Standards for Site Construction and Contractor Specifications

tyco Electronics

M/A-COM

NOTICE!

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

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1. INTRODUCTION

This document presents standards for site construction and contractor specifications for M/A-COM projects. M/A-COM will assign a representative to the project to provide direction and inspect all work performed by contractors and subcontractors. Section 2 covers general provisions and site preparation. Section 3 discusses the construction of roads for the project, and Section 4 discusses the necessary clearing, grading, and site preparation. Section 5 covers the constructing of foundations for buildings, towers, guy anchors, generators, and fuel tanks. Section 6 presents the standards for the prefabricated equipment shelter. Section 7 discusses the installation of various types of fences and gates. Section 8 provides the specifications for site grounding, and Section 9 details the necessary types of insurance to be carried by the contractor. Section 10 provides drawings.

The reader of this document may wish to obtain a copy of LBI-39067, "Standard For Site Grounding And Protection," which is referenced herein.

2. GENERAL PROVISIONS AND SITE PREPARATION

2.1. GENERAL

A M/A-COM representative will accompany the contractor during several phases of construction. The representative will serve as a liaison between the contractor and M/A-COM for the direction and inspection of all work.

2.2. FCC PERMITS

No work will begin at a site until it has been confirmed that FAA and FCC approval has been granted. This information will be available from the M/A-COM Systems Engineer and/or the Program Manager assigned to the project.

2.3. SURVEYING

The contractor shall use a registered surveyor and be responsible, at his own expense, for all construction surveying and any other surveying that he may require to complete the work in the best manner possible. Distances measured shall have an accuracy of ± 1 inch (2.5 cm). ALL ANGLES shall have an accuracy of ± 1.0 Second.

2.4. PERMITS, LICENSES, AND CODES

The contractor shall obtain all required licenses and permits before construction starts. He shall perform his work in accordance with all codes, ordinances, and authorities having jurisdiction over his work and shall, upon completion, furnish the M/A-COM representative with a certificate of the inspection or other legal documents to show compliance.

Where no specific local codes exist or no codes exist or no tests or permits are required for a particular phase of the work, the contractor shall follow the National codes and/or this standard and the specific program drawings. At the completion of work, the contractor shall supply the M/A-COM representative with a documented statement that no permits, tests, or licenses were required.

2.5. TESTS

The contractor shall provide for all tests required by law, local codes, or local ordinances. Any fees required for such testing shall be paid by the contractor. All certified copies of such tests shall be given to the M/A-COM representative.

2.6. WORKMANSHIP

The contractor shall complete all work as detailed in specifications and drawings. He shall assume responsibility to provide, furnish, and pay for all transportation, labor, materials, tools, and fees required to start and complete the work in a neat, timely, and thorough manner.

2.7. MATERIALS

Unless otherwise specified, all materials to be furnished by the contractor shall be new, of first class quality, of reputable manufacture, and free from defects. Unless otherwise specified, structural steel shall be hot dipped galvanized per ASTM A123; hardware 1/4 inch (6mm)and smaller shall be stainless steel type 316 and nuts, bolts, and washers larger than 1/4 inch (6mm) shall be hot dipped per ASTM A153 with class 2 threads after galvanizing.

2.8. SUBSTITUTIONS OR VARIATIONS

No deviations from the specifications and drawings shall be made without prior written approval from the M/A-COM representative. Failure to comply with this provision shall render the contractor liable for correction costs. The contractor shall furnish the exact materials specified by the specifications and drawings unless changed by written

approval. Where two or more materials are named, the contractor shall have the choice of which one to use. M/A-COM representatives shall determine the precedence for any deviations between job and drawing specifications.

2.9. WATER/POWER

The contractor shall make whatever provisions are necessary for procuring drinking water and other water for his work, obtaining a permit if necessary and paying for all water that is used during his work. He will furnish his own power and light and other utilities that he may require for his work. He shall also furnish temporary power required by all subcontractors on the job.

2.10. CLEANING

The contractor shall, at all times, keep the premises free from accumulations of waste material and rubbish caused by his employees or work. At the completion of work, he shall remove all his rubbish from the site. In case of dispute, the M/A-COM representative may have the rubbish removed at the contractor's expense. If rubbish is not placed on grounds specifically designated for dumping, written permissions to dump shall be obtained from the property owner and the document shall be turned over to the M/A-COM representative. No on-site burning of rubbish will be allowed.

2.11. TEMPORARY TOILETS

If required, the contractor shall provide portable/chemical type temporary toilets during his work. These facilities shall be approved and shall agree with the local building code requirements. The toilets shall be maintained in a neat and sanitary condition at all times. Any remaining evidence of the temporary toilets shall be removed upon completion of the contractor's work.

2.12. WELDING

Where welding is required and permitted, it shall conform to all local codes and the requirements of the American Welding Society. Unless specified in the specifications and drawings, written permission for welding on towers must be obtained from the M/A-COM representative.

2.13. STAGING AND FALSE WORK

The contractor shall keep all staging and false work in a safe condition during construction and shall provide temporary means of inspection for the M/A-COM representative.

2.14. CUT OR DAMAGED SERVICES

Freshly cut surfaces or any service where galvanizing has been damaged shall be painted immediately with a zinc-rich touch-up paint. Any surface that is damp, coated with mud, greasy, etc., shall be cleaned and dried before painting.

2.15. SURPLUS MATERIAL

The contractor shall report surplus M/A-COM furnished material, if any, to the M/A-COM representative. Upon receipt of shipping instructions from the M/A-COM representative, the contractor shall secure, package, and/or ship the surplus material as described.

2.16. STORAGE OF MATERIAL ON THE SITE

The contractor shall unload and store material in a careful, systematic manner to prevent damage from rust or other causes and to prevent loss of small pieces. Proper skids shall be used to prevent material from resting on the ground or in the water.

2.17. PROTECTION OF THE PUBLIC

The contractor shall take the necessary precautions, as directed by the M/A-COM representative, to protect the public from injury during and after the contractor's working hours. For example, if excavations need to be left open overnight, the areas shall be adequately barricaded or covered to keep persons or animals from falling in.

2.18. SUNDAY AND EVENING WORK

Sunday and evening work must be authorized in advance by the M/A-COM representative.

2.19. SAFETY

Safety on the job is an important consideration for the M/A-COM representative. Responsibility rests on the contractor to be sure that the job is accomplished safely. The contractor shall comply with all applicable Occupational Safety and Health Standards as set forth by the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA).

2.20. PRE-CONSTRUCTION CONFERENCE

After the contract has been awarded, the contractor and job superintendent together with sub-contractors and their foremen will meet with the M/A-COM representative to review the plans and specifications and discuss a satisfactory schedule and working method. At this meeting, M/A-COM will also cover "conduct of work," "sequence of work," "safety," and the "overtime policy."

2.21. USE OF SUBCONTRACTORS

The contractor shall provide each subcontractor with a copy of these specifications. However, the contractor shall retain the responsibility for the work of these subcontractors. It shall also be the responsibility of the contractor to confirm that his subcontractors meet licensing requirements of the local jurisdiction in which the work is being performed.

3. ROADS

3.1. GENERAL

The contractor shall construct roads as specified herein and as shown on the site drawings.

3.2. CLEARING AND GRUBBING

The contractor shall remove timber, stumps, bushes, vegetation, logs, and all other objectionable material in the road area as shown on the site drawings or as directed by the M/A-COM representative. Limbs or branches of trees overhanging the road area that do not give clearance of at least 15' shall be trimmed. All removed debris shall be disposed of at a legal off-site dumping area. None of the refuse above shall be buried or burned on the site.

3.3. MINIMUM AND BASIC ROADS

The contractor shall construct a minimum or basic road as follows:

- The location and length of the road shall be as shown on the site drawings.
- The width and surface of the road shall be no less than 12 feet unless otherwise shown on site drawings.
- The road shall take every advantage of the terrain so as to eliminate fill bridging and leveling.
- Road construction will be in two phases:

  (1) Grade and stabilize as necessary for ingress and egress of construction vehicles, including truck transporting shelter, crane, concrete trucks and tower erection equipment.

  (2) After the shelter is set and the tower is erected, the entire road shall be prepared with a blade grader or other approved equipment. The roadway subgrade shall be compacted to 95% proctor. The final road shall have a typical crown of at least 1/2 inch per foot and adequate draining ditches constructed on each side, or as specified by the site plans.

The finished surface shall be free of ruts and depressions.

3.4. MATERIALS

The basic road materials to be used will be crushed stone, asphalt, or concrete.

- Crushed stone: The aggregate size and spread thickness shall be per the site drawings.
- Asphalt: Asphalt, where required, shall conform to the Standard Specifications for Asphalt.
- Cement:

  (1) Concrete: Concrete where required shall conform to the standards of the American Concrete Institute.

  (2) Subgrade: The subgrade for gravel roads shall be existing soil compacted to 95% proctor.

4. SITE WORK

4.1. PREPARATION OF THE SITE

The contractor shall perform all site work indicated on the drawings or stipulated in the job specification. This work shall include necessary clearing, grubbing, and final grading and dressing of the site to specified grades and contours, furnishing and installing approved surface materials, and the performance of all other work specified according to the architect's drawing, which is part of the job specifications.

Clearing, grubbing and grading outside the tower compound area shall be in accordance with the site drawings and job specifications. All trees which would, if fell, hit the tower, shelter, generator, fencing, guy wire, or guy anchors shall be removed. For guyed towers, the paths from the tower to the guy anchors shall also be cleared and graded.

Clearing for guyed towers:

- Guy wire path clearing: 15" both sides of the guy wire.
- Guy anchor clearing: A clear circle around each anchor with radius larger than the tallest tree (including future growth) that would hit the anchor should the tree fall.

Trees outside the _____ Services property, fitting this description, should be identified and be brought to the attention of_____ Services.

The contractor shall visit the site to investigate the actual conditions at the site. During this site investigation, he should determine construction techniques and make necessary preparations to transport men and material to the site.

4.2. GRADING

The surface area of the site, including all excavation, cuts, fills and embankments, shall be finished to the lines, grades, and cross sections shown on the site drawings. The ground shall be compacted and brought to the proper slopes and grades and shall be cleaned of all loose material.

The finished site grading shall be done in such a manner as to cause water to flow away from the shelter, tower, and/or guy anchors.

Topsoil within the graded area shall be stockpiled for later use. Topsoil free from trash and debris shall be uniformly spread and graded over all areas where the original topsoil was distributed or damaged outside of any graveled area. Topsoil shall be placed after all other construction, work on, across, or over such areas has been completed.

The contractor shall dispose of any debris which may remain after final grading.

Inside the fenced tower compound area, the soil shall be compacted to 90% proctor before the addition of crushed stone.

4.3. CRUSHED STONE

The contractor shall install crushed stone or gravel inside the tower compound area and around guy anchors in two lifts as presented below or as specified on the site drawings.

- 1ST Lift: 3-inch layer of crushed stone or gravel in a range of sized none larger than 3 inches.
- 2ND Lift: 3-inch layer of 3/4-inch washed stone.

Crushed stone or gravel shall be provided as a surfacing material for areas around the building as shown on the site drawings and as stipulated in the job specification. Before crushed stone is applied, a non-woven, landscape geotextile fabric shall be used at all areas to be graveled.

Gravel or crushed stone shall be placed on the subgrade and uniformly spread to such depth that when compacted, it will have the specified thickness and be at the grade elevations as shown on the site drawings.

4.4. EROSION CONTROL

The customer property or adjacent owner's property disturbed by the work and not covered by building, driveway, or crushed stone shall be graded to smooth contours, stockpiled on topsoil, spread, fertilized, seeded, and covered with a mulch as specified thereunder.

The soil on the areas above shall be brought to a friable condition by loosening and mixing it. All lumps and clods shall be thoroughly broken. All necessary cultivating, disking, harrowing, and raking prior to seeding shall be done by the contractor. All rocks on the surface, large enough to interfere with mowing equipment, shall be removed.

The contractor shall provide and spread a standard commercial fertilizer. The fertilizer, rate of spread, and the method of application shall be as recommended by the manufacturer.

After fertilizing has been completed, grass seed shall be sown uniformly by mechanical seeders. Grass seed mixture, rate of spread, method of application, method of mulching, and time of planting shall be as recommended by the local county agricultural agent, or as specified by the site drawings.

Immediately after seeding, the entire seeded area shall be covered with a straw or hay mulch spread evenly over the surface. Immediately after application, the mulch shall be punched or chopped into the soil to prevent the wind from

blowing it away. An approved mesh type material may be used as an alternate method to hold the mulch in place.

The contractor shall use silt fencing or hay bales to keep debris and silt from traveling off-site. Where specific requirements of this specification for erosion control are in conflict with the recommendations of the local agricultural agent or site plan information, the agent's recommendations shall prevail.

The contractor shall guarantee the newly seeded grass until the end of the next growing season after conditional acceptance of this work by the M/A-COM representative.

The contractor shall provide all necessary work and materials to ensure this guarantee, including weeding, repair of washouts and gullies, and all other work as required, including reseeding the area where germination is unsatisfactory or where seed has washed away.

4.5. SURFACE AND SUBSURFACE UTILITIES

Where encountered in the work, all existing active sewer, water, gas, electric, and other utilities which interfere with the execution of the work shall be removed and shall be capped, plugged, or otherwise discontinued at points which will not interfere with the execution of the work, subject to the approval of the M/A-COM representative and any public agencies or utilities having jurisdiction.

The contractor shall stake out the location of any utility company's underground facilities and shall maintain such stakes throughout the job to avoid inadvertent excavation in the area of the underground facilities.

4.6. FILLS AND EMBANKMENTS

The material beneath all fills and embankments shall be firm, dense, and thoroughly compacted; shall be free from mud and muck; and shall be free from all organic materials such as leaves, grass, roots, or brush. Stump holes or other small excavations within the limits of fills and embankments shall be backfilled and thoroughly compacted.

Fills and embankments shall be constructed with materials obtained from excavations for the work, to the maximum extent available, on suitable prepared subgrade to the lines and grades shown on the plans.

All materials deposited in fills and embankments shall be free from organic or any other objectionable material.

All materials to be used for fills and embankments shall include sufficiently fine material to fill all voids. All fill shall be free of boulders over 6 inches in diameter unless otherwise specified on the site drawings.

No fill or embankment material shall be placed on frozen ground, nor shall frozen materials, snow, or ice be placed in any fill embankment.

Fills and embankments shall be constructed in horizontal layers not to exceed 8 inches in non-compacted thickness. Material deposited in piles or wind rows from excavating equipment shall be maintained or brought to within 2% of the optimum moisture content, and shall be compacted by rolling, vibration, tamping, or other acceptable method approved by the M/A-COM representative, and per information on the site plans.

Each layer of fill or embankment material shall be compacted over its entire area with equipment which has been designed to most effectively compact the material.

All excess material from excavations not required for fill shall be removed from the site and legally disposed of in accordance with the laws and ordinances of public agencies having jurisdiction.

The contractor shall be liable for the condition of any fill. Any settlement of the grade shall be repaired at the contractor's expense.

4.7. BORROW PITS

Where necessary to obtain satisfactory material to complete structure backfield or fills and embankments, the material shall be excavated from borrow pits and hauled to the site of work. The borrow material used must be approved by the M/A-COM representative. All costs of obtaining the borrow site and developing the source, including the right of way, clearing, hauling, testing and any other cost shall be borne by the contractor.

5. FOUNDATIONS

5.1. GENERAL SCOPE

The contractor shall provide the shelter and generator foundations as specified on the site drawings and/or the job specifications. Shelters and generators will be anchored to the foundations in accordance with each manufacturer's instructions.

The contractor shall provide the tower and/or guy anchor foundations as specified by the tower vendor. The tower vendor will provide foundation designs based on

M/A-COM specifications, site conditions, and soil engineer's recommendations.

The tower vendor will provide all anchor bolts, templates, and guy anchor rods, as required.

The contractor shall hire an independent testing firm to inspect and approve the tower foundation installation. A written report must be furnished to M/A-COM and the tower vendor.

5.2. EXCAVATIONS

The contractor shall ascertain for himself the character of the excavation to be performed. Any subsurface investigation furnished to the contractor by M/A-COM is for reference only and does not limit his ability.

All excavations shall include the removal of all materials as encountered in obtaining the required lines, grades, size, and depth of foundations regardless of the method used or the character or type of material removed.

All excavations shall be square cut and horizontal. If the excavation is inadvertently carried below the depth indicated for a foundation, concrete shall be used to fill the required elevation at no additional expense to M/A-COM.

Where an excavation is carried to a depth called for on drawings produced by M/A-COM and the nature of the soil is unsatisfactory, the excavation shall be deepened as directed by the authorized M/A-COM representative. The contractor shall receive additional compensation for this work upon receipt of a written construction change authorization originated by the authorized M/A-COM representative.

All excavation and trenching shall be in accordance with the latest OSHA regulations. The contractor shall provide, install and maintain all shoring, bracing, and sheet piling necessary to shore-up the side of excavations as may be required to execute the work properly and protect all property and construction adjacent to the excavations. The method and quantity of shoring shall be approved by the M/A-COM representative.

5.2.1. Removal of Water

The contractor, at his own expense, shall remove in an approved manner all surface or underground water encountered during the term of the contract which in any way affects the construction work.

Water shall not be permitted to accumulate in or flow through trenches or excavations intended for site construction.

The contractor shall provide pumps, well points, silt boxes, hoses, pipes, ditches, coverings, and/or other necessary and approved means to direct the water away from the site and protect adjacent property from water damage.

The Contractor shall obtain all permits which may be required by local authorities for discharge of water.

5.2.2. Rock Excavation

All blasting shall be carried out in strict accordance with the regulations of the state, local laws, and ordinances, and the regulations of any other agency exercising jurisdiction.

Blasting to depths greater than the depths of the foundations will not be permitted.

Shattered, loose, or unstable rock, or rock which shows signs of incipient disintegration, will not be acceptable as a foundation medium.

5.2.3. Protection of the Public

Excavations which remain open overnight shall be adequately barricaded or covered to prevent people or animals from falling into them.

5.3. CONCRETE

Concrete work shall comply with applicable sections of "The Building Code for Reinforced Concrete" (AC 318-71) of the American Concrete Institute or such local codes as may apply, whichever is more stringent.

All concrete above grade shall be of quality known as "Architectural Concrete" with special care given to density, elimination of voids, honeycomb, bleeding, segregation, and shrinkage.

5.3.1. Materials

- Cement: All cement shall be Portland cement conforming to ASTM C150, latest edition, Type I or Type II. All cement shall be from the same mill and be of uniform color.

- Aggregates: All concrete aggregates shall conform to ASTM C33, latest edition, and shall have clean, hard, durable uncoated particles, free from

deleterious matter. Fine aggregate shall consist of natural sand, evenly graded from fine to coarse. The coarse aggregate shall consist of crushed stone or gravel, evenly graded from 1/4 inches to 1/3 inches, only aggregate from approved sources shall be used and shall be from one basic source.

- Water: Mixing water shall be clean and portable, fit to drink.

- Admixtures: Air Entraining Mixture may be used in concrete only if it is added at the batch plant. Mixing of admixtures at site must be avoided and can only be permitted with written authorization from the M/A-COM representative. The Air Entraining Admixture shall be neutralized Vinsol Resin, Darex, N-Tair, or Airalon. The Air Entraining Agent shall comply with ASTM C226, or C260, latest edition. Air content in concrete should be 3% to 5%. No other admixtures shall be used unless approved by the M/A-COM representative. Calcium chloride or admixtures containing calcium chloride shall not be used.

- Forms: Forms for all smooth concrete surfaces shall be at least 3/4-inch exterior grade wood unless otherwise noted. Forms may be reused only if the panels are in a condition satisfactory to the M/A-COM representative. Supporting members for form-work shall be Construction Grade Douglas Fir, or No. 1 Southern Pine. All lumber shall be straight and true and free from warps.

- Reinforcement: All reinforcement shall be new billet steel bars.

5.3.2. Mixing and Placing

- Design: All concrete shall have a minimum compressive strength at 28 days of 3000 psi. The proportioning of the materials shall be based on the requirements for a plastic and workable concrete. The slump shall be 4 inches plus or minus 1 inch. The contractor is to perform the slump test on each pour under the supervision of the M/A-COM representative.

- Field Control: A minimum of two concrete test cylinders per truckload, one for 7-day and one for 28-day break, shall be made by the contractor. The cylinders shall be made, stored, and cured in strict accordance with ASTM 31, latest edition. The test cylinders shall be delivered to the testing laboratory by the contractor. The contractor shall pay for the expense of laboratory testing. Three copies of the test results shall be furnished to the M/A-COM representative.

For 3000 psi concrete 28-day cylinder tests, no cylinder shall test less than 3000 psi. In the event that this value is not met, the M/A-COM representative may condemn the portion of the work involved, or may require a load test, or may require a stronger mix for subsequent work. Such additional tests and corrective measures shall be at the contractor's expense.

All batching slips from the concrete supplier shall indicate the truck number, time of departure from the batching plant, time of arrival at the job site, amount of water added, if needed at the site, mixing time, moisture content, content of fine and coarse aggregates, and weights of cement, sand, and aggregate. One copy of all batching slips shall be made available to the M/A-COM representative.

A level area shall be provided for taking slump tests and preparing concrete test cylinders. One slump test according to ASTM method for test C143 shall be taken for each truck.

Delivery carts or buggies, where used, shall be kept on temporary runways. Runway supports shall not bear upon reinforcing steel or fresh concrete.

Concrete shall not be allowed to drop freely more than 3 feet unless otherwise approved by the M/A-COM representative. Where greater drops are required, a canvas "elephant truck" tremie or other approved device must be employed.

No concrete shall be placed on frozen ground.

Concrete during and immediately after pouring shall be thoroughly worked around reinforcing and embedded fixtures and into the corners of the forms. Vibrations should be induced throughout the mass; superficial, too long sustained, or haphazard operation of vibrators will not be permitted. Vibrators shall not be used for moving the concrete horizontally within the forms or a horizontal position.

The point at which concrete is being placed shall be shifted as required so that it will not be necessary for concrete to flow more than 2 feet in any direction to reach its final position. Special care shall be exercised along the exterior surface of the exterior walls to minimize air pockets and honeycomb. Honeycomb or porous concrete will not be accepted.

A minimum of 24 to 36 hours is required before placement of concrete piers on mat foundations. Placement

of concrete before this time must be approved by the M/A-COM representative prior to proceeding with the work.

5.3.3. Protection and Curling

In freezing weather, suitable means shall be provided for keeping the concrete at not less than 65 degrees Fahrenheit and no more than 75 degrees Fahrenheit for 3 days or not less than 50 degrees Fahrenheit and no more than 75 degrees Fahrenheit for 5 days. When heated aggregates and/or water are used, the temperature of any component shall not exceed 95 degrees Fahrenheit. Salt, calcium chloride, or other material shall not be mixed with the concrete to prevent freezing. All ground, fill, or forms shall be free of frost before any concrete is placed.

If the air temperature around freshly poured concrete is or is expected to be (within 4 hours after pouring) below 40 degrees Fahrenheit, the following method is recommended for curing.

Once the concrete surface is hard enough to deform, place dry hay or straw to a depth of 12 inches.

Cover the entire concrete surface with a 6-mill polyethylene sheet such there is a gap of about 2 feet between the concrete surface and the polyethylene. A temporary wooden framework around the concrete may be used for this purpose.

Use portable blow heaters under the polyethylene. The size of the heaters will depend on the quantity of concrete to be heated.

After the concrete has been placed in locations exposed to weather, it shall be protected to prevent the loss of moisture from the surface. The protection may consist of covering the concrete with plastic, wet burlap, canvas, sand, or straw and should be applied as soon as the concrete is hard enough to receive it. When plastic is not used, the cover should be protected from "washing" and from the addition of excess water during rainstorms until it is hardened enough to resist washing or dilution.

5.3.4. Reinforcement

Metal reinforcement, at the time concrete is placed, shall be free from loose rust, scale, or other coating which would destroy or reduce the bond. Reinforcement shall be accurately placed and securely supported to avoid displacement. Wood spacers or the equivalent may be inserted between reinforcing steel and the surfaces to maintain clearances and shall be withdrawn as the placement progresses.

Reinforcement accessories including spacers, chairs, bolsters, ties, etc., shall be furnished and placed in accordance with the requirements of the "Manual of Standard Practice for Detailing Reinforce Concrete Structures," ACI 315, latest edition.

All accessories coming within 3 inches of the surface of the concrete shall be galvanized or shall have plastic-coated feet. The feet, as with all accessories, shall be rounded to prevent their being indented into the plywood forms.

5.3.5. Forms

Forms shall conform to the shape, lines, and dimensions of members as shown on the drawings. They shall be placed or tied together to maintain position and shape. Forms shall be sufficiently tight to prevent leakage of water. Forms shall be made sufficiently rigid to prevent displacement or sagging between supports. Responsibility for their adequacy shall rest with the contractor.

Form surfaces shall be smooth and free from irregularities, dents, sags, or holes. Forms shall be so constructed that they can be removed without hammering or prying against the concrete.

The edges and contact faces of forms shall be coated with non-staining mineral oil such as "nonxcrete" or equivalent. The contractor shall make certain that the forms are completely dry and free of coatings. The coating material shall be allowed to float onto the wood with a minimum of brushing.

Form ties shall be adjustable in length to permit the tightening of forms and leave no metal closer than 1-1/2 inches from the surface. They shall not be fitted with any lugs, cones, washers, or other device to act as a spreader within the form or for any other purpose which will leave a hole larger than 1-1/2 inches in diameter or a depression back of the exposed surface of the concrete.

5.4. ANCHOR BOLTS

Anchor bolts shall be firmly supported and anchored. At the completion of the work, all bolts shall be plumb and the dimension between the centers of any two tower bolt groups shall not vary from the indicated dimension by more than 1/4 inch, nor shall the center of any tower bolt group be more than 1/4 inch from its indicated position, nor shall any tower bolt in a group be more than 1/16 inch from its indicated position relative to the center of the group.

The wave guide bridge support bolt, if applicable, shall be set accurately to dimensions shown on the drawings with a tolerance of not more than 3/16 inch.

5.5. GUYED TOWER ANCHORS

No slope will be permitted on that part of the excavation that abuts the front face of the anchor. Although reinforcing may not be required in the anchors, the contractor may find it expedient to drive a few short lengths of reinforcing rods into the sides and bottoms of the excavations to support the anchor rods during the pouring operation. A sloping trench should be dug to accommodate the guy rods when they are placed. The trench should be deep and long enough so that the guy rod is free to pull in a straight line with its tension guy without bending.

Anchors shall be checked with a transit prior to back filling to ensure proper alignment.

5.6. STRUCTURE BACKFILL

All material, debris, and wood forms shall be removed from excavations before backfilling.

No backfill shall be placed against foundation walls or any other location until the work to be covered has been inspected and approved by the authorized M/A-COM representative.

Backfilling against concrete may not proceed until 24 hours after placement of the concrete. Fill shall be compacted equally on all sides of the foundation.

Backfill shall be furnished by the contractor from the excavated site material to the extent available. Additional backfill, similar to the site material, shall be furnished by the contractor where required and shall be approved by the M/A-COM representative before placement.

If excavated material is not suitable as backfill, the contractor will bring in new material as recommended by the soil report.

No frozen soil shall be used for fill.

All fill materials shall include sufficient fines to fill all voids in the material.

The final 6 inches of backfill material shall be from stockpile topsoil removed from excavation, or as directed on the site plans.

5.6.1. Method of Backfilling and Compaction

Unless noted otherwise in contract drawings and specifications, fill materials shall be placed in horizontal layers of 8-inch lifts, and each layer compacted with vibrating compactors such as tampers, hammers or vibro plates to 95% proctor density unless otherwise stated on the site plans.

Soil should be compacted at a water content equal to optimum moisture content ± 2%. In place density, if required, shall be in accordance with ASTM standard method Test D1556-58T or D698. This test, if called for, will be conducted by a company qualified to perform such a test.

5.6.2. Removal of Excess Material

All excess material from excavations not required for fill shall be removed from the site and legally disposed of in accordance with the laws and ordinances of public agencies having jurisdiction.

5.6.3. Finish Grade

The finish grade at backfilled and other distributed areas shall conform to the lines and grades shown on the site drawings.

Areas around buildings, towers, and tower guy anchors shall be graded to cause surface water to flow away from them. See site plans for additional information.

5.6.4. Rock Anchor

The following procedures shall be adopted in grouting mortar for rock anchors.

- Grouting Procedure: Drill a minimum diameter hole as outlined by the foundation designer. During drilling, a continuous supply of water should be maintained to avoid overheating.
- Clean the drilled hole with water and air to remove dirt, chips, oil, and grease. Force water into the drilled hole until clean water returns from the top, then leave the hole full of clean water.
- Insert the pipe (or hose with 3 feet to 5 feet of pipe on end) to the bottom of the hole and pump the grout slowly at about 20 psi, pulling the pipe as the grout rises. The mortar-grout will displace the water without appreciable dilution if the rate of rise of the grout is less than 2 feet per minute. Maintain pumping until the pipe is totally out of the hole and until all diluted grout (if any) has been displaced.
- As the grout stiffens following the pumping operation, cut back the grout about 2 inches and fill this recess with water to ensure the proper curing.

- No mortar or epoxy should pumped below 40 degrees Fahrenheit without written approval from the M/A-COM representative.
- Any suitable piston type group pump or equivalent can be used; consult the manufacturer's representative for details.

6. PREFABRICATED EQUIPMENT SHELTER

6.1. TRANSPORTING AND HOISTING

The shelter manufacturer is responsible for providing the crane and rigging necessary for hoisting and placing the shelter on the finished foundation.

The contractor shall be on-site and furnish the equipment and labor necessary to assist the truck and crane from the established road to the site.

6.2. PLACEMENT

The shelter manufacturer representative is responsible for the shelter placement. The contractor shall assist the installer with off-loading, placement, and anchoring of the shelter.

If any large gaps occur between the foundation and the building edges, the contractor may need to grout or caulk the edges around the entire building for aesthetic purposes.

6.3. MAINTAINING SHELTER CLEANLINESS

After being placed, the shelter shall not be used as a storage building. The contractor shall take every precaution to limit the amount of dirt and debris being tracked into the building by his working personnel. At some sites, plastic or paper coverings may need to be placed over the shelter floor to protect it from mud and dirt. The shelter shall be kept as dust-free as possible. Working personnel shall limit their entry into the building. The contractor shall have the ultimate responsibility for the cleanliness of the building.

6.4. COMMERCIAL POWER

The contractor shall install material from the power company source to the shelter to provide commercial electrical service and any wiring required within the shelter. The contractor shall be responsible for the initial contact and coordination of the service application with the local power company.

Any deposits, initial fees, etc., required by the power company will be reimbursed to the contractor per change order.

The contractor shall contact the M/A-COM representative for the billing address of the regular monthly electrical service.

The contractor, at his own expense, is responsible for retaining all electrical permits.

The power current specified by the M/A-COM drawings shall be provided. A 2-1/2-inch sleeve in the shelter wall will provide the routing of conductors to the transfer switch inside the shelter.

Contractor shall provide pole, riser, weatherhead, conduit, wire, and any other required material to interface with the power company supply as shown on the site plans and as required by the power company.

All electrical work shall conform to the requirements of the National Electrical Code and local codes. All electrical work must be performed by a qualified and licensed electrician.

6.5. EMERGENCY GENERATOR

The contractor shall provide the electrical connection to an existing or new emergency power generator. The emergency power generator shall be wired and turned up (operated/tested) by the contractor while the M/A-COM representative is present for inspection.

The contractor shall follow vendor recommendations and local codes for site installation and fuel-tank installation.

6.6. TOWER LIGHTING

The contractor shall be responsible for the electrical connection between the shelter breaker panel and the tower lighting control system.

7. FENCES AND GATES

7.1. GENERAL

The Contractor shall furnish and install fences and gates as specified herein as modified by the site drawings or job

specifications after tower and shelter installations are complete.

7.2. CONTRACTOR'S RESPONSIBILITY

The contractor shall establish the legal boundary of the plot by a licensed survey as described on the site drawings, if required.

The contractor shall remove all trees, shrubs, and all vegetation that fall within the fence line, as directed by the authorized M/A-COM representative. All rubbish caused by the removal of such growth shall be completely removed from the job site. Tree stumps directly within the fence line shall be cut even with or below grade and shall not interfere with the properly spaced post footings.

The contractor shall be responsible for the complete installation of the fence as shown on the site drawings.

7.3. INSTALLATION

The contractor shall install all fencing in true alignment and each post shall be plumb with the vertical.

All post corners, gate posts, and terminal posts shall be heavy duty and braced to withstand the additional forces acting on these posts.

The fabric and wire stands shall be correctly tensioned and the post verticals spaced so as not to create a sag or bow along the fence line.

The fence, unless otherwise specified, shall as nearly as possible follow the contour of the terrain. Special provisions shall be made where sudden changes of elevation occur or where drainage depressions occur.

Galvanized fences, railing, posts, and gates shall not be painted unless otherwise specified or directed by the authorized M/A-COM representative.

Guyed tower sites shall have individual fencing completely enclosing each guy anchor location. Fence type shall be woven farm fabric, 6x6-inch mesh, 9 gauge, per typical drawing in these specifications. The contractor shall install a single row of embedded posts, on 5-foot centers, directly below any guy wires to achieve a minimum 12-inch vertical separation between the grade and the guy wire. All posts shall be marked with 3m 871 (Yellow) or 3m tape (or equal).

7.4. FENCE TYPES

7.4.1. Chain Link Fence

Chain link fence shall be as determined by the M/A-COM representative unless otherwise specified. The fence shall be 6 feet in height, not including extension arms for barbed wire, and shall be of 9 gauge steel wire.

The specifications for the material and installation of the various fence components are as follows:

- Fabric: Wire fabric shall be composed of individual wire pickets which form a continuos 2-inch woven mesh.

- Line Post: Post shall be 1-5/8 inch O.D. standard pipe, hot galvanized and joined with extra long pressed steel sleeves, hot galvanized, making a rigid connection but allowing for expansion and contraction.

- Top Wire: Top wire may be used in lieu of top rails when approved by the authorized M/A-COM representative. Top wire shall be number 7 gauge extra galvanized or aluminized coiled steel tension wire. It shall be securely fastened to line and terminal posts.

- Fabric Ties: Ties shall be aluminum strips or wire of approved gauge. They shall be used ontop rails every 24 inches and on line posts every 14 inches.

- Barbed Wire Extension at Side of Fence: Intermediate, terminal, and corner posts shall be equipped with extension arms for supporting 3 strands of barbed wire. Extension arms should be made of pressed steel, hot galvanized after fabrication.

- Extension arms shall be turned in for installation of barbed wire slanting inward toward the tower compound. Extension arms must be used at the corner posts. Do not connect barbed wire directly to the vertical corner posts.

- Barbed Wire Extension at Side of Fence: Chain link fences inside pastures shall be equipped with horizontal extension arms or stand-offs for supporting 4-strand barbed wire to discourage livestock from rubbing against the fence.

- Barbed Wire: Barbed wire shall consist of 2 number 12 gauge twisted galvanized or aluminized

steel line wires with number 14 gauge aluminum 4-point barbs spaced not more than 4 inches apart.

- End and Corner Posts: Posts shall be 3-inch O.D. of the same material and set in concrete similar to line posts.

- Swing and Corner Posts: Posts shall be of the same material as line posts and sized according to the width of the gate opening.

- Bracing: Terminal and gate posts shall be braced with 1-5/8-inch O.D. horizontal compression members, securely attached to terminal and first line posts with malleable iron fittings and beveled edge bands; truss braced from the first line post to the bottom of the terminal post with 3/8-inch minimum diameter rods and turnbuckles. Corner posts shall be similarly braced in each direction.

- Gates: Gates shall be of the swing type and shall open in the direction as indicated on the drawings. Frames shall be of 1-5/8-inch O.D. standard pipe with internal bracing of 1-5/8-inch O.D. standard pipe or rods and turnbuckles. Drive gates shall be 12 feet wide and personnel gates shall be 3 feet wide unless otherwise specified on the site plans.

- Gate Fillers: Frames shall be filled with the same type of fabric as used in the line of the fence.

- Hinges: Hinges shall be of the offset type to allow gates to swing back parallel with the line of fence and shall be made of malleable iron and forgings.

- Latch: A suitable latch shall be provided in order to readily lock gates with a padlock. In-ground cups for gate drop rods shall be imbedded in concrete for stability.

7.4.2 Barbed Wire Fence

Unless otherwise specified, the fence shall consist of 4 strands of barbed wire spaced 12 inches on centers, with the bottom strand approximately 12 inches above ground.

The specifications for the material and installation of the various fence components are as follows:

- Barbed Wire: Barbed wire shall consist of 2 number 12 gauge twisted galvanized or aluminized steel line wires with number 14 gauge aluminum 4-point barbs spaced not more than 4 feet apart. Wire shall be securely fastened to all posts.

- Line Posts: Line posts shall be high carbon galvanized rail steel studded tee posts, T-section 1-3/8 x 1-3/8 inches or Silver Tip Tee Posts, or considered equivalent. Posts shall be spaced approximately 10 feet apart and driven into the ground at least 2 feet.

- End, Corner and Swing Gate Posts: Post shall be extra heavy duty set in concrete to a depth of at least 2 feet 6 inches and shall be truss braced at the top with the compression members set in concrete footings.

- Gates: Gates should be either a Western Gate or Farm Gate and should be 12 feet wide. Barbed wire strands should be spaced the same as along the fence line. Farm gates may be purchased locally or constructed of galvanized iron pipes or angles. Farm gates shall be provided with suitable hinged and locking hardware, and shall swing in the direction indicated on the site plan.

7.4.3. Stock or Field Fence

The stock or field fence shall be as manufactured by a reputable firm and as approved by the authorized M/A-COM representative.

Unless otherwise specified, the fence shall be 8 feet in height, including two strands of barbed wire placed 6 inches and 12 inches above the wire fabric.

The specification for the material and installation of the various fence components are as follows:

- Fabric: Wire fabric shall be of heavy duty (10 to 12-1/2 gauge) low carbon, galvanized steel wire knotted together to form approximately 3 x 4-inch rectangles.

- Line Posts: Line posts shall be high carbon galvanized rail steel studded tee posts, T-section 1-3/8 x 1-3/8 inches or Silver Tip Tee Posts as manufactured by the Colorado Fuel and Iron Company or approved equivalent. Posts shall be spaced approximately 10 feet apart and driven into the ground at least 2 feet

- Fabric Ties: The fabric shall be slot fastened to line posts or tied with approved metal tie fastenings. Ties shall not exceed 9 feet O.C.

- End, Corner, and Swing Gate Posts: Post shall be extra heavy duty set in concrete to a depth of at least 2 feet 6 inches and shall be trussed braced at

the top with the compression members set in concrete footings.

- Gates: Gate frames may be purchased locally or constructed of galvanized iron pipe or angles and should be 12 feet wide. Wire fabric and barbed wire shall be rigidly attached to the gate frame. Gates shall be provided with suitable hinged and locking hardware and shall swing in the direction as indicated on the site plan.

- Barbed Wire: Barbed wire shall consist of 2 number 12 gauge twisted galvanized or aluminized steel line wires with number 14 gauge aluminum 4-point barbs spaced not more than 4 inches apart. Wire shall be securely fastened to all posts.

8. SITE GROUNDING

8.1. SPECIFICATIONS

The contractor shall install the site grounding per M/A-COM's specifications. Refer to the M/A-COM "Standard For Site Grounding And Protection," LBI-39067. Other grounding requirements may be furnished as drawings to be attached site-specific as a part of these specifications.

8.2. GENERAL

The practice above provides the detailed methods, specifications, and requirements for a complete grounding system for a mobile communications site.

The practice, where applicable, conforms to the National Electric Code (NEC) requirements. This practice does not cover every requirement, however. Compliance with the NEC requirements and any requirements from authorities having jurisdiction must be observed; the governing authority or code must prevail. The M/A-COM representative shall be notified of such conflict and present this information to the engineering staff for further evaluation.

8.3. MATERIAL

Basic materials for ring grounding shall consist of 8-foot long by 5/8-inch copper-clad steel ground rods, number 2 bare, tinned, solid, copper wire, exothermic weld molds, and shot.

8.4. EXOTHERMIC WELDS

All ground connections shall be made with exothermic welds except where noted in this specification.

Exothermic welds shall be made using cadweld (Erico Products Inc., Cleveland, Ohio) molds and shot or Termoweld (A Division of Continental Industries, Tulsa, Oklahoma) molds and shot. The contractor shall follow the manufacture's instructions when using these molds.

8.5. SITE GROUND REFERENCE

The M/A-COM communications building, shelter, or room is equipped with a Metal Ground Bar (normally copper, MGB). The MGB establishes a common ground reference point for the entire communications site. To accomplish this, the MGB is bonded to the interior halo ring ground, the waveguide cable ground bars, and the building exterior ring ground, as described in "M/A-COM Standards for Grounding," LBI-39067. The communications building, in addition to the MGB, is bonded from the halo ring ground to the exterior ring ground with pigtails of #2, solid, tinned copper as spelled out in M/A-COM LBI-39067.

The tower also has a ring ground around it. The tower ring ground and the shelter ring ground are bounded together (see "M/A-COM Standards for Site Grounding," LBI-39067).

9. INSURANCE

9.1. CONTRACTOR RESPONSIBILITY BEFORE WORK COMMENCES

Prior to commencement of any work, but not later than 10 days before the execution of the contract, the contractor shall procure insurance coverage from an insurance carrier satisfactory to M/A-COM and for performance of the contract. The insurance coverage shall meet the specifications below and shall not be less than the limits specified in the following paragraphs.

9.2. STATUTORY WORKER'S COMPENSATION INSURANCE

Statutory Worker's Compensation Insurance and Occupational Disease insurance shall be obtained in each of the jurisdictions in which work is to be performed for M/A-COM, with such statutory limits as may be applicable. Such insurance shall cover all persons engaged in any work to be performed for M/A-COM, including all employees of any

subcontractor engaged in work to be performed for the contractor within the scope of this Standard Statement of work.

9.3. EMPLOYER'S LIABILITY INSURANCE

Employer's Liability Insurance shall be obtained in each of the jurisdictions in which work is to be performed for M/A-COM, with such statutory limits as may be applicable. Such insurance shall cover all persons engaged in any work to be performed for M/A-COM including all employees of any subcontractor engaged in work to be performed for the contractor within the scope of this Standard Statement of work.

9.4. COMPREHENSIVE GENERAL LIABILITY INSURANCE

Comprehensive General Liability Insurance shall be obtained for bodily injury and property damage from hazards including but not limited to the premises, operations, jurisdiction, completed operations, blanket contractual liability, and contractors protective liability. Such insurance shall be on an "occurrence" basis and must include Broad Form Property Damage; coverage for explosion, collapse, and underground hazards, and personal injury. The policy must provide for a minimum coverage of $1,000,000 (one million dollars) combined single limit or

- Comprehensive General Liability Insurance; "Bodily Injury" of not less than $1,000,000 per person and not less than $2,000,000 aggregate.
- Comprehensive General Liability Insurance; "Property Damage" of not less than $1,000,000 per occurrence and not less than $1,000,000 aggregate.

9.5. AUTOMOBILE LIABILITY INSURANCE

Automobile Liability Insurance shall be obtained insuring all owned, non-owned, and hired automotive equipment in minimum amounts of $500,000 combined single limit or

- Bodily Injury; not less than $500,000 per person and not less than $500,000 per occurrence.
- Property Damage; not less than $500,000 per occurrence.

9.6. UMBRELLA FROM EXCESS LIABILITY INSURANCE

Umbrella from excess liability Insurance shall have a minimum limit of at least $5,000,000 for each occurrence for bodily injury and property damage. Such insurance will protect the contractor and M/A-COM from damage caused by, but not limited to, any of the following perils, and/or a combination thereof:

1. Fire and lightning
2. Windstorm and hail
3. Explosion
4. Riot or Civil Commotion
5. Aircraft and Vehicles
6. Smoke
7. Vandalism and Malicious Mischief
8. Fire Protection System Leakage
9. Molten Material
10. Sonic Boom and Vibrations

9.7. GENERAL LIABILITY AND AUTOMOBILE PROVISIONS AND WAIVERS

The General Liability and Automobile Liability policies referenced in this document shall include M/A-COM Critical Radio Systems Inc. as an additional insured and shall be endorsed to provide primary insurance coverage to M/A-COM with respect to incidents arising from the execution of this contract.

In addition, all policies shall be endorsed to provide a waiver of subrogation in favor of M/A-COM.

The carrying of insurance as specified in this document shall not limit the contractor's liability under this standards and statement of work agreement.

The contractor shall furnish M/A-COM Critical Radio Systems Inc. with Certificates of Insurance evidencing that it has obtained the insurance described in this document, and that the insurance described herein is, in fact, in effect.

9.8. CONTRACTOR'S NOTICE TO M/A-COM OF INTENDED CHANGES,

RENEWALS, AND INSURANCE MODIFICATIONS

The contractor's insurance shall include the contractually assumed liability of the contractor under this agreement and shall provide for receipt of 30 days prior written notice to be given to M/A-COM of any intended cancellation, refusal to renew, or modification/changes in the provisions of such payment.

10. DRAWINGS

To be attached as they become available.

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