SPECIFICATIONS
FOR
DEMOLISH AND CONSTRUCT STEEL RADIO TOWER, MOUNTAIN GROVE MISSOURI

GENERAL:

1. Complete installation of one (1) 110' freestanding tower with foundation, antennas, mounting hardware, waveguide ladder, safety climb device, and ice bridge in accordance with the TIA/EIA-222-G, the national standard'.

2. Demolish and dispose of existing 110' guyed tower that is on site.
   Remove existing concrete and guy anchors, 1' below grade and all other debris.
   Preferred disposal: Recycling this scrap material rather than dumping in a landfill.

3. Furnish and erect one (1) 110'freestanding tower with waveguide ladder, safety climb device, ice-bridge and antennas/standoffs and coax as listed below.

4. The footprint of the tower must fit the proposed site.

5. Ice-bridge to building shall be constructed

6. The galvanized steel constructed tower does not require primer and/or paint.

7. The National Electrical Code NEC standards and requirements shall be complied with in all instances. The Contractor shall complete the wiring and make proper connections at the electrical control panel in the building. The Contractor shall cooperate with the generator contractor in making these connections.

8. Antenna Tower Grounding Requirements. All connections shall be exothermically (cadwelded) connected. Tower and ice shield bridge grounding must meet all Motorola R-56 Standards.

9. The contractor supplied equipment shall be new and the manufacturer's latest current model. The supplier of theses towers and equipment shall furnish evidence that he has been regularly engaged in the manufacturing of this equipment. All equipment, material, labor, and installation shall comply with or exceed F.A.A. and F.C.C. requirements.

10. Supply and install: Two (2) each Andrews Solutions DB224 with Andrew Solutions recommended standoffs along with Andrews 7/8" hard-line (LDF5-50A) coax and the appropriate ends. There shall be no substitute for the Andrew Solutions brand antennas, standoffs, coax or ends. The first DB 224 shall be side mounted at the top of the tower with the DB224 antenna tip height not to exceed 120 feet. The second DB 224 shall be side mounted at 80 feet with the antenna height not to exceed 100 feet. See Section on Loading.

TOWER LOCATION: MoDOT, District 8, 1.5 Miles South of Junction Route 95 and AM, Wright County Mo. 37-05-55 W. 092-16-12 N.

TYPES OF TOWER: The tower shall be triangular in cross section. The tower shall also be of a rigid frame construction, consisting of solid or tubular vertical members.

Vertical members shall be braced with suitable horizontal and diagonal members of solid, tubular or angular cross section. Towers may be fabricated in sections of 10' or 20' (+/-) lengths.

PLANS, DRAWING, AND, STRESS CALCULATIONS: The contractor shall furnish complete drawings as called for in these specifications as follows:

1. Plans: The Contractor shall submit for approval, complete plans drawn to a legible scale from which he must install the tower foundations. The State shall furnish a plot plan for each and every location. The Contractor shall furnish large-scale details of each foundation which shall show dimensions, reinforcing, anchor bolts, etc.

General drawings showing the type of construction and the size and weight of members for various heights of towers shall be submitted with the contractor's bids.

2. Shop Drawings: Shop drawing shall be submitted which must show overall dimensions, sections, size and relative location of each member, side and top mount antenna supports, ladder details, coaxial cable strap details, location of aircraft warning lights, power wiring, conduit, and details of connections to towers, obstruction marking painting, detail of base plates and connection between tower sections, and any and all other necessary details as required.

3. Tower Analysis: Plans shall be supplemental with a stress analysis of the tower for design winds as specified later herein, showing design loads, shears, moments and axial forces resisted by all members and their connections. This analysis must be sealed by a Professional Engineer (PE)

LOADING:

1. Towers, antennas, antenna and coax mounting hardware shall be designed to withstand an indicated wind loading of 120 MPH with no ice and 95 MPH with ½ radial ice loads. In addition to the contractor supplied antennas, the contractor shall design the tower to accommodate the future needs of one 3 foot flat panel antenna with 7/8" coax at 80 feet and an additional DB 224 with 7/8" coax at 80 feet. These additional antennas and coax are not to be installed at this time, but the tower has to be designed and built with these future needs in mind.

2. The total load specified above shall be applied to the structure in the directions which will cause the maximum stress in the various members.

ALLOWABLE UNIT STRESSES:

1. Structural Steel: All parts of the tower structure made of structural steel shall be designed in accordance which "Section C, Unit Stresses", E.I.A. Standard Code for Radio Transmitting antennas and Supporting Towers for Radio Transmitting antennas, RS-222, and the A.I.S.C. Specifications for design of structural steel.

2. Foundation: The tower foundation shall be designed for the actual tower loading specified in this document and actual soil conditions. In no case shall tower foundations be less than 2' 0" x 2' 0" x 5' 0" in size with nominal 1' 0" above the ground line.

3. Other Materials: Allowable unit stresses for structural materials other than structural steel shall be subject to approval by the Engineer. For a particular material, the ultimate strength, yield strength, modulus of elasticity and proposed working stress shall be tabulated and submitted to the Engineer for approval.

MATERIALS:

1. Structural Steel: Structural steel shall conform to ASTM Standard Specifications for "Steel for Bridges and Buildings".

2. Concrete: All concrete shall have a minimum compressive strength at twenty-eight (28) days of 4000 pounds per square inch. All material shall conform to state requirements, as set forth in the latest revision of the Missouri Standard Specifications for Highway Construction.

3. Reinforcing Steel: All reinforcing steel shall conform to TIA/EIA-222 standards for steel antenna towers and antenna supporting structures for all classes of communications service.

4. Bolts: Tower bolts, nuts, and anchor bolts shall conform to the ASTM Tentative Specification for "Galvanized Steel Transmission Tower Bolts".

5. Welding: All welding shall conform to the requirements of the specifications of the American Welding Society.

6. Tower Accessories: All required accessories including but not limited to antenna brackets, antenna standoff stupors, coax and cable supports, anti-climb panels, etc. shall be designed for the towers structure provided and as specified by the tower structure manufacturer.

FINISH:

1. Shop Finish: Towers, Bolts, anchor rods, and other attachments and brackets made of iron or steel shall be furnished with a protective finish of zinc as specified below Galvanizing of structural steel shall be done after fabrication in accordance with the provisions of A.S.T.M. Serial Designation A123, "Zinc (Hot Galvanized). Coating on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bar and Strips", an amended to date.

   Galvanizing of steel hardware, other than tower bolts, shall conform to A.S.T.M. Serial Designation A153 as amended to date. Where applicable, the provisions of A.S.T.M. Serial Designation A385 and A386, as amended to date, shall be followed.

FABRICATION:

1. Workmanship: All workmanship shall be equal to the best practice in modern structural shops.

2. Straightening: All materials shall be straight and clean. If straightening or flattening is necessary, it shall be done by a process and in a manner that will not injure the material. Sharp kinks or bends shall be cause for rejection.

3. Welding: Parts to be fillet welded shall be brought in as close contact as practical. Welds of joints at contract surfaces shall be complete or 100% welds to avoid pockets which galvanizing material must not fill. The technique of welding employed, the appearance and quality of welds made, and the methods used in correcting defective work shall conform to the "Code of Arc and Gas Welding in Building Construction" of the American Welding Society, Section 4, Workmanship.

FOUNDATIONS:

1. Standard Foundations: Shall be designed for a soil bearing pressure of 4000 pounds per square inch under the specified loading. In uplift, the tower foundations shall be designed to resist 100% more than the specified uplift loading. A soil analysis of the tower site is included in the attachments.

2. In no case shall the tower foundations be less than 2' –0" x 2' –0" x 5' –0" in size, with approximately 1' –0" above the ground line.

3. Excavation, Grading, Etc: The work covered by this section includes the furnishing of forms, all material, labor and equipment and the performing of all operations in connection with the installation of tower base foundations. All trees, vegetation, roots brush, grass sod, decayed matter, rubbish, etc. shall be removed from the area and disposed of by the Tower Contractor All excavation waste shall be disposed of by the Tower Contractor per page 1 paragraph 2. The Contractor shall submit the drawings and the design calculations for the tower foundations to MoDOT.

ANTENNAS: The contractor shall furnish all antennas, side arms brackets, coaxial transmission lines, clamps, fittings, and all other necessary accessories. It shall be the responsibility of the radio equipment contractor to assemble the above and to also furnish a detailed equipment list for each location and instructions for proper installation by the tower contractor. However, it shall be the duty and responsibility of the tower contractor to properly install all antennas, coaxial cable and etc. as called for in these specifications and as shown on the plans. All transmission lines connectors shall be completely covered with a heavy coat of liquid neoprene upon installation. It shall also be the responsibility of the tower contractor to assist the radio contractor in testing the transmission lines and antennas. Any shorts and etc. discovered in the transmission lines, antennas or accessories shall be corrected by the tower company, in conjunction with the radio technician.

Supply and install antennas. All transmission feed lines shall be Andrew Heliax® 7/8" rigid coax which must be connected with Andrew® end connectors (Part # LDF5-50) designed for LDF series cable. There shall be no substitute for the Andrew® brand feed line and connectors.

It shall be the responsibility of the tower contractor to route the transmission line through the proper conduit from the tower to inside the building, leaving a sufficient extra length coiled in a neat package to make the necessary connections to the transmitter. The tower contractor is not required to make the final connections to the transmitter; this shall be the responsibility of the radio contractor.

PROTECTIVE GROUNDING: All towers shall be effectively grounded. Exact arrangement shall be as conditions require in accordance with Motorola R56 ground ring around the tower and dictates how the site grounding is to be installed.

Since connection of copper to steel will produce a cathodic reaction in the presence of moisture, such connections shall be painted using an electrically conducting, corrosion-resistant paint such as “Galvanox”, manufactured by Subox, Inc. or approved equal. Any and all equipment mounted on a tower mast shall be so fastened that it is be effectively grounded. On structures provided with obstruction lights, the power service to the obstruction lights shall be protected with lighting arrestors. Where power to tower lights is run underground, lighting protection shall be provided where electric service enters building. The grounding shall be installed in a fashion that meets the requirements of the Motorola R56 grounding ring. All the fencing, tower and the concrete reinforcing bars shall be exothermically welded to the ring. The contractor shall provide a grounding lug into the building to be used for equipment grounding. The grounding lug shall be exothermically welded to the grounding ring. The exact positioning of the grounding lug will be determined during construction.

CONDUIT: Rigid metallic conduit shall be furnished and installed as shown on the plans for the tower base and in accordance with the rules of the National Electrical Code. The tower contractor is to make final connections of conduit between the tower base and house foundation. Conduit shall be of the size as shown on the plans.

FENCING: The contractor shall furnish and erect galvanized steel fencing: Minimum 6’ chain link with a minimum of 2-strands of barbed wire topping; Fenced area shall allow for an 8’ clearance from the base of the tower; 12’ gate entrance with two 6’ gate sections; and fenced area must have weed barrier and 4 inches of crushed limestone. MoDOT Fence Specification Section 02830 shall be used to evaluate and accept or reject proposals.

EXTRA WORK: Claims for extra work not authorized in writing by the Department of Transportation or its representatives, prior to the performance of work, shall be rejected.

TEMPORARY LIGHTING: The contractor shall provide at his own expense all current for temporary lighting that may be required during the construction and completion of the work.

CLEANING: Contractors shall not allow waste material or rubbish, caused by their employees, to accumulate in or about the premises, but shall promptly remove same. At the completion of the work, they shall remove any rubbish and all tools, and surplus materials provided for operations from and about the premises and shall leave all work clean and ready for use.

LAYING OUT OF THE WORK: The contractor shall carefully lay out his own work on the premises except as otherwise provided and make proper provision for the work of other contractors. The contractor who will be responsible for its correctness shall lay out all work of every description. Before ordering any material or doing any work, each contractor shall verify all measurements.

SHED AND STORAGE: The contractor shall provide maintain and remove at completion of work, suitable, substantial, water-tight storage sheds upon the premises where directed, in which he shall store all material which would be damaged by water or weather. Contractors shall confine the storage materials and equipment and the operation of their workmen to the limits provided by law, ordinance, permits or as directed by MoDOT.

COORDINATION OF WORK: Proper coordination between contractor installing the radio towers and other contractors shall be maintain so that and overall proper functioning layout shall be accomplished. In case the work

required interferes with other contractors, the tower contractor may make a request 72 hours in advance to MoDOT so that proper coordination accomplished.

ACCEPTANCE: During installation and at the time all components of this tower is installed by the contractor, it shall be subject to inspection by MoDOT. Before acceptance of the installation, site cleanup shall be affected by removal of excess or scrap material, packing, crating or other refuse. Excavation waste from tower foundation shall be disposed of as directed by MoDOT.

WARRANTY: All towers in their entirety shall be guaranteed for a period of one (1) year against defective materials, design, and workmanship, and if a failure of any portion of any part occurs during the first year due to above causes, the defective portions or parts plus any damage caused by the failure of such defective part shall be replaced promptly upon notice by the Department, by and at the expense of the Contractor.

MoDOT shall be responsible for providing a soil analysis of the tower site.

The new tower that was erected at the District 3 Office, Highway 61, Hannibal, Mo. should be used as an example of the MoDOT requirement described herein.