SOC)
Hanover Complex
Rear of 7491 Connelly Drive
Hanover, MD. 21076

(The new installation will be adjacent to the existing 65' lattice tower. The exact location will be specified by the State Project Manager or designee.)

The Contractor shall comply with all applicable sections of the MD State Highway Administration Standards of Construction Specifications for Construction and Materials, July 2008 (Grey Book).

Contractors will only use approved shelter designs. The following manufacturers have preapproved designs:

Cellxion www.cellxion.com
Fibrebond www.fibrebond.com
ThermoBond www.thermobond.com
VFP www.vfpinc.com

2. TORFP Specifications

The Contractor shall provide all coordination, functions, labor, materials, insurance and purchase items required to install a fully functional wireless communications shelter in accordance with the following specifications;

A. Site Preparation Work

1. Locating (“Miss Utility”) of any and all buried electrical, telephone and other communications cables, gas and water pipes, conduits and drain pipes on all of the property affected by the construction and installation of foundations, equipment shelters, gas, electrical, communications conduits and other associated items and ancillary components shall be the responsibility of the Contractor.

Important note: If at any point, during this project, aerial or buried utility system components are damaged by the Contractor and/or its Subcontractor activities, the Contractor shall immediately notify the State Project Manager as well as the appropriate utility company and service companies needed for a quick and thorough repair of the affected system components. The highest priority shall be given to the quick and efficient repair of any damaged components restoring all items to a condition at least equal to or better than originally found and the Contractor must ensure that the system performance has been returned to normal functionality.

2. The Contractor shall follow the approved sequence of constructions as shown in the attached construction drawings. Any deviations must be approved as required.
3. The Contractor will survey and mark the Limits of Disturbance (LOD) in accordance with the attached construction drawings.

Important note: If needed, The Contractor shall be responsible for researching and applying the appropriate soil erosion devices to properly control and prevent storm-water and sediment runoff associated with project activities. The Contractor shall be responsible for any required cleanup as a result of improper soil erosion and storm-water management technique and/or failure to follow appropriate environmental site design (ESD) requirements, guidelines and procedures. The ESD must be implemented and maintained to the maximum extent possible (MEP). For more information you may download a copy of the “2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control” handbook at:

http://mde.maryland.gov/programs/water/StormwaterManagementProgram/Pages/esc_standards.aspx

4. All concrete supplied shall originate from a State certified / SHA approved plant. Supplied concrete shall meet SHA, tower designer specifications and comply with Section 902 of the Grey Book. Contractors shall use a SHA approved concrete mix that complies with the shelter foundation designers' specifications.
5. Construct one (1) 12x38ft equipment shelter foundation. The foundation design shall be approved by the shelter manufacturer. At a minimum its footers will extend at least 6 IN below the local frost line. The supply and installation of the equipment shelter foundation shall include: the construction of each concrete foundation shall contain an integrated continuous stoop for the doors, designed to support a 12x38x10ft concrete equipment shelter (height is inside dimension).
6. The latest version of Motorola R56 installation standards shall be used. This will include a test well. Test wells shall not interfere with vehicular traffic. Location will be verified by the State Project Manager.
7. Upon completion of shelter and site improvements, the Contractor will furnish and install surface materials in accordance with the construction drawings. Contractor shall restore all areas of existing landscaping, grass, curbs, pavement and striping which have been disturbed during construction.
8. The Contractor shall install an eight (8) ft. high-galvanized chain link fence with two (2) feet of barbed wire on top, with a twenty (20) ft. wide, double leaf vehicle gate; and two (2) five (5) foot man gates around the site as shown on the construction drawings. The fence materials will be bonded /grounded in accordance with the latest version of R56. The Contractor shall utilize sufficiently sized insulated copper wire to bond the fence fabric and barbed wire. The insulation will be UV rated and black or grey in color. If the copper is not tinned, anti-oxidation compound will be furnished for any mechanical connections. The Contractor shall provide chains and combination style commercial grade padlocks for the security of all gates. The State Project Manager shall be given the combination and shall control access to the site.
9. The Contractor is responsible for any/all maintenance of traffic (MOT) requirements and/or MOT permits associated with this project. The Contractor is also required to coordinate with the State Project Manager and the SHA – SOC/Hanover Complex officials whenever project efforts may affect the flow

of traffic and/or the use of parking areas. The Contractor shall make every effort to minimize impact to the flow of traffic and parking areas at the SHA Hanover Complex and must schedule and coordinate the transportation and installation of the new equipment shelter and the use of any/all cranes “after hours” within a pre-determined time-frame that all parties agree will be the least likely to negatively impact the SHA Hanover Complex operations, flow of traffic and/or its’ employees.

10. The Contractor shall obtain authorization from the State Project Manager, the SHA-SOC/Hanover Complex officials and utility companies and shall coordinate with those parties concerning any and all procedures that would involve the loss of utility power, gas, water, communications, alarm, and/or telephone systems at the SHA-SOC/Hanover Complex. In general, system outages should be avoided if at all possible but if required shall be scheduled on days and times that have been agreed upon by all parties.

B. Equipment Shelter Specifications -
12x38x10 ft Shelter with 75 Kw Generator:

1. Shelter installations must be in conformance with manufacturer’s requirements for application of warranties provided by the manufacturer as well as be compliant with the current version Motorola R56 grounding and bonding requirements.
2. The equipment shelter supplied shall be a one-piece concrete communications equipment shelter and include a 75 Kw natural gas fueled generator, 400-amp integrated load center, such as a Transtector ISP Series, incorporating the main service disconnect, manual transfer switch, surge protection and load center, and 200-amp sub feed with installation. The supplied equipment shelter shall be nominally sized 12x38x10 ft (height is inside dimension) and configured with two rooms as depicted in the construction drawings – Typical Equipment Shelter with Generator.
3. The double room shelter shall be provided with a NEMA 4, 250 Volt D.C., 600 Volt A.C. 200amp, weatherproof emergency generator receptacle such as Appleton AJA20044-200, mounted on the front of the shelter to allow connection of a 50kW portable Emergency Generator in case of failure of the internal generator during a power outage. The generator receptacle shall be located in such a place that it will not interfere with the operation of the equipment room door. The receptacle’s operation will be controlled by operating the manual transfer switch inside the equipment shelter.
4. Furnish a compatible Appleton plug such as AP20044CD with 50 Ft of conductors terminated in a pig tail. The plug will be designed to interface a

portable generator with the Appleton receptacle mounted on the building. The plug will be weather proof and the conductors will be adequately insulated and weatherproofed. They should be sized to safely connect a 50 KW emergency generator and mitigate any voltage drop. The cable assembly will be provided with each shelter and installed inside the generator compartment on an adequately sized hose bib in accordance with the attached shelter layout. If made of a conductive material the cable holder will be bonded per the latest version of R56. Shelters without generators will have the cable installed/stored just inside the door in accordance with the shelter layout drawings.

5. Two 16-port cable entry points complete with weatherproof caps shall be provided for antenna cable entry. One entry point will be located on the long side of the Equipment Shelter and the second entry point will be located on the end wall of the Equipment Shelter between the air conditioner units. These locations are shown in the supplied construction drawings. Each port within both assemblies shall be four (4) inches in diameter and shall be located with the top of the assembly located directly under the cable rack, in four (4) rows of four (4) ports each. In addition to the cable entry points, one single four-inch PVC conduit sleeve for communications conduits and one single two-inch PVC conduit sleeve for installation of S.O. cables to the tower lighting system, both with temporary end caps shall be installed. The actual location of these penetrations and sleeves must be confirmed with the Project Manager prior to the fabrication of the shelter.
6. Cable ladders (24 inches wide) shall be mounted from the ceiling using all-thread and “cherry” insulators eight feet above the finished floor as measured from the floor to the bottom of the cable ladder, as shown in the construction drawings – Typical Equipment Shelter with Generator.
7. Two 5-ton 230/208V-Single-phase, dual (redundant) wall-mounted, vertical, self-contained HVAC units with 5-kw heat strips shall be installed at the locations specified on the equipment shelter drawing. Separate circuit breakers for each unit shall be installed in the main load circuit panel. The provided HVAC units shall have sufficient capacity for the Equipment Shelter size supplied, fully loaded with equipment. Each unit shall contain a time delay startup relay, low ambient control, and a forced air resistive heat strip. The HVAC controller will include a humidity control feature. The outside portions of the units will be weather/rodent and tamper proof.
8. All shelters shall be equipped with 16” ventilation fans with gravity operated back draft louvers and 16” gravity intake damper with filter and hood (bug and rodent intrusion resistant). Each fan shall be connected to a thermostatic device to allow automatic fan on-off control. The openings will be provided with shutters and weather hoods. All required exhaust piping and intake and exhaust plenums required for the manufacturer’s recommended air flow shall

be included as part of the installed equipment. All openings in the shelter structure for the provision of entry or exit of cables, equipment, ventilation, etc. must be sealed to prevent the invasion of the shelter interior by insects, rodents and external moisture.

9. Electric baseboard heater strips shall supply heating for the generator room. A thermostat mounted on the wall opposite the heater shall control the heater strips. The heater strips shall be of sufficient size for the generator room to maintain a room temperature of 72 degrees F.
10. Insulation shall be non-combustible, with a vapor barrier. Wall and floor thickness shall provide an R-11 (minimum) rating, and the roof shall have an R-19 (minimum) rating.
11. Concrete Construction – The wall outer finish will be natural stone aggregate finish with an aesthetically pleasing earth tone.
12. Each foundation shall be comprised of concrete piers or concrete pad with steel reinforcement. The top of the finished foundation shall be 6 inches above finished grade. The foundations shall level each shelter such that all foundation to shelter contact points shall have equal loads. The equipment shelter is to rest flush on the poured concrete foundation without showing any gaps between shelter and pad and to be level to within ½ degree. The shelter shall have an integrated continuous stoop for the doors, and steps if necessary, to provide safe entry into the shelter. Installations requiring stoops more than 24 inches above grade shall have safety rails installed.
13. The minimum floor live loading design will be 300lbs. per square foot.
The minimum roof loading design will be 100lbs. per square foot.
The minimum wall loading design will be 34 lbs. per square foot.
The minimum wind loading design will be 50 lbs. per square foot.
14. Two reinforced steel finished doors shall be located on the shelter, per the attached drawings. The doors will be finished to match the appearance of the shelter. The doors shall be pre-hung, gasket sealed, insulated, approximately 3 foot by 7 foot, and in a metal frame. Doors will be supplied with door-closer, magnetic weather stripping, drip strip over door, doorstop, door sweep and a 42-inch door canopy. Door checks and door stops shall be provided along with a three (3) point locking system for maximum security. The doors will have non-removable ball bearing hinges and deadbolt locks with tamper plates installed. These deadbolt locks shall be security type with removable cylinders, such as “Best” locks. The generator and equipment room doors will be bonded to their frames with welding cable of an appropriate gauge in accordance with the latest version of R56. Braided cable will not be used.

15. The equipment shelter floor shall be covered with 1/8", 12" x 12" vinyl tile, light in color (beige, tan or white). The walls will be trimmed with a 4-inches high and 1/8 inch thick rubber base trim against the floor.
16. The walls will be covered with a minimum of white wood-grained paneling or white vinyl over 1/2 inch plywood. The equipment shelter shall have a 3/4" X 4ft X 8ft plywood telephone mounting board installed as per attached shelter layout drawings – Typical Equipment Shelter with Generator.
17. Electrical installation and wiring shall conform to the latest version of the National Electrical Code. Surface mounted, grounded, duplex outlets shall be provided at five (5) foot intervals (where possible) around the interior walls. All wiring shall be installed in surface mount EMT conduit. Outlets shall be installed 18 inches above finished floor. Horizontal runs of conduit will be installed a minimum of 7 1/2 feet above the floor whenever possible with vertical connections to the surface mounted devices to minimize interference with installing equipment against the wall. Two weatherproof outlets will be installed on the exterior of the shelter. These outlets are to be located at both ends of the shelter. In addition, circuits supplying power to equipment racks # 3-16 in the shelter shall extend downward six (6) feet from boxes mounted at 22" intervals on the ceiling as shown in the supplied construction drawings - Typical Equipment Shelter with Generator.
18. Wiring for these drops shall be housed in "Sealtite" flexible conduit and each drop shall be terminated in a quad receptacle box. Each quad box shall contain two circuits and each circuit shall have its own dedicated 15 or 20-amp circuit breaker. These drops shall be planned to fall immediately adjacent to the edge of the cable tray. The exact location for each drop must be confirmed with the State Project Manager before the shelter is fabricated. The circuit breakers for the 240 VAC quad boxes supplying power to equipment racks # 1-3 shall be located in the main load center. Racks #1-3 shall be supplied with one junction box each containing one 240 Volt 20-amp circuit. The junction box will be fastened to the wall in accordance with the shelter drawings and supplied photos. All circuits will have a dedicated neutral installed in accordance with the latest Motorola R56 standard. The junction boxes will be mounted in line vertically.
- 19. All low voltage wiring (i.e. alarm, control, etc.) shall be routed in separate conduits in accordance with the national electrical code.**
20. Power to the shelter shall be fed through a properly sized 240-Volt, fused single-phase disconnect switch mounted on the exterior wall of the shelter. (See attachment - Typical Equipment Shelter with Generator.).
21. Shelter is to be provided with 400-amp, 20-position (minimum) main load center, equipped with a minimum of twenty (20) 20-amp breakers. Breakers

shall be “high magnetic” or high inrush current type (Square D, HM or equivalent). This box shall be installed at one end of the equipment area within five (5) feet of the primary cable entry port. In addition to the 400-ampere main load center, a minimum 20-position quad box load center shall be installed, fed from the main load center; the quad box load center shall be located on the generator room wall and shall supply power to quad boxes above rack positions 3-16. Load centers, circuit breakers and quad boxes shall be properly marked.

22. An interior system ground (halo) with a single #2 AWG stranded wire will be provided with proper connections to the shelter and, in turn, to the tower ground system. The halo will have a 6-inch break roughly opposite the Master Ground Bar. The #2 AWG ground wire for each row of racks will be suspended on independent ground lead stand offs as outlined in the typical shelter drawing. They will be positioned to ensure the #2 AWG lead is isolated from the main cable racks. No electrical conduit is allowed to bridge the 6” gap in the halo ground. The internal ground system will be mounted on the wall using 2-inch (2”) standoff insulators, connected to two (2) minimum ¼” x 5”x 24”, (33 hole pairs) minimum copper master ground bus bars that are installed directly under each cable entry port. The ground bus system shall be a Harger EPK16MOT bus bar system or an approved substitute. The copper ground bars on the back interior wall of the shelter will be connected to the corresponding exterior ground bar with stainless steel insulated feed through. The external ground bar will be connected through a minimum of three (3) 2-inch copper straps to the external building ground ring and tower grounding system. All exterior connections shall be exothermically welded to ensure proper connection. Electrical ground will be bonded to the RF ground.
23. Purchase and installation of the following lightning protection devices in the equipment shelter:
 - i. An IEEE Type 1 SAD/MOV protection device shall be part of the integrated load center and approved for use in the latest version of R56.
 - ii. An IEEE Type 2 MOV protection device will be installed at the main power input inside the shelter, by means of a 60-Ampere (per “leg”) breaker or fused disconnect, across the utility lugs of the transfer switch. The device will be installed inside of the equipment shelter and approved for use in the latest version of R56 such as Transtector IMAX series. Its installation will comply with the latest version of R56 and maintain the device’s UL1449 (latest edition) listing.
 - iii. All surge suppression devices will have the ability to create a dry contact alarm (contact closure upon alarm). This alarm will be integrated with the shelter alarm wiring. The dry contact alarms will be enabled from the factory.

24. The Air conditioning units shall be connected to the internal (halo) grounding system **only**, not to the external equipment shelter grounding system.
25. 48-inch, two or four-tube, energy efficient fluorescent fixtures shall provide sufficient lighting (minimum 50 foot candles) for the shelter in accordance with the construction drawings. The lights shall be controlled by a wall switch / timer internal to the shelter and located next to the entry door. An exterior entry light shall be installed outside the main doorway of the structure. This light shall be controlled by a motion sensor wired through a wall switch inside the shelter.
26. The shelter shall be pre-wired, with the following functions, to a common point in the radio compartment and terminated with a split 66 Block. The 66 Block shall be mounted in the upper right-hand side of the punch block board. All alarms shall be punched down on the left-hand side of the punch block using solid wire. The 66 block will not be enclosed in any box or enclosure. All functions/alarms will be programmed to be normally open. Upon alarm they will close.
 1. High Temperature Alarm – Adjustable for over-temperature alert (may be integrated with HVAC system).
 2. Low Temperature Alarm – Adjustable for under-temperature alert (may be integrated with HVAC system).
 3. HVAC Failure Alarm- derived from the HVAC controller
 4. Generator Running Alarm – Closure when generator is running.
 5. Remote Generator Start – No transfer to load (a dry contact closure will remote start the generator but will not transfer to the load if commercial power is good)
 6. Generator transfer to Load (a dry contact closure will initiate a transfer to load. If the generator is off, it will start the generator)
 7. Low Oil Pressure Alarm
 8. Low Coolant Alarm
 9. Generator Over-crank Alarm
 10. High Coolant Temperature alarm
 11. Transfer Panel Switched- indicates that the transfer panel has switched to backup power
 12. Equipment Room Door Alarm
 13. Generator Room Door Alarm
 14. Equipment Room Smoke Alarm
 15. Equipment Room Heat Detector Alarm
 16. Generator Room Smoke Alarm
 17. Generator Room Heat Detector Alarm
 18. Type I Surge Suppressor Alarm
 19. Type II Surge Suppressor Alarm
 20. Type III Lighting Controller Surge Suppressor Alarm

21. Strobe White Alarm (per strobe controller)
 22. Strobe Red Alarm (per strobe controller)
 23. Marker Alarm (per strobe controller)
 24. Spare
 25. Spare
27. On this double room shelter, there shall be a partition wall separating the emergency generator from the room containing the RF equipment. This partition wall shall have a one (1) hour fire rating (from the inside out and outside in). The floor under this section shall be reinforced to handle additional loading. Two gravity intake louvers and one exhaust fan with gravity louvers shall be installed. All louvers and openings will be wire covered for security and prevention of entry by rodents. A separate outside door shall be installed on this room and shall be identical to the equipment room door. (See attachment - Typical Equipment Shelter with Generator.)
28. The lighting for this room shall be controlled by a separate wall switch / timer internal to the room and located next to the entry door.
29. The Contractor shall supply with each equipment shelter a 75 kilowatt, liquid cooled, natural gas fueled, 1800-RPM generator, 60 Hz, 120 / 240 volt, single phase with a 400-amp Automatic Transfer Switch (ATS).
30. Installation shall include all materials, parts, labor, etc. to provide a fully functional generator back-up system. Included in the installed price is the transfer switch and all associated wiring as well as generator alarm programming in accordance with state requirements. Block heaters with necessary wiring are to be included. Fuel hookup, and fuel supply piping to the shelter is to be provided by the site work Contractor. Fuel supply piping shall be non-metallic to comply with R56 single point grounding requirements.
31. Fuel strainers on the fuel systems must be installed for proper drainage to prevent moisture buildup in the line. Proper sized flex fuel lines shall be installed on all generators and the fuel line so as to not impede the proper flow of fuel and must not be sharply bent or crimped. The flex jumper must be placed to ensure minimal engine vibration is transferred to the fuel solenoid assemblies to prevent rupture. The fuel line from the fuel source to the manifold shall not be less than 1" to minimize fuel pressure drop from no load to full load. The metal fuel line inside the room will be bonded to the internal halo where it enters the room. This can be done with a c-clamp style device at the fuel line. Proper venting of the fuel system must be installed to ensure no buildup of pressure and safe venting will occur. Fuel lines run in conduit or sleeves must be sealed from moisture. All exhaust piping that can come in contact with personnel will have a heat shield installed. Proper battery

chargers must be installed for the appropriate system, either 12 VDC or 24 VDC, 110 VAC.

32. The Contractor must perform on-site startup of the generator under full load, using a load bank. The original of the startup form must be completed and submitted prior to submission of an invoice for work performed. The State Project Manager or his designee must be notified in advance to attend the event at their discretion. The load bank test will be at least one hour in duration and conducted under full load. The startup will also include the programming of all generator related alarms/function.
33. All alarm outputs from the generator are to be extended to the radio compartment via a data cable and terminated in a remote annunciator panel which provides both visual and audible alarm indications for each circuit monitored. The annunciator panel will also provide either normally open or normally closed dry contacts which can be field selectable as needed to provide the proper inputs to the existing "66 block" for the dissemination of alarm information to the system. The annunciator panel will be located directly below the existing "66 block" in the radio compartment.
34. All wiring for the generator must be routed overhead. It is unacceptable to cross the floor with conduits.
35. An external minimum of ¼" x 4" x 24", (36-hole pairs) copper ground bar is to be installed on the outside of the shelter directly under the main cable entry port and attached with three (3), solid tinned copper, 2-inch ground straps, to the single ground point directly below the main cable entry port. Refer to Harger EPK16MOT.
36. The shelter shall be designed and installed per the latest version of Motorola R56 to include eye wash station, first aid kit, chemical and CO2 type fire extinguishers mounted on the partition wall in the radio compartment.
37. The shelter shall include one broom and dust pan (mounted to the wall), one six-foot step ladder, one (1) 30 gallon (plastic) garbage can and one box of 30 gallon garbage can liners. (Comment: this is what we currently have in all of our shelters.)
38. An external ground ring shall be provided around the shelter foundation. Above grade ground tails will be provided. The buried external ground ring shall be in direct contact with the earth at a depth of 30 inches below the earth's surface with ground rods driven into the earth at intervals not to exceed twice the ground rod length. In the event 10-foot ground rods cannot be driven shorter rods are acceptable if driven at the proper intervals. The

external ground ring is to be placed 3 feet outside the shelter foundation in order to be outside the drip line of the shelter.

39. All grounds must be bonded together. This includes the generator, the shelter, fencing, and equipment shelter grounding systems, the ice bridge and the tower. The ground test reading must not normally exceed 5 OHMS. The State Project Manager or designee will test all grounds using a fall-of-potential method test to determine compliance. In the event 5 OHMS cannot be reached by reasonable means and through no fault of the Contractor, the State Project Manager will determine the course of action to be taken by the Contractor at an additional cost to the State Highway Administration. Grounds must test fewer than 10 OHMS for the site to be acceptable for reasons of personal safety.

C. Specifications for Installation

1. Purchase and installation of one (1) 12x38x10 ft. concrete equipment shelter (height is inside dimension) with a 75kW generator and one (1) 12x38x10 ft. concrete equipment shelter without generator. The equipment shelter must rest flush on the poured concrete foundation without showing any gaps between the equipment Shelter and pad and leveled to within ½ degree. A typical Equipment Shelter drawing will be provided by the State Project Manager and should be used for pricing purpose.
2. An approved/certified shelter manufacturer representative must be on site for each shelter delivery to supervise the setting of the shelter. This individual will correct any foundation gaps or any deficiencies found due to shipment. This individual will also supervise the installation of any field installable items (e.g. hoods, light fixtures, etc).
3. Provision and installation of a liquid cooled, 1800 RPM, 75 kW natural gas fueled generator complete with a 400-Amp automatic transfer switch capable of zero cross-over (in-phase switching) and time-delay neutral switching to eliminate service interruptions of the electronic equipment and the tower lighting system. Underground fuel piping shall be "plastic" high-performance polyethylene piping or equivalent. The above ground piping must be UV-rated rubber jacketed corrugated metallic piping. Both underground and above ground piping shall be sized so that the flow of fuel is not impeded with the system operating at full load. The transfer switch will also have a programmable exercise timer. Time delay neutral will be programmable from at least 0-3 seconds. The exercise timer will allow preprogramming of time

and date of weekly generator runs. The transfer switch will allow the weekly generator runs to be conducted with or without load.

4. Generator start-up and test under full load (using load bank) after permanent power is connected to the equipment shelter must be coordinated with the State Project Manager. The test using the load bank will be one hour. The startup will include generator alarm/function programming.
5. Purchase and install one (1) extruded metal, 24-inch wide, no cantilever ice-bridge with a four tier “tee” or “tree” trapeze cable management system to facilitate easy installation and removal of cables, such as Andrew WB-T24-4 or suitable equivalent. Ice bridge posts will be no less than 3” in diameter, spaced no more than 6’ apart. Posts will be buried 36” encased in concrete. The ice bridge will be routed in accordance with the construction drawing (See sections a-f) and electrically insulated from the tower. The trapeze sections will be no more than four (4) feet apart. The ice bridge will be bonded to the external ground bus bar.
6. Purchase and installation, per local utility standard, of an electrical backboard of steel post and unistrut construction to include CT cabinet if required, wire trough, main disconnect, at least one (1) electric company approved meter socket with room to accommodate a minimum of three (3) additional meters.
7. Purchase and installation of two (2) 4-inch conduits, approx. 230 ft. in length from the utility (BGE) power source to the power company supplied pad mounted transformer location.
8. Purchase and installation of two (2) 4-inch conduits, approx. 60 ft. in length from the power company supplied pad mounted transformer, to the Contractor supplied electrical backboard, and from the backboard into the disconnect switch, located on the back of the equipment shelter.
9. Purchase and connection of electrical wiring, per local electrical code, from the Contractor installed backboard to the fused disconnect on the back of the shelter and from fused disconnect located on the back of the shelter into the equipment shelter’s 400-amp load center. Electrical work must be completed by a State of Maryland certified electrician.
10. Purchase and installation of a 12x12x12 IN or larger communications cable pull box on the exterior of the shelter with generator. The pull box will accommodate at least three (3) 4” diameter schedule 40 conduits. This box will be weather proof and constructed of plastic or other non-conductive materials. The location of the pull box will be determined by the State Project Manager. Three (3) 4” diameter communications conduits will extend from the communications cable pull box located on the exterior of the equipment

shelter with the generator to the existing 4' x 4' communications box located adjacent to the tower. The distance will be approximately 60 feet and shall be

hand-dug. Locator tape shall be installed in all telco and electric trenches one (1) ft. above the new conduits.

11. Supplied materials, including, but not limited to, the equipment shelter, ice bridge, etc. shall be new, unused and shall meet the latest design and fabrication standards of the Electronics Industry Association (EIA).
12. All supplied materials shall be purchased, not leased.
13. The contractor shall supply and install 6” dia. bollards as needed in accordance with the attached construction drawings.
14. The Contractor will provide placards affixed to every equipment and generator room door stating there is Electro Magnetic Energy dangers. These signs will comply with the latest version of Motorola’s R56. The Contractor shall provide aluminum placards conspicuously affixed to the equipment shelter and main gate indicating the site is alarmed and under 24 hour surveillance. The signs will read: ““No trespassing. This site is monitored by remote surveillance equipment. Equipment and entrances are alarmed and will notify local police of any intrusion.” A 7”x5” aluminum placard shall be affixed to the side of the equipment shelter, 5’ above ground level, directly above the point at which the gas pipe enters the equipment shelter, that reads: “WARNING – Underground Gas Line” (Text shall be a black, bold font on a yellow background). Additionally, a 12”x2” placard shall be attached to the main gate that reads: “For tower site information call: 1-410-582-5650”.

D. Inspection schedule/requirements

- a. Electrical inspection – Final wiring will be inspected prior to energizing the site. An approved third-party inspection agency can be utilized if recognized by the local utility. This shall be supplied by the Contractor.
- b. R56 Inspection – the site and shelter will be subject to a R56 inspection. Discrepancies will be corrected at the Contractor’s expense. The inspector will be provided by the SHA/DoIT.
- c. Punch-list – A final inspection will be conducted by SHA/DoIT personnel to ensure all items in the task order are completed to the satisfaction of the SHA.

E. Commencement of Work

Work in response to this Task Order shall be initiated only upon issuance of a fully executed Notice to Proceed, authorized by the State Project Manager. The Contractor shall comply with all Master Contract requirements and specifications.

F. Approvals

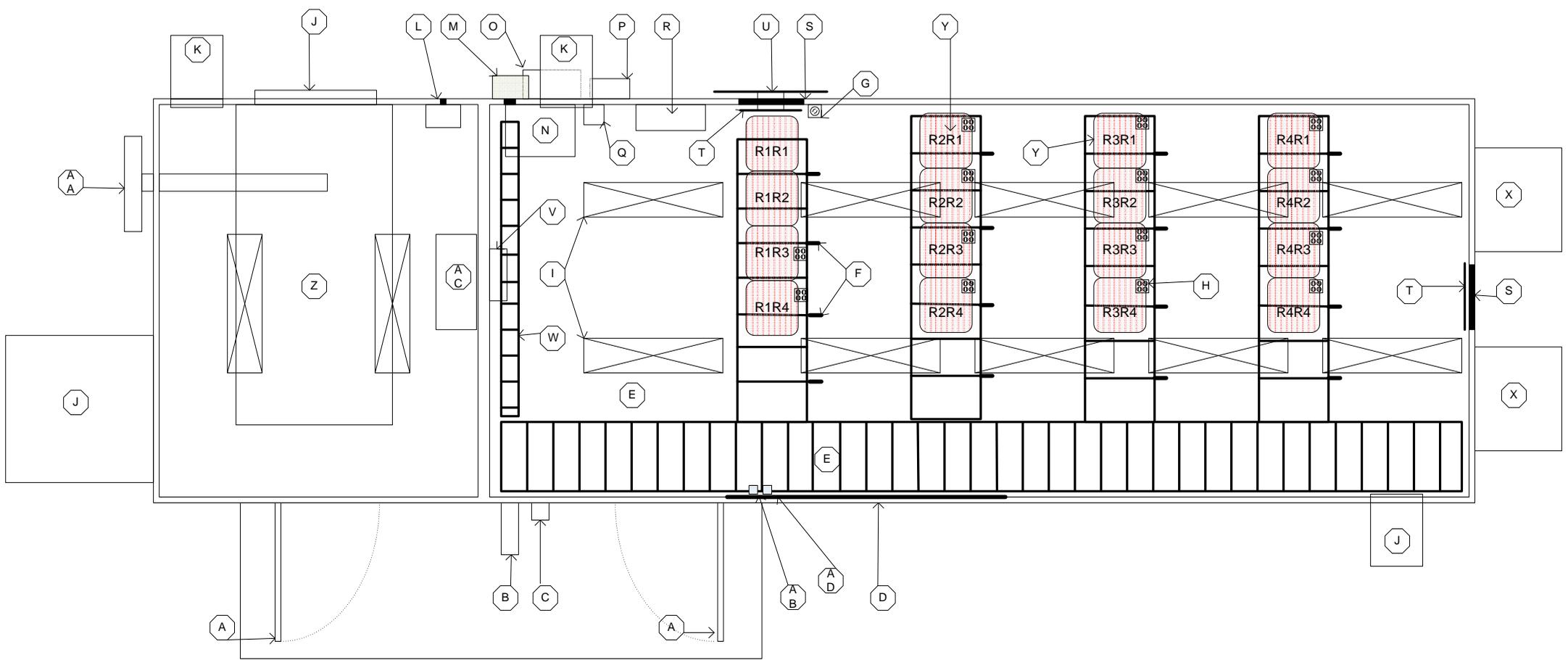
Prior to ordering any services or equipment, the following drawings/designs shall be provided by the Contractor and delivered to the State Project Manager for review and approval;

- Shelter drawings (Final drawings shall have PE stamp)
- Foundation design (Final drawings shall have PE stamp)
- Shop drawings for fence and gates.

G. Final Acceptance Sign-off

The Contractor shall provide all items identified above and all items outlined in the DoIT close out policy (Attached). The following is required to be demonstrated to the State Project Manager upon project completion:

- a. All deficiencies noted by the State Project Manager, designee(s) and inspector(s) have been corrected to the satisfaction of all parties.
- b. All construction materials, equipment, excess tools and other materials will be removed from the site. The shelter interior (equipment and generator room) will be swept and all protective paper removed from the floors. The site should be neat and organized.
- c. If applicable, final acceptance by MDE that all work has been completed in accordance with the MDE permit.



TITLE State of Maryland Typical 12x38 Ft Shelter (with generator) Layout		REVISIONS		Drawn by: Sean Javins sean.javins@dot.state.md.us 410-818-9074 -Dimensions are approximate. -Final layout/design is subject to the State's approval.
DATE ORIGINAL 9/8/08	LATEST REVISION C	NO.	DATE	
SCALE 1/4" = 1'	JOB NO.	DESCRIPTION		
		Added alarms	10/08	B
		Changed location of 240VAC outlets/ added 4x8 Telco board	06/09	C
		CHECKED		
		DRAWN		

A	Door	J	Intake hood	S	16 Port cable entry port	A	Alarm 66 Block (no enclosure)
B	Appleton Plug	K	Temp activated fans	T	Internal ground bus bar	B	Appleton cable/hose bib
C	Exterior Light	L	Light controller and penetration for SO cables	U	External ground bus bar	C	Generator annunciator panel
D	4x8 Telco board	M	Pull box and 4IN penetration for telco	V	Quad box load center	D	
E	24" cable ladders	N	Auto transfer switch	W	Telco cable ladder	E	
F	Stand offs for #2 ground lead	O	Main service disconnect	X	HVAC	F	
G	(3) vertically mounted 240v outlets (twist lock type)	P	Building subfeed disconnect	Y	Rack footprint	G	
H	120V Quad box outlet	Q	Type2 MOV	Z	Generator	H	
I	48IN lights	R	Integrated load center	AA	Generator exhaust	I	

MEMORANDUM

TO: Ed Macon, Project Manager
Department of Information Technology,
Statewide Public Safety Radio System

FROM: Nathan Moore, Chief
Engineering Geology Division (EGD) *Nate Moore*

SUBJECT: FMIS No.: AX028A51
Communication Tower Equipment Shelter at Hanover Complex
District 5 – Anne Arundel County, Maryland
Subsurface Exploration Summary Report

DATE: March 8, 2019

**RESPONSE
REQUESTED BY:** N/A

PURPOSE OF MEMORANDUM

In accordance with email correspondence dated May 16, 2018 and February 27, 2019; EGD has completed a subsurface exploration program for the proposed Communication Tower Equipment Shelter at Hanover Complex in Anne Arundel County, Maryland. The purpose of this report is to summarize the subsurface exploration activities for the proposed communication tower equipment shelter facility within the project limits.

SUMMARY

Two (2) foundation borings (B-1 and B-2) were drilled by the Field Explorations Division (FED). The attached Subsurface Exploration Summary Report contains our findings.

If we can be of any further assistance, please contact me at 443-572-5171 or Ransford Addei at 443-572-5175.

NM/MG/GW/ra

Attachments: Appendix A – B

cc: Madan Gaddam, Engineering Geology Division, OMT/SHA
Karen Kalbaugh, Engineering Geology Division, OMT/SHA
Getaneh Woldetsadik, Engineering Geology Division, OMT/SHA
Ransford Addei, Engineering Geology Division, OMT/SHA
Daniel Woldehanna, Pavement and Geotechnical Division, OMT/SHA
David Rineholt, Communications Division, SOC/SHA

Communication Tower Equipment Shelter at Hanover Complex Anne Arundel County, Maryland

1.0 INTRODUCTION

The scope of this project consists of the design and construction of a proposed Communication Tower Equipment Shelter Facility at the Maryland Department of Transportation, State Highway Administration (MDOT SHA) Hanover Complex in Anne Arundel County, Maryland. We understand the proposed equipment shelter facility will have a 12 feet by 38 feet dimension.

The following documents were provided to our office to prepare this subsurface exploration summary report:

- A google map showing the approximate location of the site and boring locations, and
- A total of two (2) foundation boring logs.

2.0 GEOLOGY INFORMATION

Based off James P. Reger and Emery T. Cleaves, 2008, Physiographic Map of Maryland: Maryland Geological Survey, Baltimore, Maryland, scale 1: 250,000. The site is in the Glen Burnie Rolling Upland District of the Atlantic Coastal Plain Physiographic Province. The Glen Burnie Rolling Upland District is characterized as an undulating upland with slopes typically less than eight degrees, transitional between the Waldorf Upland Plain and the Prince Frederick Knobby District.

According to Glaser, J.D., 1976, Geologic map of Anne Arundel County: Maryland Geological Survey, County Atlas CA-1, scale 1:62,500, this site lies on the Sand-gravel facies of the Potomac Group. The geologic description is as follows:

Sand-gravel facies – Interbedded quartz sand, pebbly sand, gravel, and subordinate silt-clay. Sand wholly quartzose, fine to coarse-grained, poorly to well-sorted, clean to very muddy. Color white, buff, red-brown, to vari-colored. Pebbles chiefly vein quartz and quartzite with some sandstone and chert interstratified with much subordinate white, buff, gray, or red silt-clay in thin lenticular beds. Sand-gravel cross-bedded or flat-bedded, rarely massive. Fining-upward cycles common. Silt-clay lenses massive or rarely laminated. Ferruginous concretions and limonite-cemented pods or ledges common.

3.0 SUBSURFACE EXPLORATION

A total of two (2) Standard Penetration Test (SPT) foundation borings were drilled for this project. Borings B-1 and B-2 were drilled for the proposed communication tower equipment shelter facility. The boring locations are indicated in the Boring Location Map in Appendix A. The boring logs are provided in Appendix B.

The borings were drilled using continuous-flight, hollow-stem augers to advance the boreholes. SPT were performed using a split spoon sampler driven by a 140-lb hammer with free fall of 30 inches in accordance with AASHTO T-206. The values reported on the boring logs are the hammer blows required to advance three or four successive six-inch increments. The first six-inch increment blows are considered for seating the sampler below the possibly disturbed overburden, and not indicative of the in situ soil resistance. The sum of the number of blows for the second and third increments is the "N" value. The fourth six-inch increment is driven only to obtain additional soil sample and is not used to determine the N value. The N value is used to determine the relative density of the soil. Soil samples retrieved were visually identified in the field, labeled, preserved in a glass jar, and then delivered to the Office of Materials Technology (OMT) warehouse.

4.0 GROUNDWATER OBSERVATIONS

Groundwater data was recorded during drilling, at completion, and 24-hr after drilling. It is noted that fluctuations in the groundwater level may occur due to variations in rainfall, evaporation, construction activity, surface runoff, and other site-specific factors. Groundwater levels over the project site are summarized in Table 1.

Table 1. Summary of Groundwater Depths

Boring Id.	Water Depth Below Existing Ground Surface			Existing Ground Surface Elevation (ft)	Estimated Groundwater Elevation at Completion / Final (ft)	Cave-in	
	At Completion (ft)	Final (ft)	Final Time (hours)			Depth at Completion / Final (ft)	Elevation at Completion / Final (ft)
B-1	Dry	Dry	24	139.4	Dry / Dry	12 / 11.5	127.4 / 127.9
B-2	Dry	Dry	24	138.7	Dry / Dry	18 / 15	120.7 / 123.7

5.0 LABORATORY TESTS

A laboratory soil testing program was not conducted as initial identification and descriptions of soils in the field by the driller was consistent with visual identification by the engineer at the office.

6.0 SUBSURFACE CONDITIONS

The boring logs represent the driller's interpretation of the subsurface conditions based on visual examination of field samples. The lines designating the interfaces between various strata on the test boring records represent the approximate strata interface locations. However, the actual transitions between strata may be gradual or abrupt. Information on actual subsurface conditions exists only at the specific boring locations and is relevant only to the time the exploration was performed. The following sections briefly describe the stratigraphy encountered within termination depths below the ground surface at the project site.

Pavement: The existing pavement structure encountered in the borings included approximately 12 inches of Hot-Mixed Asphalt (HMA) overlying approximately 12 inches of aggregate stone base. The total pavement thickness was in the order of 24 inches.

Stratum I: Stratum I soils generally consists of fine SAND; and it extends below the existing pavement to the borings termination depths of approximately 30 feet below existing grade (Elevation EL 109.4 to EL 108.7). The SPT N values in this stratum range from 15 to 55 blows per foot (bpf), indicating medium dense to very dense relative density.

7.0 SOIL DESIGN PARAMETERS

Suggested soil parameters for design and analysis are shown in Table 2.

Table 2. Suggested Soil Parameters for Design and Analysis

Soil Types	Unit Weight		Strength Parameters	
	Moist (pcf)	Saturated (pcf)	c (psf)	ϕ (degrees)
Stratum I	120 - 125	125 - 130	0	32 - 34

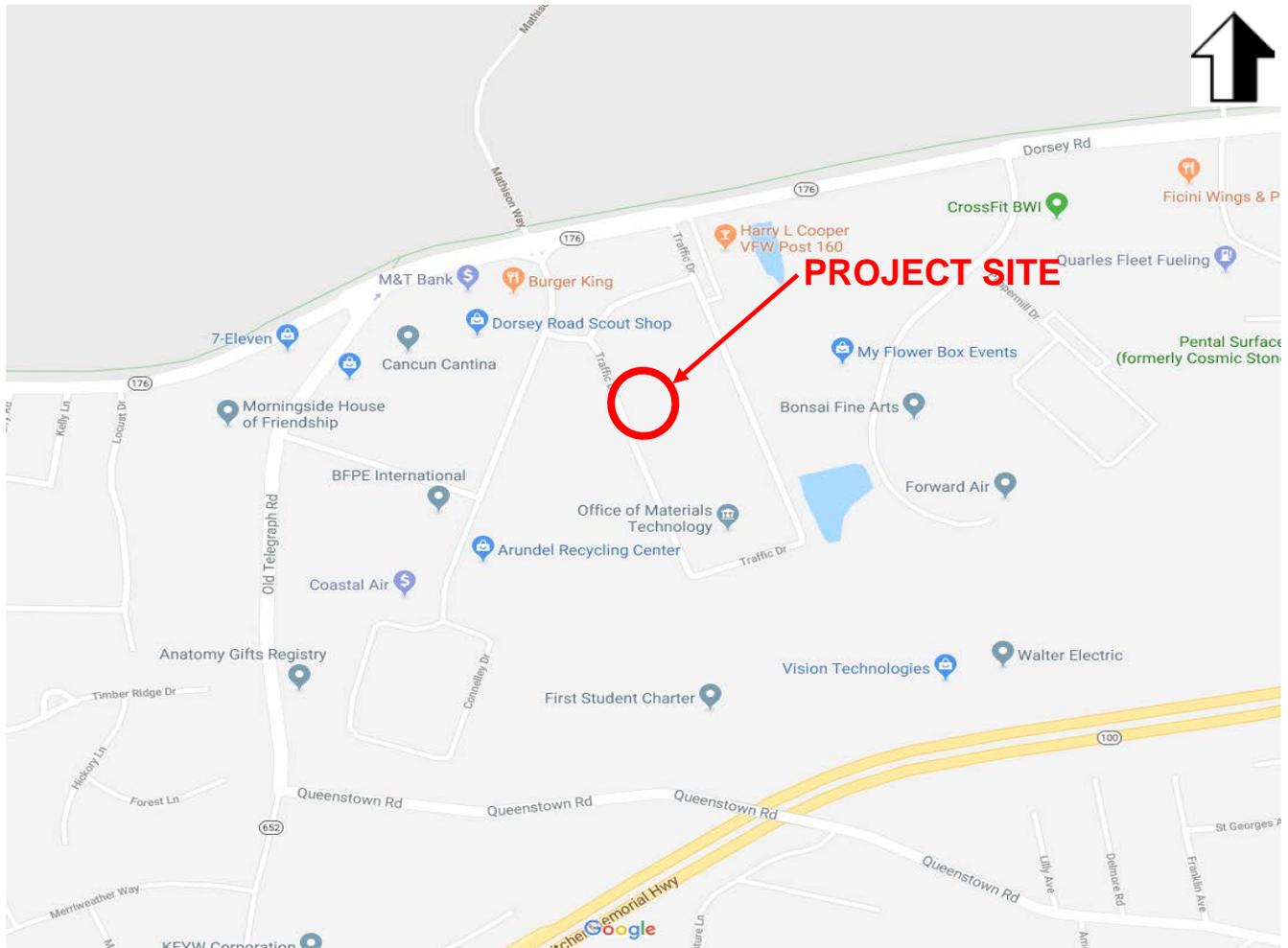
8.0 BASIS OF RECOMMENDATIONS

Engineering Geology Division (and its consultants) developed the recommendations above based on subsurface conditions at the time of writing this report. These recommendations are based in part on the project information provided, and only apply to the specific project and site discussed in this report. If there are any significant changes to the project characteristics or if significantly different subsurface conditions are encountered during construction, we should be consulted so that the recommendations of this report can be reviewed.

Our recommendations have been performed in accordance with generally accepted engineering principles and practices; no warranty, expressed or implied, is made. This report should be kept in its entirety and the Engineering Geology Division assumes no responsibility for interpretations made by others. The boring logs and figures contained in this report represent an integral part of the report and incorrect interpretation of the data may occur if the attachments are separated from the text.

APPENDIX

APPENDIX - A
FIGURES



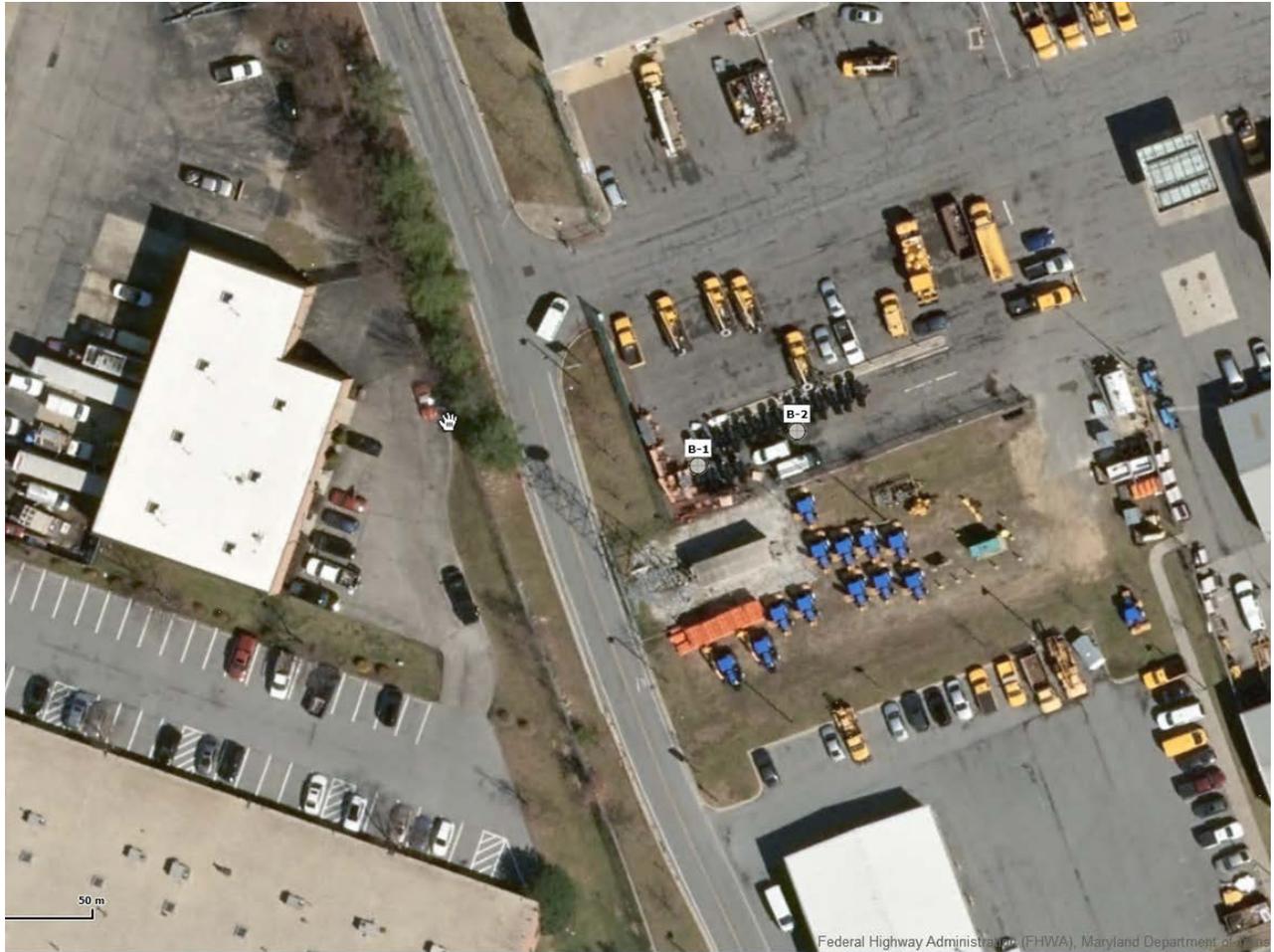
SCALE: NTS

Figure 1: Project Site Vicinity Map



STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

ENGINEERING GEOLOGY DIVISION



SCALE: NTS

Figure 2: Boring Location Plan

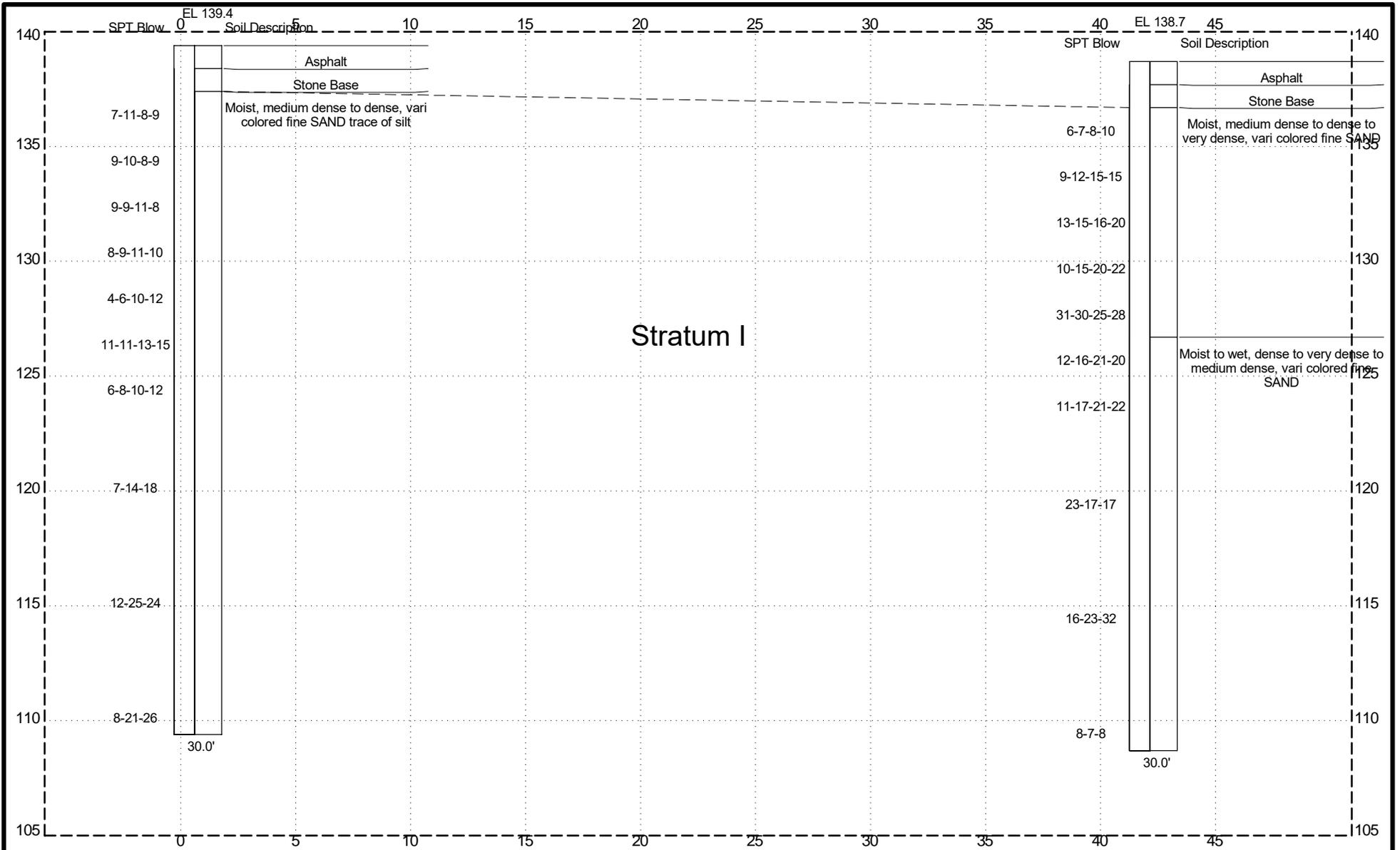


STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

ENGINEERING GEOLOGY DIVISION

B-1

B-2



Stratum I

WATERTABLE KEY

0 HR Reading

24 HR Reading

USCS SOIL KEY

<input type="checkbox"/> GW	<input type="checkbox"/> SW	<input type="checkbox"/> ML	<input type="checkbox"/> CL-ML
<input type="checkbox"/> GP	<input type="checkbox"/> SP	<input type="checkbox"/> MH	<input type="checkbox"/> OH
<input type="checkbox"/> GM	<input type="checkbox"/> SM	<input type="checkbox"/> CL	<input type="checkbox"/> TOPSOIL
<input type="checkbox"/> GC	<input type="checkbox"/> SC	<input type="checkbox"/> CH	<input type="checkbox"/> ROCK

Title: **Generalized Subsurface Profile**

Drawn: RA Approved: GW Date: 3/1/19

Figure No. **3**

Job No. AX028A51

APPENDIX - B
BORING LOGS

**MARYLAND STATE HIGHWAY ADMINISTRATION
BORING LOG**

Boring and Sampling Conforms to AASHTO:

Sheet 1 of 1
Boring _____ of 2

Contract No. AX028A51 Project Description Communication Tower Building Hanover Complex

Boring No. B-1 Station _____ B/L _____

N: 543444.82 E: 1403379.63 Relocated?

Surface Elevation 139.4 Boring By T.Potter

Date Started 9/10/18 Date Completed 9/10/18

Driller _____
Rig Type CME-45
Rig No. S603450
Drive Hammer _____ LB
Casing Auger Size 3 1/4 IN
Size of Core _____ IN
Size of Bit OD _____ IN
Core Barrel Type _____
Auger Depth 28.5 FT

WATER TABLE		CAVE-IN		Time (hours)	Date
Depth (ft)	Elev (ft)	Depth (ft)	Elev (ft)		
▼ DRY		12.0	127.4	0	9/10/18
▽ DRY		11.5	127.9	24	9/11/18

DEPTH IN FEET	ELEV. IN FEET	MATERIAL DESCRIPTION	SPOON			RECOVERY	REMARKS
			SAMPLE NO.	BLOWS/RQD	DEPTH		
1.0	138.40	Asphalt					
2.0	137.40	Stone Base					
		Moist, medium dense to dense, vari colored fine SAND trace of silt	1	7-11-8-9	2.0-4.0	83.5%	
			2	9-10-8-9	4.0-6.0	87.5%	
			3	9-9-11-8	6.0-8.0	83.5%	
			4	8-9-11-10	8.0-10.0	79.0%	
			5	4-6-10-12	10.0-12.0	75.0%	
			6	11-11-13-15	12.0-14.0	91.5%	
			7	6-8-10-12	14.0-16.0	91.5%	
			8	7-14-18	18.5-20.0	128.0%	
		9	12-25-24	23.5-25.0	100.0%		
30.0	109.40		10	8-21-26	28.5-30.0	100.0%	
		BORING TERMINATED AT 30.0'					Boring backfilled @24hrs

FOUNDATIONS BORING LOG AX028A51GINT - EGD.GPJ SHA DF US STD.GDT 3/1/19

**MARYLAND STATE HIGHWAY ADMINISTRATION
BORING LOG**

Boring and Sampling Conforms to AASHTO:

Sheet 1 of 1
Boring _____ of 2

Contract No. AX028A51 Project Description Communication Tower Building Hanover Complex

Boring No. B-2 Station _____ B/L _____

N: 543458.45 E: 1403418.89 Relocated?

Surface Elevation 138.7 Boring By T.Potter

Date Started 9/10/18 Date Completed 9/10/18

Driller _____
Rig Type CME-45
Rig No. S603450
Drive Hammer _____ LB
Casing Auger Size 3 1/4 IN
Size of Core _____ IN
Size of Bit OD _____ IN
Core Barrel Type _____
Auger Depth 28.5 FT

WATER TABLE		CAVE-IN		Time (hours)	Date
Depth (ft)	Elev (ft)	Depth (ft)	Elev (ft)		
▼ DRY		18.0	120.7	0	9/10/18
▽ DRY		15.0	123.7	24	9/10/18

DEPTH IN FEET	ELEV. IN FEET	MATERIAL DESCRIPTION	SPOON			RECOVERY	REMARKS
			SAMPLE NO.	BLOWS/RQD	DEPTH		
1.0	137.70	Asphalt					
2.0	136.70	Stone Base					
12.0	126.70	Moist, medium dense to dense to very dense, vari colored fine SAND	1	6-7-8-10	2.0-4.0	83.5%	
			2	9-12-15-15	4.0-6.0	91.5%	
			3	13-15-16-20	6.0-8.0	87.5%	
			4	10-15-20-22	8.0-10.0	83.5%	
			5	31-30-25-28	10.0-12.0	91.5%	
30.0	108.70	Moist to wet, dense to very dense to medium dense, vari colored fine SAND	6	12-16-21-20	12.0-14.0	83.5%	
			7	11-17-21-22	14.0-16.0	91.5%	
			8	23-17-17	18.5-20.0	100.0%	
			9	16-23-32	23.5-25.0	100.0%	
			10	8-7-8	28.5-30.0	100.0%	
		BORING TERMINATED AT 30.0'					Boring backfilled @ 24hrs

FOUNDATIONS BORING LOG AX028A51GINT - EGD.GPJ SHA DF US STD.GDT 3/1/19

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ATTACHMENT 31

State Of Maryland Dept. of Information Technology Communication Tower Closeout Acceptance Standards

Table of Contents

1. Intent

- 1.11 Tower Foundation
- 1.12 Concrete Placement
- 1.13 Concrete Testing
- 1.14 Electrical Conduit Placement
- 1.15 Tower Erection and Installation
- 1.16 Shelter Placement
- 1.17 Fence Installation
- 1.18 Tower Lighting
- 1.19 Site grounding
- 1.20 Liquid Propane Information
- 1.21 Generator Start Up
- 1.22 Site As - Built Drawings
- 1.23 MD Dept of the Environment Permit and Receipt
- 1.24 Photo Documentation

2. Closeout Book Set Up

- 1. Site Name and Notes
- 2. Manufacturer Warranties
- 3. Site Ground Resistance Reports
- 4. Concrete Test Reports
- 5. Site Photos
- 6. Tower and Foundation Drawings
- 7. Shelter Drawings
- 8. Site As-Built Drawings
- 9. MDE Permit / Completion Receipt
- 10. Equipment Spec Sheets
- 11. Contract Task Orders (include any addendums)
- 12. Contract Purchase Order
- 13. Liquid propane information

3 Site Binder

- 1. Site ground test.
- 2. Concrete reports.
- 3. Manufacturer warranties for shelter, generator, lighting controller, HVAC, Transfer Switch, etc.
- 4. Generator start up documents.
- 5. Photos of underground work.

1. Intent

The intent of this document is to provide designated personnel with set guidelines, including specified performance metrics, for verifying completeness of construction of communication towers, shelters, and ancillary equipment. Successful completion of the tests and mandatory document submissions set forth in this document will guarantee functional acceptance of a quality facility.

1.11 Tower Foundation

Tower foundation closeout documentation will include:

a. The reinforcement bar steel manufacturer will furnish certification of grade steel report. The certification shall include actual mill test results including the chemical and physical properties of the finished metal products.

1.12 Concrete Placement

a. Concrete placement shall comply with current ASTM and/or AASHTO specifications.

b. Concrete delivery tickets will include the following

- Concrete producers name, including address and phone number.
- Date and time batched concrete departed the mix facility.
- Concrete mixture (i.e. 4000 psi mix, % of air, slump, etc).
- Time batched concrete arrived and site location.
- Verified time of discharged concrete.

1. 13 Concrete Testing

3rd party independent inspection and certification report to include the following (provided at the vendor's expense):

- The sealed report will include a written report of inspection of the reinforcement bar in accordance with the approved tower foundation design.
- Certified concrete test cylinders break test report.
- The report will include results of slump, air entrainment, weather conditions at the time of pour, the use of any admixtures per latest DoIT concrete inspection policy.

1.14 Electrical Conduit/Equipment Installation

Electrical conduit, wiring and materials will be installed in accordance with National NEC codes and standard, local jurisdictional requirements, local utility requirements, and latest version on Motorola's R56. Documentation required for electrical installation is:

- a. Photo documentation of underground conduit depicting depth of trench.
- b. Photo documentation of underground utility marking tape.
- c. Electrician's current Maryland License.

1.15 Tower Erection and Installation

The tower installation will be in accordance with ASTM specifications. Closeout documentation will include:

- a. A copy of the erection manual specification contained with the tower.
- b. A copy of the lighting installation manual.
- c. Copies of the safety climb installation manual.
- d. Compliance letter from the installer certifying the tower has been installed in accordance with the manufactures specifications.
- e. Provide photo documentation of any repairs or corrections made as a result of the State supplied tower inspection report.

1.16 Ground System/Underground Details

- a. Provide photo documentation of ground ring depth, welded and mechanical ground connections.

1.17 Shelter Placement

Provide copy of shelter documents enclosed with the shelter.
Provide shelter set photos.

1.18 Tower Lighting

Provide a copy of the tower light manual and diagnostic materials. Document that the tower light has been functional for at least 30 days and at the time of acceptance.

- a. Provide proof of warranty through the manufacturer or CATS + vendor.

1.19 Site grounding

Provide evidence of site grounding compliance through a three point – fall of potential test and resistance test of at least 10 equipment grounds with a clamp on test meter. These tests will be conducted at the vendor's expense.

- a. Clamp on test will demonstrate less than 5 ohms of resistance for each ground tested.
- b. Report will describe the ground lead tested, relative location within the site and the ground reading.
- c. Fall of potential test will describe type of equipment used, soil type, equipment calibration date and test results.
- d. All will be conducted by personnel trained on the equipment.

1.20 Liquid Propane Information

Provide evidence to support buried installation. The tank shall be new and unused.

- a. Provide an invoice that demonstrates the installation of non metallic fuel line.
- b. Provide photos of underground installation.
- c. Provide certified documentation that high performance polyethylene “plastic” fuel line or similar substitute was installed.
- d. Provide a bill of sale demonstrating the tank’s ownership by the State of Maryland.

1.21 Generator Start up

Provide factory certified inspection/start up documents. The initial setup and testing of the generator will be conducted by a factory certified representative. The required documentation under this section includes:

- a. Record serial numbers, models, nomenclature, etc of the generator and automatic transfer switch.
- b. Record and document all services performed to check the integrity of the delivered generator, alarm configuration, components and automatic transfer switch.
- c. Record and document the generator’s performance during the required one (1) hour load bank test (under full load).
 - a. This will include indicators such as voltage output, frequency output, oil/water pressure, load, etc.
- d. Provide a copy of the generator and transfer switch warranty.

1.22 Site As Built Drawings

Provide three hard copies of site as built drawings. Provide one soft copy of the as built drawings.

In the event construction drawings are provided by the State the vendor will red line any changes and provide measurements/locations highlighting the actual location.

If no construction drawings are provided, then the vendor will create a set of as built drawings that show the location of the following items: Tower, shelters, LP tank/pad, electrical conduit, transformer, electric backboard, fence, ice bridges, etc. The drawings will be to scale.

1.23 MD Dept of the Environment Permit and Receipt

Provide a copy of the MDE permit. Provide a copy of the receipt provided by MDE to demonstrate completion of the E&S/SWM portion of the project.

1.24 Photo Documentation

Exhibit A Photo Documentation Log

Format

All photographs must be submitted printed in color and contained within the photo tab of the closeout binder.

Pre Construction

1. Access road.
2. Utility path.
3. Utility Pole at primary power location, including pole number.
4. Proposed compound location 4 photos. North, East, West South.
5. Tower Location.
6. Shelter Pad location.

Construction

Tower Foundation

1. Tower foundation excavation and shoring.
2. Placement of rebar.
3. Placement of anchor bolts.
4. Tower foundation concrete placement.
5. Finished concrete.
6. Backfill and compaction of foundation.

Shelter Foundation

1. Shelter foundation excavation, forms and shoring.
2. Placement of rebar.
3. Foundation concrete placement.
4. Stoop forms, rebar and reinforcement.
5. Finished concrete.

Utilities

1. Power routing from primary pole location to tower site.
2. Telco routing from pole to demark.
3. Underground conduit depth.
4. Power and Telco conduit bends.

Fuel Tank

1. Installation of pad, including rebar, concrete, etc.

2. Underground fuel supply line trench, trench depth, and connections.
3. Photo evidence of installation of non-metallic fuel line.

Tower Installation

1. Erection process.
2. Installation of lighting system.
3. Lighting cable routing (to include strain relief).

Facility Grounding

1. Grounding trench including verification of trench depth.
2. #2 solid to ground rod (minimum of 5 photos).
3. Underground exothermic welds (minimum of 5 photos)
4. Ice bridge grounding.
5. Entry port grounding.
6. Fence grounding including grounding "buttons".
7. Fence Gate grounding.
8. Shelter grounding exterior / interior.

Post Construction

1. Tower profile. North, East, South West.
2. Compound and Tower with Shelter, North, East, South West.
3. Generator including serial number model number.
4. Primary utility backboard, including meter and meter number.
5. Generator fuel tank location and connections.
6. Shelter bolted down.
7. Shelter door grounds.
8. Tower grounded.
9. Fire Extinguisher.

2. Closeout Book Set Up

Closeout binder will be submitted in one (1) hard copy and one (1) CD version with all photos in jpeg format

1. Site Name and Notes
 - Provide title sheet to include:
 - Site name.
 - Project number.
 - Proper physical address.
 - Company name
2. Manufacture Warranties
 - Include all manufactures warranties.
3. Site Ground Resistance Reports
 - Provide post ground test.
4. Concrete Test Reports
 - Provide certified test reports.

- Concrete delivery tickets for all concrete placed at site location - **Mandatory submission.**
5. Site Photos
 - As required by Exhibit A.
 6. Tower and Foundation Drawings (if applicable)
 - **Mandatory Submission** (Provide 2 copies).
 7. Shelter Drawings
 - Mandatory Submission (Provide 2 copies).
 8. Site As-Builts
 - Provide as required.
 9. MDE Permit / Completion Receipt
Provide if required
 10. Equipment Spec Sheets
 - Provide as required.
 11. Contract Task Orders
 - **Mandatory submission.**
 12. Contract Purchase Order
 - **Mandatory submission.**
 13. Liquid Propane Information (if applicable)
 - A bill of sale demonstrating the tank's ownership by the State of Maryland - **Mandatory submission.**
 14. Generator Startup
 - Documented record of all services performed and generator performance during load bank testing- **Mandatory submission.**
 15. Electricians current Maryland License
 - **Mandatory submission.**