

**Updated 10/18/07**

# **STATE PROJECT**

## **BIDDING INSTRUCTIONS**

### **FOR ALL PROJECTS:**

1. Use pen and ink to complete all paper Bids.
2. As a minimum, the following must be received prior to the time of Bid opening:

#### **For a Paper Bid:**

a) a copy of the Notice to Contractors, b) the completed Acknowledgement of Bid Amendments form, c) the completed Schedule of Items, d) two copies of the completed and signed Contract Offer, Agreement & Award form, e) a Bid Guaranty, and f) any other certifications or Bid requirements listed in the Bid Documents as due by Bid opening.

#### **For an Electronic Bid:**

a) a completed Bid using Expedite® software and submitted via the Bid Express™ web-based service, b) a Bid Guaranty (as described below) or a faxed copy of a Bid Bond (with original to be delivered within 72 hours), and c) any other certifications or Bid requirements listed in the Bid Documents as due by Bid opening.

3. Include prices for all required items in the Schedule of Items. (“Zero is not considered a Bid price.”)
4. Include a Bid Guaranty. Acceptable forms are:
  - a. a properly completed and signed Bid Bond on the Department’s prescribed form (or on a form that does not contain any significant variations from the Department’s form as determined by the Department) for 5% of the Bid Amount or
  - b. an Official Bank Check, Cashier’s Check, Certified Check, U.S. Postal Money Order or Negotiable Certificate of Deposit in the amount stated in the Notice to Contractors.
5. If a paper Bid is to be sent, Federal Express overnight delivery is suggested as the package is delivered directly to the DOT Headquarters Building located at 16 Child Street in Augusta. Other means, such as U.S. Postal Service’s Express Mail has proven not to be reliable.

### **IN ADDITION, FOR FEDERAL AID PROJECTS:**

6. Complete the DBE Proposed Utilization form in the proper amounts, and deliver to the Civil Rights Office, or fax to (207)624-3431 by 4:30 PM on bid opening day.

If you need further information regarding Bid preparation, call the DOT Contracts Section at (207)624-3410.

For complete bidding requirements, refer to Section 102 of the Maine Department of Transportation, Standard Specifications, Revision of December 2002.

# NOTICE

The Maine Department of Transportation is attempting to improve the way Bid Amendments/Addendums are handled, and allow for an electronic downloading of bid packages from our website, while continuing to maintain a planholders list.

Prospective bidders, subcontractors or suppliers who wish to download a copy of the bid package and receive a courtesy notification of project specific bid amendments, must provide an email address to Diane Barnes or Mike Babb at the MDOT Contracts mailbox at: [MDOT.contracts@maine.gov](mailto:MDOT.contracts@maine.gov). Each bid package will require a separate request.

Additionally, interested parties will be responsible for reviewing and retrieving the Bid Amendments from our web site, and acknowledging receipt and incorporating those Bid Amendments in their bids using the Acknowledgement of Bid Amendment Form.

The downloading of bid packages from the MDOT website is not the same as providing an electronic bid to the Department. Electronic bids must be submitted via <http://www.BIDX.com>. For information on electronic bidding contact Larry Childs at [Larry.Childs@maine.gov](mailto:Larry.Childs@maine.gov).

# NOTICE

For security and other reasons, all Bid Packages which are mailed, shall be provided in double (one envelope inside the other) envelopes. The *Inner Envelope* shall have the following information provided on it:

Bid Enclosed - Do Not Open

PIN:

Town:

Date of Bid Opening:

Name of Contractor with mailing address and telephone number:

In Addition to the usual address information, the *Outer Envelope* should have written or typed on it:

Double Envelope: Bid Enclosed

PIN:

Town:

Date of Bid Opening:

Name of Contractor:

*This should not be much of a change for those of you who use Federal Express or similar services.*

Hand-carried Bids may be in one envelope as before, and should be marked with the following information:

Bid Enclosed: Do Not Open

PIN:

Town:

Name of Contractor:

**STATE OF MAINE DEPARTMENT OF TRANSPORTATION**  
Bid Guaranty-Bid Bond Form

**KNOW ALL MEN BY THESE PRESENTS THAT** \_\_\_\_\_

\_\_\_\_\_, of the City/Town of \_\_\_\_\_ and State of \_\_\_\_\_

as Principal, and \_\_\_\_\_ as Surety, a

Corporation duly organized under the laws of the State of \_\_\_\_\_ and having a usual place of

Business in \_\_\_\_\_ and hereby held and firmly bound unto the Treasurer of

the State of Maine in the sum of \_\_\_\_\_ for payment which Principal and Surety bind

themselves, their heirs, executors, administrators, successors and assigns, jointly and severally.

The condition of this obligation is that the Principal has submitted to the Maine Department of

Transportation, hereafter Department, a certain bid, attached hereto and incorporated as a

part herein, to enter into a written contract for the construction of \_\_\_\_\_

\_\_\_\_\_ and if the Department shall accept said bid

and the Principal shall execute and deliver a contract in the form attached hereto (properly

completed in accordance with said bid) and shall furnish bonds for this faithful performance of

said contract, and for the payment of all persons performing labor or furnishing material in

connection therewith, and shall in all other respects perform the agreement created by the

acceptance of said bid, then this obligation shall be null and void; otherwise it shall remain in full

force, and effect.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_\_

WITNESS:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

WITNESS

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

PRINCIPAL:

By \_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

SURETY:

By \_\_\_\_\_

By: \_\_\_\_\_

Name of Local Agency: \_\_\_\_\_

# NOTICE

## Bidders:

Please use the attached “Request for Information” form when faxing questions and comments concerning specific Contracts that have been Advertised for Bid. Include additional numbered pages as required. Questions are to be faxed to the number listed in the Notice to Contractors. This is the only allowable mechanism for answering Project specific questions. Maine DOT will not be bound to any answers to Project specific questions received during the Bidding phase through other processes.



September 14, 2007

### **Vendor Registration**

Prospective Bidders must register as a vendor with the Department of Administrative & Financial Services if the vendor is awarded a contract. Vendors will not be able to receive payment without first being registered. Vendors/Contractors will find information and register through the following link –

<http://www.maine.gov/purchases/vendorinfo/vss.htm> .

**STATE OF MAINE DEPARTMENT OF TRANSPORTATION  
NOTICE TO CONTRACTORS**

Sealed Bids addressed to the Maine Department of Transportation, Augusta, Maine 04333 and endorsed on the wrapper "Bids for a **Radio Communications Tower** project in the town of **Cooper**" will be received from contractors at the Reception Desk, Maine DOT Building, Child Street, Augusta, Maine, until 11:00 o'clock A.M. (prevailing time) on **November 28, 2007**, and at that time and place publicly opened and read. Bids will be accepted from contractors prequalified by the Department of Transportation for similar projects. All other Bids may be rejected. **MDOT provides the option of electronic bidding. We now accept electronic bids for those bid packages posted on the bidx.com website. Electronic bids do not have to be accompanied by paper bids. Please note: the Department will accept a facsimile of the bid bond; however, the original bid bond must then be received at the MDOT Contract Section within 72 hours of the bid opening. During this transition, dual bids (one paper, one electronic) will be accepted, with the paper copy taking precedence.**

Description: Maine State Project No. 014274.00.

Location: In Washington County, project is located on Cooper Hill in Cooper, Maine.

Outline of Work: Construction, installation, testing and commissioning of a radio tower. Furnishing a modular prefabricated, pre-outfitted telecommunications type shelter, installation of radio equipment, refurbishing an existing generator building, and installation of a generator system and perimeter fence, and other incidental work.

**Contractor's bid package must include a list of 3 examples of successful completion of similar turn-key projects. This list shall include names, addresses and phone numbers of the owner for who the work was performed for.**

For general information regarding Bidding and Contracting procedures, contact Scott Bickford at (207)624-3410. Our webpage at [http://www.maine.gov/mdot/contractor-consultant-information/contractor\\_cons.php](http://www.maine.gov/mdot/contractor-consultant-information/contractor_cons.php) contains a copy of the schedule of items, Plan Holders List, written portions of bid amendments (not drawings), and bid results. **For Project-specific information fax all questions to Project Manager, Joel Kittredge at (207)624-3431.** Questions received after 12:00 noon of Monday prior to bid date will not be answered. Bidders shall not contact any other Departmental staff for clarification of Contract provisions, and the Department will not be responsible for any interpretations so obtained. Hearing impaired persons may call the Telecommunication Device for the Deaf at 888-516-9364.

Plans, specifications and bid forms may be seen at the Maine DOT Building in Augusta, Maine. They may be purchased from the Department between the hours of 8:00 a.m. to 4:30 p.m. by cash, credit card (Visa/Mastercard) or check payable to Treasurer, State of Maine sent to Maine Department of Transportation, Attn.: Mailroom, 16 State House Station, Augusta, Maine 04333-0016. They also may be purchased by telephone at (207)624-3536 between the hours of 8:00 a.m. to 4:30 p.m. Bid Book \$10 (\$13 by mail), Single Sheets \$2, payment in advance, all non-refundable.

Each Bid must be made upon blank forms provided by the Department and must be accompanied by a bid bond at 5% of the bid amount or an official bank check, cashier's check, certified check, certificate of deposit, or United States postal money order in the amount of \$12,000 payable to Treasurer, State of Maine as a Bid guarantee. A Contract Performance Surety Bond and a Contract Payment Surety Bond, each in the amount of 50 percent of the Contract price, will be required of the successful Bidder.

All work shall be governed by "State of Maine, Department of Transportation, Standard Specifications, Revision of December 2002", price \$10 [\$13 by mail], and Standard Details, Revision of December 2002, price \$20 [\$25 by mail]

Standard Detail up dates can be found at:

[http://www.maine.gov/mdot/contractor-consultant-information/contractor\\_cons.php](http://www.maine.gov/mdot/contractor-consultant-information/contractor_cons.php)

The right is hereby reserved to the MDOT to reject any or all Bids.

Augusta, Maine  
November 14, 2007



JOHN E. DORITY  
CHIEF ENGINEER

**SPECIAL PROVISION 102.7.3  
ACKNOWLEDGMENT OF BID AMENDMENTS**

With this form, the Bidder acknowledges its responsibility to check for all Amendments to the Bid Package. For each Project under Advertisement, Amendments are located at <http://www.maine.gov/mdot/comprehensive-list-projects/project-information.php> It is the responsibility of the Bidder to determine if there are Amendments to the Project, to download them, to incorporate them into their Bid Package, and to reference the Amendment number and the date on the form below. The Maine DOT will not post Bid Amendments any later than noon the day before Bid opening without individually notifying all the planholders.

Amendment Number	Date

The Contractor, for itself, its successors and assigns, hereby acknowledges that it has received all of the above referenced Amendments to the Bid Package.

**CONTRACTOR**

\_\_\_\_\_ Date

\_\_\_\_\_ Signature of authorized representative

\_\_\_\_\_ (Name and Title Printed)

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 014274.00

PROJECT(S): 14274.00

CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
SECTION 0001 PROJECT ITEMS						
0010	642.91 PERIMETER FENCE & GRAVEL LAYER ACCEPTED	LUMP	LUMP			
0020	643.97 RADIO COMMUNICATIONS TOWER - SELF-SUPPORTING	LUMP	LUMP			
0030	643.971 RADIO COMMUNICATIONS TOWER - FIELD INSPECTION & ACCEPTANCE	LUMP	LUMP			
0040	643.972 RADIO COMMUNICATIONS TOWER - INSPECTION & FINAL ACCEPTANCE	LUMP	LUMP			
0050	643.973 RADIO COMMUNICATIONS TOWER-INSPECTION & ACCEPTANCE TRAINING	LUMP	LUMP			
0060	643.974 STATE OWNED ANTENNAS - INSTALLED	LUMP	LUMP			
0070	643.98 EMERGENCY POWER GENERATOR SYSTEM	LUMP	LUMP			
0080	643.981 EMERGENCY POWER GENERATOR -FIELD INSPECTION & ACCEPTANCE	LUMP	LUMP			
0090	643.982 EMERGENCY POWER GENERATOR - INSPECTION & ACCEPTANCE TESTING	LUMP	LUMP			

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 014274.00

PROJECT(S): 14274.00

CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0100	643.983 EMERGENCY POWER GENERATOR - INSPECTION & FINAL ACCEPTANCE	LUMP	LUMP			
0110	643.99 COMMUNICATIONS EQUIPMENT SHELTER: MODULAR, PREFABRICATED, PRE-OUTFITTED	LUMP	LUMP			
0120	643.991 COMMUNICATIONS EQUIPMENT SHELTER - FIELD INSPECTION & ACCEPTANCE	LUMP	LUMP			
0130	643.992 COMMUNICATIONS EQUIPMENT SHELTER - INSPECTION & FINAL ACCEPTANCE	LUMP	LUMP			
0140	643.993 COMMUNICATIONS EQUIPMENT SHELTER - INSPECTION & ACCEPTANCE TRAINING	LUMP	LUMP			
0150	644.91 RADIO COMMUNICATION SITE, EARTH, GROUND & LIGHTNING PROTECTION SYSTEM, INSTALLED	LUMP	LUMP			
0160	644.92 RADIO COMMUNICATION SITE, EARTH, GROUND & LIGHTNING PROTECTION SYSTEM, FIELD INSPECTED	LUMP	LUMP			
0170	644.93 RADIO COMM. SITE, EARTH, GROUND & LIGHTNING PROTECTION SYSTEM, FINAL ACCEPTANCE	LUMP	LUMP			

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 014274.00

PROJECT(S): 14274.00

CONTRACTOR : \_\_\_\_\_

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0180	645.91 COMMUNICATIONS EQUIPMENT SHELTER, REFURBISHED	LUMP	LUMP			
0190	645.92 COMMUNICATIONS EQUIPMENT SHELTER, REFURBISHED - INSPECTION & ACCEPTANCE, FIELD TESTING	LUMP	LUMP			
0200	645.93 COMMUNICATIONS EQUIPMENT SHELTER, INSPECTION & ACCEPTANCE, FINAL ACCEPTANCE	LUMP	LUMP			
0210	645.94 COMMUNICATIONS EQUIPMENT SHELTER, REFURBISHED - INSPECTION & ACCEPTANCE, TRAINING	LUMP	LUMP			
0220	656.75 TEMP SOIL EROS AND WATER POLL CONTROL	LUMP	LUMP			
0230	659.10 MOBILIZATION	LUMP	LUMP			
	SECTION 0001 TOTAL					
	TOTAL BID					

## CONTRACT AGREEMENT, OFFER & AWARD

AGREEMENT made on the date last signed below, by and between the State of Maine, acting through and by its Department of Transportation (Department), an agency of state government with its principal administrative offices located at Child Street, Augusta, Maine, with a mailing address at 16 State House Station, Augusta, Maine 04333-0016, and

\_\_\_\_\_ a corporation or other legal entity organized under the laws of the State of \_\_\_\_\_, with its principal place of business located at \_\_\_\_\_

The Department and the Contractor, in consideration of the mutual promises set forth in this Agreement (the "Contract"), hereby agree as follows:

### **A. The Work.**

The Contractor agrees to complete all Work as specified or indicated in the Contract including Extra Work in conformity with the Contract, PIN No. **014274.00** for a **Radio Communications Tower** in the town of **Cooper**, County of Washington, Maine. The Work includes construction, maintenance during construction, warranty as provided in the Contract, and other incidental work.

The Contractor shall be responsible for furnishing all supervision, labor, equipment, tools supplies, permanent materials and temporary materials required to perform the Work including construction quality control including inspection, testing and documentation, all required documentation at the conclusion of the project, warranting its work and performing all other work indicated in the Contract.

The Department shall have the right to alter the nature and extent of the Work as provided in the Contract; payment to be made as provided in the same.

### **B. Time.**

The Contractor agrees to complete all Work, except warranty work, on or before **February 15, 2008**. Further, the Department may deduct from moneys otherwise due the Contractor, not as a penalty, but as Liquidated Damages in accordance with Sections 107.7 and 107.8 of the State of Maine Department of Transportation Standard Specifications, Revision of December 2002 and related Special Provisions.

**C. Price.**

The quantities given in the Schedule of Items of the Bid Package will be used as the basis for determining the original Contract amount and for determining the amounts of the required Performance Surety Bond and Payment Surety Bond, and that the amount of this offer is \_\_\_\_\_

\$ \_\_\_\_\_ Performance Bond and Payment Bond each being 50% of the amount of this Contract.

**D. Contract.**

This Contract, which may be amended, modified, or supplemented in writing only, consists of the Contract documents as defined in the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds. It is agreed and understood that this Contract will be governed by the documents listed above.

**E. Certifications.**

By signing below, the Contractor hereby certifies that to the best of the Contractor's knowledge and belief:

1. All of the statements, representations, covenants, and/or certifications required or set forth in the Bid and the Bid Documents and the Contract are still complete and accurate as of the date of this Agreement.
2. The Contractor knows of no legal, contractual, or financial impediment that prevents Contractor from entering into this Contract.
3. The person signing below is legally authorized by the Contractor to sign this Contract on behalf of the Contractor and to legally bind the Contractor to the terms of the Contract.

**F. Offer.**

The undersigned, having carefully examined the site of work, the Plans, Standard Specifications Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of:

**PIN: 014274.00 – Radio Communications Tower, in the town of Cooper, State of Maine**, on which bids will be received until the time specified in the “Notice to Contractors” do(es) hereby bid and offer to enter into this contract to supply all the materials, tools, equipment and labor to construct the whole of the Work in strict accordance with the terms and conditions of this Contract at the unit prices in the attached “Schedule of Items”.

The Offeror agrees to perform the work required at the price specified above and in accordance with the bids provided in the attached “Schedule of Items” in strict accordance with the terms of this solicitation, and to provide the appropriate insurance and bonds if this offer is accepted by the Government in writing.

As Offeror also agrees:

First: To do any extra work, not covered by the attached “Schedule of Items”, which may be ordered by the Resident, and to accept as full compensation the amount determined upon a “Force Account” basis as provided in the Standard Specifications, Revision of December 2002, and as addressed in the contract documents.

Second: That the bid bond at 5% of the bid amount or the official bank check, cashier’s check, certificate of deposit or U. S. Postal Money Order in the amount given in the “Notice to Contractors”, payable to the Treasurer of the State of Maine and accompanying this bid, shall be forfeited, as liquidated damages, if in case this bid is accepted, and the undersigned shall fail to abide by the terms and conditions of the offer and fail to furnish satisfactory insurance and Contract bonds under the conditions stipulated in the Specifications within 15 days of notice of intent to award the contract.

Third: To begin the Work as stated in Section 107.2 of the Standard Specifications Revision of December 2002 and complete the Work within the time limits given in the Special Provisions of this Contract.

Fourth: That this offer shall remain open for 30 calendar days after the date of opening of bids.

Fifth: The Bidder hereby certifies, to the best of its knowledge and belief that: the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with its bid, and its subsequent contract with the Department.

IN WITNESS WHEREOF, the Contractor, for itself, its successors and assigns, hereby execute two duplicate originals of this Agreement and thereby binds itself to all covenants, terms, and obligations contained in the Contract Documents.

CONTRACTOR

\_\_\_\_\_  
Date

\_\_\_\_\_  
(Signature of Legally Authorized Representative  
of the Contractor)

\_\_\_\_\_  
Witness

\_\_\_\_\_  
(Name and Title Printed)

**G. Award.**

Your offer is hereby accepted.  
documents referenced herein.

This award consummates the Contract, and the

Office of Information Technology

\_\_\_\_\_  
Date

\_\_\_\_\_  
By: Richard B. Thompson  
Chief Information Officer

\_\_\_\_\_  
Witness

## **CONTRACT AGREEMENT, OFFER & AWARD**

AGREEMENT made on the date last signed below, by and between the State of Maine, acting through and by its Department of Transportation (Department), an agency of state government with its principal administrative offices located at Child Street, Augusta, Maine, with a mailing address at 16 State House Station, Augusta, Maine 04333-0016, and

\_\_\_\_\_ a corporation or other legal entity organized under the laws of the State of \_\_\_\_\_, with its principal place of business located at \_\_\_\_\_

The Department and the Contractor, in consideration of the mutual promises set forth in this Agreement (the "Contract"), hereby agree as follows:

### **A. The Work.**

The Contractor agrees to complete all Work as specified or indicated in the Contract including Extra Work in conformity with the Contract, PIN No. **014274.00** for a **Radio Communications Tower** in the town of **Cooper**, County of Washington, Maine. The Work includes construction, maintenance during construction, warranty as provided in the Contract, and other incidental work.

The Contractor shall be responsible for furnishing all supervision, labor, equipment, tools supplies, permanent materials and temporary materials required to perform the Work including construction quality control including inspection, testing and documentation, all required documentation at the conclusion of the project, warranting its work and performing all other work indicated in the Contract.

The Department shall have the right to alter the nature and extent of the Work as provided in the Contract; payment to be made as provided in the same.

### **B. Time.**

The Contractor agrees to complete all Work, except warranty work, on or before **February 15, 2008**. Further, the Department may deduct from moneys otherwise due the Contractor, not as a penalty, but as Liquidated Damages in accordance with Sections 107.7 and 107.8 of the State of Maine Department of Transportation Standard Specifications, Revision of December 2002 and related Special Provisions.

**C. Price.**

The quantities given in the Schedule of Items of the Bid Package will be used as the basis for determining the original Contract amount and for determining the amounts of the required Performance Surety Bond and Payment Surety Bond, and that the amount of this offer is \_\_\_\_\_

\$ \_\_\_\_\_ Performance Bond and Payment Bond each being 50% of the amount of this Contract.

**D. Contract.**

This Contract, which may be amended, modified, or supplemented in writing only, consists of the Contract documents as defined in the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds. It is agreed and understood that this Contract will be governed by the documents listed above.

**E. Certifications.**

By signing below, the Contractor hereby certifies that to the best of the Contractor's knowledge and belief:

1. All of the statements, representations, covenants, and/or certifications required or set forth in the Bid and the Bid Documents and the Contract are still complete and accurate as of the date of this Agreement.
2. The Contractor knows of no legal, contractual, or financial impediment that prevents Contractor from entering into this Contract.
3. The person signing below is legally authorized by the Contractor to sign this Contract on behalf of the Contractor and to legally bind the Contractor to the terms of the Contract.

**F. Offer.**

The undersigned, having carefully examined the site of work, the Plans, Standard Specifications Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of:

**PIN: 014274.00 – Radio Communications Tower, in the town of Cooper, State of Maine**, on which bids will be received until the time specified in the “Notice to Contractors” do(es) hereby bid and offer to enter into this contract to supply all the materials, tools, equipment and labor to construct the whole of the Work in strict accordance with the terms and conditions of this Contract at the unit prices in the attached “Schedule of Items”.

The Offeror agrees to perform the work required at the price specified above and in accordance with the bids provided in the attached “Schedule of Items” in strict accordance with the terms of this solicitation, and to provide the appropriate insurance and bonds if this offer is accepted by the Government in writing.

As Offeror also agrees:

First: To do any extra work, not covered by the attached “Schedule of Items”, which may be ordered by the Resident, and to accept as full compensation the amount determined upon a “Force Account” basis as provided in the Standard Specifications, Revision of December 2002, and as addressed in the contract documents.

Second: That the bid bond at 5% of the bid amount or the official bank check, cashier’s check, certificate of deposit or U. S. Postal Money Order in the amount given in the “Notice to Contractors”, payable to the Treasurer of the State of Maine and accompanying this bid, shall be forfeited, as liquidated damages, if in case this bid is accepted, and the undersigned shall fail to abide by the terms and conditions of the offer and fail to furnish satisfactory insurance and Contract bonds under the conditions stipulated in the Specifications within 15 days of notice of intent to award the contract.

Third: To begin the Work as stated in Section 107.2 of the Standard Specifications Revision of December 2002 and complete the Work within the time limits given in the Special Provisions of this Contract.

Fourth: That this offer shall remain open for 30 calendar days after the date of opening of bids.

Fifth: The Bidder hereby certifies, to the best of its knowledge and belief that: the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with its bid, and its subsequent contract with the Department.

IN WITNESS WHEREOF, the Contractor, for itself, its successors and assigns, hereby execute two duplicate originals of this Agreement and thereby binds itself to all covenants, terms, and obligations contained in the Contract Documents.

CONTRACTOR

\_\_\_\_\_  
Date

\_\_\_\_\_  
(Signature of Legally Authorized Representative  
of the Contractor)

\_\_\_\_\_  
Witness

\_\_\_\_\_  
(Name and Title Printed)

**G. Award.**

Your offer is hereby accepted.  
documents referenced herein.

This award consummates the Contract, and the

Office of Information Technology

\_\_\_\_\_  
Date

\_\_\_\_\_  
By: Richard B. Thompson  
Chief Information Officer

\_\_\_\_\_  
Witness

## CONTRACT AGREEMENT, OFFER & AWARD

AGREEMENT made on the date last signed below, by and between the State of Maine, acting through and by its Department of Transportation (Department), an agency of state government with its principal administrative offices located at Child Street Augusta, Maine, with a mailing address at 16 State House Station, Augusta, Maine 04333-0016, and (Name of the firm bidding the job) a corporation or other legal entity organized under the laws of the State of Maine, with its principal place of business located at (address of the firm bidding the job)

The Department and the Contractor, in consideration of the mutual promises set forth in this Agreement (the "Contract"), hereby agree as follows:

### A. **The Work.**

The Contractor agrees to complete all Work as specified or indicated in the Contract including Extra Work in conformity with the Contract, PIN No. 1224.00, for the Hot Mix Asphalt Overlay in the town/city of South Nowhere, County of Washington, Maine. The Work includes construction, maintenance during construction, warranty as provided in the Contract, and other incidental work.

The Contractor shall be responsible for furnishing all supervision, labor, equipment, tools supplies, permanent materials and temporary materials required to perform the Work including construction quality control including inspection, testing and documentation, all required documentation at the conclusion of the project, warranting its work and performing all other work indicated in the Contract.

The Department shall have the right to alter the nature and extent of the Work as provided in the Contract; payment to be made as provided in the same.

### B. **Time.**

The Contractor agrees to complete all Work, except warranty work, on or before November 15, 2006. Further, the Department may deduct from moneys otherwise due the Contractor, not as a penalty, but as Liquidated Damages in accordance with Sections 107.7 and 107.8 of the State of Maine Department of Transportation Standard Specifications, Revision of December 2002 and related Special Provisions.

**C. Price.**

The quantities given in the Schedule of Items of the Bid Package will be used as the basis for determining the original Contract amount and for determining the amounts of the required Performance Surety Bond and Payment Surety Bond, and that the amount of this offer is           (Place bid here in alphabetical form such as One Hundred and Two dollars and 10 cents)            
\$ (repeat bid here in numerical terms, such as \$102.10) Performance Bond and Payment Bond each being 50% of the amount of this Contract.

**D. Contract.**

This Contract, which may be amended, modified, or supplemented in writing only, consists of the Contract documents as defined in the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds. It is agreed and understood that this Contract will be governed by the documents listed above.

**E. Certifications.**

By signing below, the Contractor hereby certifies that to the best of the Contractor's knowledge and belief:

1. All of the statements, representations, covenants, and/or certifications required or set forth in the Bid and the Bid Documents, and the Contract are still complete and accurate as of the date of this Agreement.
2. The Contractor knows of no legal, contractual, or financial impediment that prevents the Contractor from entering into this Contract.
3. The person signing below is legally authorized by the Contractor to sign this Contract on behalf of the Contractor and to legally bind the Contractor to the terms of the Contract.

**F. Offer.**

The undersigned, having carefully examined the site of work, the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002, as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of:

**PIN 001234.00 , Hot Mix Asphalt Overlay South Nowhere,**  
State of Maine, on which bids will be received until the time specified in the “Notice to Contractors” do(es) hereby bid and offer to enter into this contract to supply all the materials, tools, equipment and labor to construct the whole of the Work in strict accordance with the terms and conditions of this Contract at the unit prices in the attached “Schedule of Items”.

The Offeror agrees to perform the work required at the price specified above and in accordance with the bids provided in the attached “Schedule of Items” in strict accordance with the terms of this solicitation, and to provide the appropriate insurance and bonds if this offer is accepted by the Government in writing.

As Offeror also agrees:

First: To do any extra work, not covered by the attached “Schedule of Items”, which may be ordered by the Resident, and to accept as full compensation the amount determined upon a “Force Account” basis as provided in the Standard Specifications, Revision of December 2002, and as addressed in the contract documents.

Second: That the bid bond at 5% of the bid amount or the official bank check, cashier’s check, certificate of deposit or U. S. Postal Money Order in the amount given in the “Notice to Contractors”, payable to the Treasurer of the State of Maine and accompanying this bid, shall be forfeited, as liquidated damages, if in case this bid is accepted, and the undersigned shall fail to abide by the terms and conditions of the offer and fail to furnish satisfactory insurance and Contract bonds under the conditions stipulated in the Specifications within 15 days of notice of intent to award the contract.

Third: To begin the Work as stated in Section 107.2 of the Standard Specifications Revision of 2002 and complete the Work within the time limits given in the Special Provisions of this Contract.

Fourth: That this offer shall remain open for 30 calendar days after the date of opening of bids.

Fifth: The Bidder hereby certifies, to the best of its knowledge and belief that: the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with its bid, and its subsequent contract with the Department.

IN WITNESS WHEREOF, the Contractor, for itself, its successors and assigns, hereby execute two duplicate originals of this Agreement and thereby binds itself to all covenants, terms, and obligations contained in the Contract Documents.

**SAMPLE**

CONTRACTOR  
**(Sign Here)**  
\_\_\_\_\_  
(Signature of Legally Authorized Representative of the Contractor)

Date \_\_\_\_\_

**(Witness Sign Here)**  
\_\_\_\_\_  
Witness

**(Print Name Here)**  
\_\_\_\_\_  
(Name and Title Printed)

**G. Award.**

Your offer is hereby accepted. documents referenced herein.

This award consummates the Contract, and the

Office of Information Technology

\_\_\_\_\_  
Date

\_\_\_\_\_  
By: Richard B. Thompson  
Chief Information Officer

\_\_\_\_\_  
(Witness)

BOND # \_\_\_\_\_

CONTRACT PERFORMANCE BOND  
(Surety Company Form)

KNOW ALL MEN BY THESE PRESENTS: That \_\_\_\_\_  
\_\_\_\_\_ **and the State of** \_\_\_\_\_, as principal,  
and \_\_\_\_\_,  
a corporation duly organized under the laws of the State of \_\_\_\_\_ and having a  
usual place of business \_\_\_\_\_,  
as Surety, are held and firmly bound unto the Treasurer of the State of Maine in the sum  
of \_\_\_\_\_ **and 00/100 Dollars (\$** \_\_\_\_\_ **)**,  
to be paid said Treasurer of the State of Maine or his successors in office, for which  
payment well and truly to be made, Principal and Surety bind themselves, their heirs,  
executors and administrators, successors and assigns, jointly and severally by these  
presents.

The condition of this obligation is such that if the Principal designated as Contractor in  
the Contract to construct Project Number \_\_\_\_\_ in the Municipality of  
\_\_\_\_\_ promptly and faithfully performs the Contract, then this  
obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the State  
of Maine.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 20.....

WITNESSES:

SIGNATURES:

CONTRACTOR:

Signature.....

.....

Print Name Legibly .....

Print Name Legibly .....

SURETY:

Signature .....

.....

Print Name Legibly .....

Print Name Legibly .....

SURETY ADDRESS:

NAME OF LOCAL AGENCY:

ADDRESS .....

.....

.....

.....

.....

TELEPHONE.....

.....

BOND # \_\_\_\_\_

CONTRACT PAYMENT BOND  
(Surety Company Form)

KNOW ALL MEN BY THESE PRESENTS: That \_\_\_\_\_  
\_\_\_\_\_ **and the State of** \_\_\_\_\_, as principal,  
and \_\_\_\_\_  
a corporation duly organized under the laws of the State of \_\_\_\_\_ and having a  
usual place of business in \_\_\_\_\_,  
as Surety, are held and firmly bound unto the Treasurer of the State of Maine for the use  
and benefit of claimants as herein below defined, in the sum of  
\_\_\_\_\_ **and 00/100 Dollars (\$** \_\_\_\_\_ **)**  
for the payment whereof Principal and Surety bind themselves, their heirs, executors and  
administrators, successors and assigns, jointly and severally by these presents.

The condition of this obligation is such that if the Principal designated as Contractor in  
the Contract to construct Project Number \_\_\_\_\_ in the Municipality of  
\_\_\_\_\_ promptly satisfies all claims and demands incurred for all  
labor and material, used or required by him in connection with the work contemplated by  
said Contract, and fully reimburses the obligee for all outlay and expense which the  
obligee may incur in making good any default of said Principal, then this obligation shall  
be null and void; otherwise it shall remain in full force and effect.

A claimant is defined as one having a direct contract with the Principal or with a  
Subcontractor of the Principal for labor, material or both, used or reasonably required for  
use in the performance of the contract.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 20 .. .

WITNESS:

SIGNATURES:

CONTRACTOR:

Signature.....

.....

Print Name Legibly .....

Print Name Legibly .....

SURETY:

Signature.....

.....

Print Name Legibly .....

Print Name Legibly .....

SURETY ADDRESS:

NAME OF LOCAL AGENCY:

.....

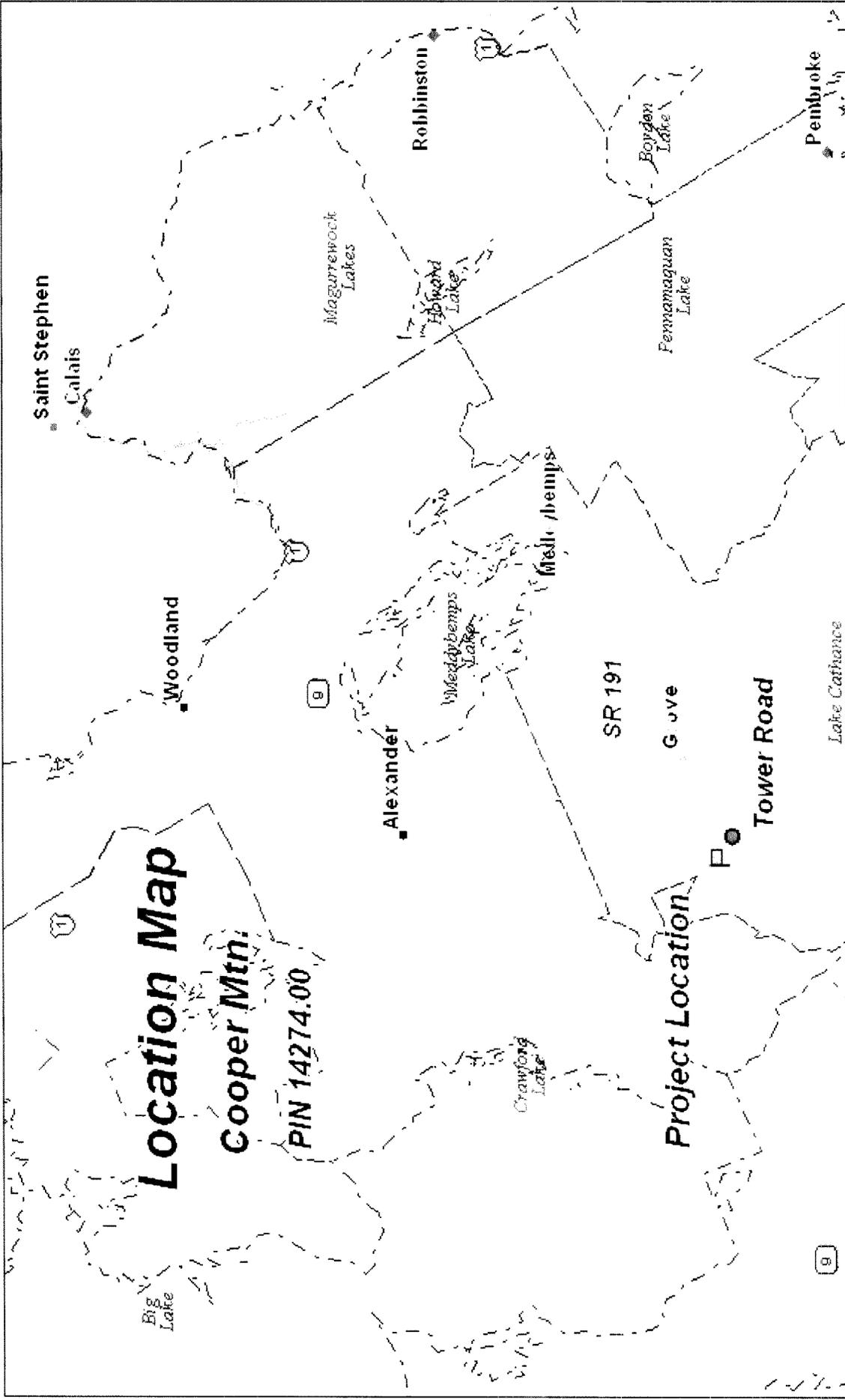
ADDRESS .....

.....

.....

TELEPHONE .....

.....



**Location Map**  
**Cooper Mtn.**  
**PIN 14274.00**

**Project Location**

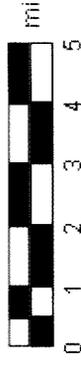


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 www.delorme.com

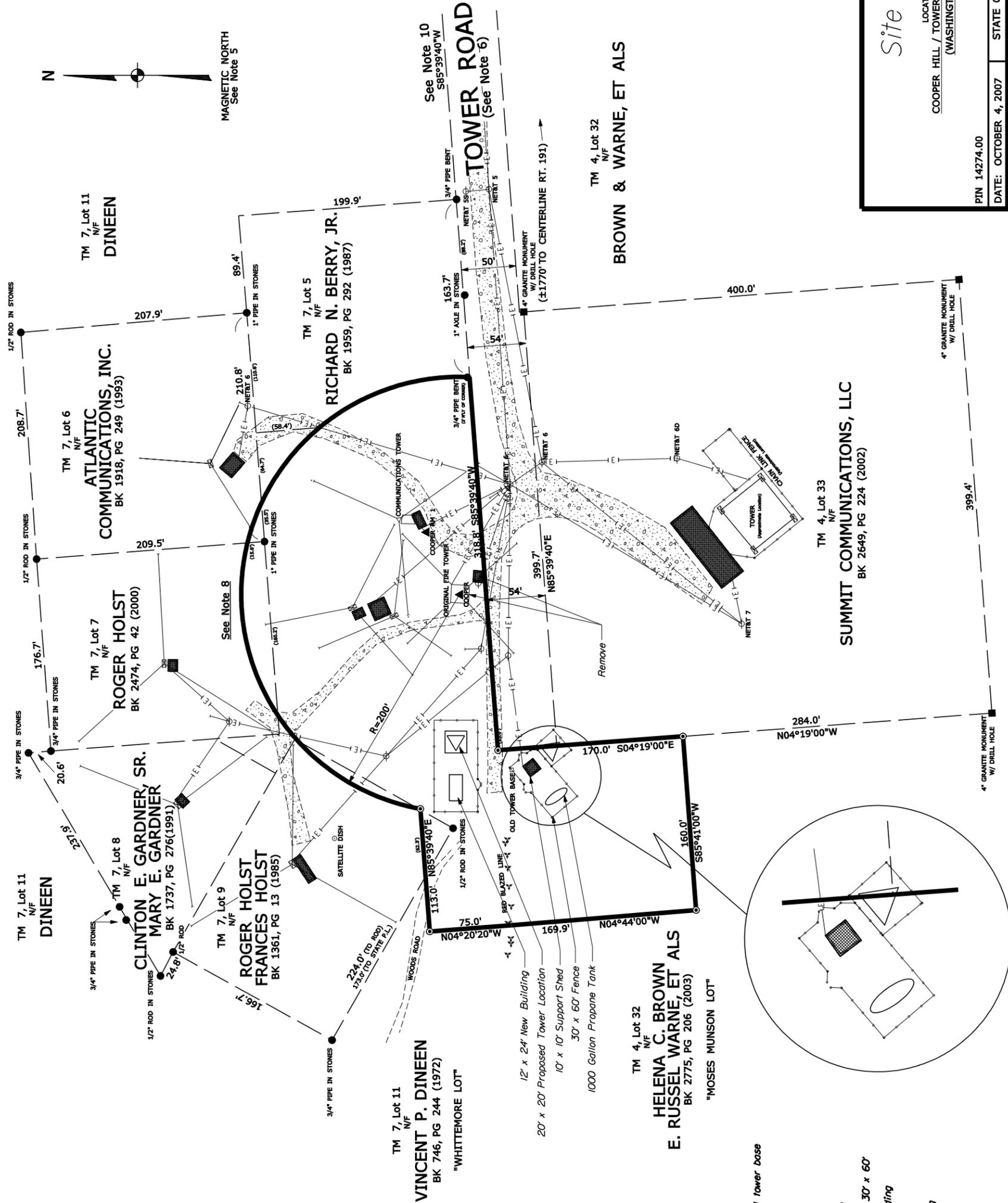
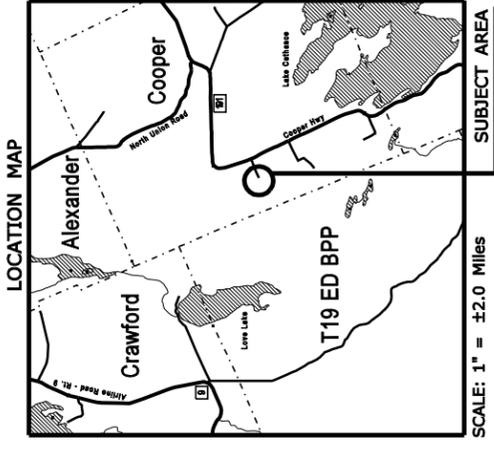
**Street Atlas USA: 2004 Plus**



MN (0.0° W)



Data Zoom 9-5



**Notes:**

- 1) New Building is 12' x 24'
- 2) Tower is 20' from building
- 3) Fence is 10' from building and tower base
- 4) Tower base is 20' x 20'
- 5) Gates in fences are 10' wide
- 6) Support shed is 10' x 10'
- 7) Fence is 10' from support shed
- 8) Fence for the support shed is 30' x 60'
- 9) Propane tank is 25' from building
- 10) Site plan not to scale
- 11) Remove fire tower and building

*Site Plan*

LOCATED AT  
COOPER HILL / TOWER ROAD, COOPER, MAINE  
(WASHINGTON COUNTY)

PIN 14274.00  
DATE: OCTOBER 4, 2007

STATE OF MAINE SHEET NO. 1 OF 1 SHEET

**MAINEDOT**  
STATE OF MAINE  
DEPARTMENT OF TRANSPORTATION  
16 STATE HOUSE STATION - AUGUSTA, ME 04333-0016

**SPECIAL PROVISION**

**SECTION 102.3**

**EXAMINATION OF DOCUMENTS, SITE AND OTHER INFORMATION  
(Geotechnical Information)**

Geotechnical Information pertaining to this project has been collected and assembled. Bidders and Contractors are obligated to examine and, if necessary, obtain geotechnical information. Geotechnical Information is available at the Maine Department of Transportation office on Child Street, Augusta, Maine. Geotechnical Information will be provided to interested parties who request this information. Requests for this information should be directed to the Project Manager as outlined in the "Notice to Contractors".

The Department shall not be responsible for Bidder's and Contractor's interpretations of, or estimates or conclusions drawn from, the Geotechnical Information. Data provided may not be representative of the subsurface conditions between the boring locations.

This section does not diminish the duties imposed upon parties in Section 102 or in any other sections.

March 14, 2007  
Supersedes March 3, 1966

Non-federal Projects Only

NOTICE TO CONTRACTORS - PREFERRED EMPLOYEES

Sec. 1303. Public Works; minimum wage

In the employment of laborers in the construction of public works, including state highways, by the State or by persons contracting for the construction, preference must first be given to citizens of the State who are qualified to perform the work to which the employment relates and, if they can not be obtained in sufficient numbers, then to citizens of the United States. Every contract for public works construction must contain a provision for employing citizens of this State or the United States. The hourly wage and benefit rate paid to laborers employed in the construction of public works, including state highways, may not be less than the fair minimum rate as determined in accordance with section 1308. Any contractor who knowingly and willfully violates this section is subject to a fine of not less than \$250 per employee violation. Each day that any contractor employs a laborer at less than the wage and benefit minimum stipulated in this section constitutes a separate violation of this section. [1997, c. 757, §1 (amd).]

**COOPER**  
**14274.00**  
**10-17-07**

SPECIAL PROVISION  
SECTION 104.3.8.B.1  
(State of Maine Wage Rates Apply)

104.3.8.B.1 State Wage Rate

Wages. This Project is not being constructed with federal funds and is not subject to the jurisdiction of the Davis-Bacon or other Federal Act that requires the Secretary of Labor to establish the minimum wages and benefits. The State of Maine minimum wage and benefits apply to the construction of this Radio Tower Project (PIN 14274.00). See the provisions in 26 MRSA §§ 1304 to 1313. Federal wage rates do not apply.

State of Maine  
 Department of Labor  
 Bureau of Labor Standards  
 Technical Services Division  
 Augusta, Maine 04333-0045  
 Telephone (207) 623-7906

Wage Determination - In accordance with 26 MRSA §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid laborers and workers employed on the below titled project.

**Title of Project** ----- Cooper Hill Radio Communications Tower

**Location of Project** -- Cooper, Maine in Washington County

**2007 Fair Minimum Wage Rates  
 Building 2 Washington County  
 (other than 1 or 2 family homes)**

<u>Occupation Title</u>	<u>Minimum Wage</u>	<u>Minimum Benefit</u>	<u>Minimum Total</u>	<u>Occupation Title</u>	<u>Minimum Wage</u>	<u>Minimum Benefit</u>	<u>Minimum Total</u>
Asbestos Abatement Wrkr	\$16.00	\$0.73	\$16.73	Ironworker - Reinforcing	\$20.15	\$10.00	\$30.15
Assembler - Metal Bldg	\$12.00	\$3.32	\$15.32	Ironworker - Structural	\$20.15	\$1.91	\$22.06
Backhoe Loader Operator	\$14.00	\$2.24	\$16.24	Laborers/Helper/Tender	\$12.00	\$0.68	\$12.68
Boilermaker	\$19.75	\$4.21	\$23.96	Laborer - Skilled	\$12.50	\$1.12	\$13.62
Boom Truck Operator	\$16.50	\$2.66	\$19.16	Loader Op - Front End	\$14.75	\$2.28	\$17.03
Bricklayer	\$23.00	\$2.72	\$25.72	Mechanic - Maintenance	\$19.00	\$2.52	\$21.52
Bulldozer Operator	\$16.00	\$2.87	\$18.87	Mechanic - Refrigeration	\$17.38	\$3.11	\$20.49
Cable Splicer	\$20.25	\$3.35	\$23.60	Millwright	\$21.00	\$11.15	\$32.15
Carpenter	\$16.00	\$2.32	\$18.32	Oil/Fuel Burner Serv & Instr	\$19.00	\$6.09	\$25.09
Carpenter - Acoustical	\$13.00	\$2.15	\$15.15	Painter	\$13.38	\$0.00	\$13.38
Carpenter - Rough	\$13.63	\$1.11	\$14.74	Paperhanger	\$13.00	\$0.00	\$13.00
Cement Mason/Finisher	\$15.00	\$1.02	\$16.02	Paver - Bituminous	\$14.88	\$1.27	\$16.15
Commun Equip Installer	\$19.50	\$4.24	\$23.74	Pile Driver Operator	\$19.00	\$5.55	\$24.55
Concrete Mixing Plant Op	\$14.55	\$3.70	\$18.25	Pipe/Stm/Sprkler Fitter	\$22.00	\$5.39	\$27.39
Concrete Pump Operator	\$18.50	\$2.38	\$20.88	Pipelayer	\$20.75	\$5.45	\$26.20
Crane Operator =>15 Tons	\$19.50	\$4.70	\$24.20	Plumber (Licensed)	\$19.50	\$5.36	\$24.86
Crusher Plant Operator	\$14.48	\$3.27	\$17.75	Plumber Hlpr/Trainee (Lic)	\$13.00	\$2.72	\$15.72
Diver	\$21.00	\$0.75	\$21.75	Roller Operator - Earth	\$12.43	\$4.49	\$16.92
Driller - Well	\$13.00	\$1.94	\$14.94	Roofer	\$13.00	\$0.78	\$13.78
Dry-Wall Applicator	\$18.00	\$0.92	\$18.92	Screed Operator	\$15.50	\$3.42	\$18.92
Dry-Wall Taper & Finisher	\$18.00	\$3.25	\$21.25	Sheet Metal Worker	\$15.00	\$1.93	\$16.93
Electrician	\$19.00	\$4.67	\$23.67	Sider	\$14.00	\$0.60	\$14.60
Electrician Hlpr (Licensed)	\$13.00	\$1.83	\$14.83	Stone Mason	\$16.24	\$2.04	\$18.28
Elevator Constrctr/Installer	\$40.32	\$14.77	\$55.09	Tile Setter	\$16.75	\$2.93	\$19.68
Excavator Operator	\$14.75	\$2.36	\$17.11	Truck Driver - Light	\$13.25	\$0.98	\$14.23
Fence Setter	\$12.50	\$1.08	\$13.58	Truck Driver - Medium	\$10.38	\$0.81	\$11.19
Floor Layer	\$15.00	\$1.35	\$16.35	Truck Driver - Heavy	\$12.50	\$2.10	\$14.60
Glazier	\$13.67	\$1.97	\$15.64	Truck Driver - Tractor Trailer	\$12.95	\$2.10	\$15.05
Insulation Installer	\$14.00	\$2.13	\$16.13				

The Laborer classifications include a wide range of work duties. Therefore, if any specific occupation to be employed on this project is not listed in this determination, call the Bureau of Labor Standards at the above number for further clarification.

Welders are classified in the trade to which the welding is incidental.

Apprentices - The minimum wage rate for registered apprentices are those set forth in the standards and policies of the Maine State Apprenticeship and Training Council for approved apprenticeship programs.

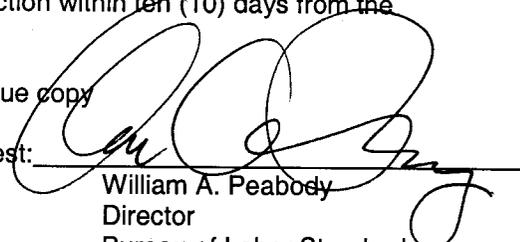
Posting of Schedule - Posting of this schedule is required in accordance with 26 MRSA §1301 et. seq., by any contractor holding a State contract for construction valued at \$50,000 or more and any subcontractors to such a contractor.

Appeal - Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates with the Secretary of State.

Determination No: B2-087-2007  
 Filing Date: October 16, 2007  
 Expiration Date: 12-31-2007

A true copy

Attest:

  
 William A. Peabody  
 Director  
 Bureau of Labor Standards

State of Maine  
 Department of Labor  
 Bureau of Labor Standards  
 Technical Services Division  
 Augusta, Maine 04333-0045  
 Telephone (207) 623-7906

Wage Determination - In accordance with 26 MRSA §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid laborers and workers employed on the below titled project.

**Title of Project** ----- Cooper Hill Radio Communications Tower

**Location of Project** -- Cooper, Maine in Washington County

**2007 Fair Minimum Wage Rates  
 Heavy & Bridge Washington County**

<u>Occupation Title</u>	<u>Minimum Wage</u>	<u>Minimum Benefit</u>	<u>Total</u>	<u>Occupation Title</u>	<u>Minimum Wage</u>	<u>Minimum Benefit</u>	<u>Total</u>
Asphalt Raker	\$12.50	\$0.23	\$12.73	Insulation Installer	\$17.25	\$5.05	\$22.30
Backhoe Loader Operator	\$14.00	\$2.24	\$16.24	Ironworker - Reinforcing	\$20.15	\$10.00	\$30.15
Boilermaker	\$18.75	\$3.57	\$22.32	Ironworker - Structural	\$19.00	\$3.65	\$22.65
Boom Truck Operator	\$16.50	\$2.66	\$19.16	Laborers/Helper/Tender	\$11.00	\$0.46	\$11.46
Bricklayer	\$21.00	\$2.62	\$23.62	Laborer - Skilled	\$14.03	\$3.09	\$17.12
Bulldozer Operator	\$16.00	\$2.87	\$18.87	Line Erector, Power	\$18.01	\$3.88	\$21.89
Cable Splicer	\$18.50	\$3.56	\$22.06	Loader Op, Front-End	\$15.63	\$2.09	\$17.72
Carpenter	\$16.50	\$1.84	\$18.34	Mechanic - Maintenance	\$16.25	\$3.19	\$19.44
Carpenter - Rough	\$16.75	\$3.33	\$20.08	Millwright	\$19.50	\$4.02	\$23.52
Cement Mason/Finisher	\$15.00	\$0.76	\$15.76	Painter	\$20.91	\$6.09	\$27.00
Commun Equip Installer	\$21.25	\$2.60	\$23.85	Paver - Bituminous	\$14.88	\$1.27	\$16.15
Commun Trans Erectr	\$16.50	\$6.51	\$23.01	Pile Driver Operator	\$19.00	\$5.07	\$24.07
Concrete Pump Operator	\$15.40	\$9.40	\$24.80	Pipe/Stm/Sprkler Fitter	\$20.75	\$5.39	\$26.14
Crane Op =>15 Tons	\$20.25	\$4.57	\$24.82	Pipelayer	\$20.00	\$3.77	\$23.77
Crusher Plant Operator	\$14.48	\$3.27	\$17.75	Plumber (Licensed)	\$20.00	\$3.80	\$23.80
Diver	\$21.00	\$10.67	\$31.67	Pump Installer	\$15.50	\$1.48	\$16.98
Driller - Rock	\$15.00	\$1.96	\$16.96	Roller Op - Pavement	\$15.00	\$3.36	\$18.36
Electrician, Licensed	\$22.00	\$4.40	\$26.40	Sheet Metal Worker	\$15.45	\$3.18	\$18.63
Electrician Hlpr (Licensed)	\$15.50	\$3.50	\$19.00	Truck Driver - Light	\$13.25	\$0.98	\$14.23
Excavator Operator	\$18.82	\$2.97	\$21.79	Truck Driver - Medium	\$12.85	\$2.06	\$14.91
Fence Setter	\$13.00	\$1.64	\$14.64	Truck Driver, Heavy	\$14.00	\$0.82	\$14.82
Hot Top Plant Operator	\$17.33	\$6.98	\$24.31	Truck Driver, Tractor Trlr	\$12.95	\$2.10	\$15.05

The Laborer classifications include a wide range of work duties. Therefore, if any specific occupation to be employed on this project is not listed in this determination, call the Bureau of Labor Standards at the above number for further clarification.

Welders are classified in the trade to which the welding is incidental.

Apprentices - The minimum wage rate for registered apprentices are those set forth in the standards and policies of the Maine State Apprenticeship and Training Council for approved apprenticeship programs.

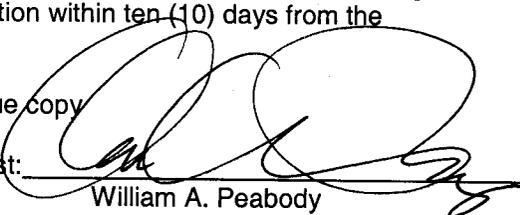
Posting of Schedule - Posting of this schedule is required in accordance with 26 MRSA §1301 et. seq., by any contractor holding a State contract for construction valued at \$50,000 or more and any subcontractors to such a contractor.

Appeal - Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates with the Secretary of State.

Determination No: HB-035-2007  
 Filing Date: October 16, 2007  
 Expiration Date: 12-31-2007

A true copy

Attest:

  
 William A. Peabody  
 Director  
 Bureau of Labor Standards

BLS 424HB (R2007) (Heavy & Bridge Washington)

**COOPER**  
**14274.00**  
**11-5-07**

**SPECIAL PROVISION**  
**SECTION 105**  
**GENERAL SCOPE OF WORK**

The Scope of work for the project consists of construction, installation, testing and commissioning of a radio tower, furnishing a modular, pre-fabricated, pre-outfitted telecommunications-type shelter, installation of radio equipment, refurbishing an existing generator building, installing a generator system and installation of a perimeter fence on Cooper Hill as shown in the project plans and outlined in the special provisions.

**COOPER**  
**PIN 014274.00**  
**10-18-07**

Special Provision  
Section 107.1.1  
Time  
Contract Completion Date

The Contract Completion Date is February 15, 2008.

**SPECIAL PROVISION**  
**SECTION 656**  
Temporary Soil Erosion and Water Pollution Control

The following is added to Section 656 regarding Project Specific Information and Requirements.

**Project Specific Information and Requirements**

The following information and requirements apply specifically to this Project. The temporary soil erosion and water pollution control measures associated with this work shall be addressed in the SEWPCP.

Standard Specification 656 of the Standard Specifications is deleted and replaced by this Special Provision.

The following information and requirements will constitute the Soil Erosion and Water Pollution Control Plan for this Project. The soil erosion and water pollution control measures associated with this work are as follows:

1. All work shall be done in accordance with the latest revision of the Maine Department of Transportation Best Management Practices for Erosion and Sediment Control (a.k.a. Best Management Practices manual or BMP Manual). The "Table of Contents" of the latest version is dated "1/19/00" (available at <http://www.state.me.us/mdot/mainhtml/bmp/bmpjan2000.pdf>.) **Procedures specified shall be according to the BMP Manual unless stated otherwise.**
2. The on-site person responsible for implementation of this plan, shall be the Contractor's Superintendent or other supervisory employee (the "Environmental Coordinator") with the authority to immediately remedy any deficient controls and shall provide the Resident with their numbers (telephone number, cellular phone and pager numbers, if applicable) where the Environmental Coordinator can be reached 24 hours a day.
3. All areas where soil is disturbed shall be permanently mulched on a daily basis and seeded on a weekly basis (if seeded by hand, it shall be done on a daily basis). All previously mulched areas shall be maintained and re-mulched on a daily basis if bare areas develop until an acceptable growth of grass has been obtained.
4. All disturbed ditches shall receive erosion control blanket or stone rip rap prior to leaving the site each day.
5. Winter stabilization BMPs such as Erosion Control Mix shall be applied in accordance with the MDOT BMP Manual between November 1 and April 15 or during frozen ground conditions.
6. If the Work includes the handling or storage of petroleum products or Hazardous Materials including the on site fueling of Equipment, the Resident must be provided with a Spill Prevention Control and Countermeasure Plan (SPCCP) plan. At a minimum, the SPCCP shall include:

**SPECIAL PROVISION**  
**SECTION 656**

Temporary Soil Erosion and Water Pollution Control

- The name and emergency response numbers (telephone number, cellular phone and pager numbers, if applicable) of the Contractor's representative responsible for spill prevention;
  - General description and location of (1) handling, transfer, storage, and containment facilities of such products or Materials ("activities and facilities") and (2) potential receptors of such products or Materials including oceans, lakes, ponds, rivers, streams, wetlands, and sand and gravel aquifers ("sensitive resources") including the distances between said activities and facilities and said sensitive resources;
  - Description of preventative measures to be used to minimize the possibility of a spill including Equipment and/or Materials to be used to prevent discharges including absorbent Materials,
  - A contingency response plan to be implemented if a spill should occur including a list of emergency phone/pager numbers including the Contractor's representative, MDEP Spill Response, the Resident, and local police and fire authorities. For a related provision, see *Standard Specification, Section, 105.2.2 - Project Specific Emergency Planning*.
7. The Environmental Coordinator must inspect and maintain daily all controls for the duration of the project.
8. If the Project Resident directs new soil disturbance that requires temporary erosion and sedimentation control, all permits shall be obtained by the DOT and a full SEWPCP will be required and paid for as Extra Work.

Pay Item 656.75

Lump Sum

## STANDARD DETAIL UPDATES

Standard Details and Standard Detail updates are available at:

[http://www.maine.gov/mdot/contractor-consultant-information/ss\\_standard\\_details\\_updates.php](http://www.maine.gov/mdot/contractor-consultant-information/ss_standard_details_updates.php)

<b><u>Detail #</u></b>	<b><u>Description</u></b>	<b><u>Revision Date</u></b>
504(15)	Diaphragms	12/30/02
507(04)	Steel Bridge Railing	2/05/03
526(33)	Concrete Transition Barrier	8/18/03
645(06)	H-Beam Posts – Highway Signing	7/21/04
645(09)	Installation of Type II Signs	7/21/04
626(09)	Electrical Junction Box for Traffic Signals and Lighting	2/25/05
604(01)	Catch Basins	11/16/05
604(05)	Type “A” & “B” Catch Basin Tops	11/16/05
604(06)	Type “C” Catch Basin Tops	11/16/05
604(07)	Manhole Top “D”	11/16/05
604(09)	Catch Basin Type “E”	11/16/05
606(02)	Multiple Mailbox Support	11/16/05
606(07)	Reflectorized Beam Guardrail Delineator Details	11/16/05
609(06)	Vertical Bridge Curb	11/16/05
504(23)	Hand-Hold Details	12/08/05
609(03)	Curb Type 3	6/27/06
609(07)	Curb Type 1	6/27/06
535(01)	Precast Superstructure - Shear Key	10/12/06
535(02)	Precast Superstructure - Curb Key & Drip Notch	10/12/06

535(03)	Precast Superstructure - Shear Key	10/12/06
535(04)	Precast Superstructure - Shear Key	10/12/06
535(05)	Precast Superstructure - Post Tensioning	10/12/06
535(06)	Precast Superstructure - Sections	10/12/06
535(07)	Precast Superstructure - Precast Slab & Box	10/12/06
535(08)	Precast Superstructure - Sections	10/12/06
535(09)	Precast Superstructure - Sections	10/12/06
535(10)	Precast Superstructure - Sections	10/12/06
535(11)	Precast Superstructure - Sections	10/12/06
535(12)	Precast Superstructure - Sections	10/12/06
535(13)	Precast Superstructure - Sections	10/12/06
535(14)	Precast Superstructure - Stirrups	10/12/06
535(15)	Precast Superstructure - Plan	10/12/06
535(16)	Precast Superstructure - Reinforcing	10/12/06
535(17)	Precast Superstructure - Notes	10/12/06
801(01)	Drives on Sidewalk Sections	2/06/07
801(02)	Drives on Non-Sidewalk Sections	2/06/07

## SUPPLEMENTAL SPECIFICATION

(Corrections, Additions, & Revisions to Standard Specifications - Revision of December 2002)

### SECTION 101

#### CONTRACT INTERPRETATION

##### 101.2 Definitions

Closeout Documentation Replace the sentence “A letter stating the amount..... DBE goals.” with “DBE Goal Attainment Verification Form”

Add “Environmental Information Hazardous waste assessments, dredge material test results, boring logs, geophysical studies, and other records and reports of the environmental conditions. For a related provision, see Section 104.3.14 - Interpretation and Interpolation.”

Add “Fabrication Engineer The Department’s representative responsible for Quality Assurance of pre-fabricated products that are produced off-site.”

Geotechnical Information Replace with the following: “Boring logs, soil reports, geotechnical design reports, ground penetrating radar evaluations, seismic refraction studies, and other records of subsurface conditions. For a related provision, see Section 104.3.14 - Interpretation and Interpolation.”

### SECTION 102

#### DELIVERY OF BIDS

102.7.1 Location and Time Add the following sentence “As a minimum, the Bidder will submit a Bid Package consisting of the Notice to Contractors, the completed Acknowledgement of Bid Amendments form, the completed Schedule of Items, 2 copies of the completed Agreement, Offer, & Award form, a Bid Bond or Bid Guarantee, and any other Certifications or Bid Requirements listed in the Bid Book.”

102.11.1 Non-curable Bid Defects Replace E. with “E. The unit price and bid amount is not provided or a lump sum price is not provided or is illegible as determined by the Department.”

### SECTION 103

#### AWARD AND CONTRACTING

103.3.1 Notice and Information Gathering Change the first paragraph to read as follows: “After Bid Opening and as a condition for Award of a Contract, the Department may require an Apparent Successful Bidder to demonstrate to the Department’s satisfaction that the Bidder is responsible and qualified to perform the Work.”

### SECTION 104

#### GENERAL RIGHTS AND RESPONSIBILITIES

104.3.14 Interpretation and Interpolation In the first sentence, change “...and Geotechnical Information.” to “...Environmental Information, and Geotechnical Information.”

Delete the entire Section 104.5.9 and replace with the following:

104.5.9 Landscape Subcontractors The Contractor shall retain only Landscape Subcontractors that are certified by the Department's Environmental Office Landscape Unit.

## SECTION 105 GENERAL SCOPE OF WORK

Delete the entire Section 105.6 and replace with the following:

105.6.1 Department Provided Services The Department will provide the Contractor with the description and coordinates of vertical and horizontal control points, set by the Department, within the Project Limits, for full construction Projects and other Projects where survey control is necessary. For Projects of 1,500 feet in length, or less: The Department will provide three points. For Projects between 1,500 and 5,000 feet in length: The Department will provide one set of two points at each end of the Project. For Projects in excess of 5,000 feet in length, the Department will provide one set of two points at each end of the Project, plus one additional set of two points for each mile of Project length. For non-full construction Projects and other Projects where survey control is not necessary, the Department will not set any control points and, therefore, will not provide description and coordinates of any control points. Upon request of the Contractor, the Department will provide the Department's survey data management software and Survey Manual to the Contractor, or its survey Subcontractor, for the exclusive use on the Department's Projects.

105.6.2 Contractor Provided Services Utilizing the survey information and points provided by the Department, described in Subsection 105.6.1, Department Provided Services, the Contractor shall provide all additional survey layout necessary to complete the Work. This may include, but not be limited to, reestablishing all points provided by the Department, establishing additional control points, running axis lines, providing layout and maintenance of all other lines, grades, or points, and survey quality control to ensure conformance with the Contract. The Contractor is also responsible for providing construction centerline, or close reference points, for all Utility Facilities relocations and adjustments as necessary to complete the Work. When the Work is to connect with existing Structures, the Contractor shall verify all dimensions before proceeding with the Work. The Contractor shall employ or retain competent engineering and/or surveying personnel to fulfill these responsibilities.

The Contractor must notify the Department of any errors or inconsistencies regarding the data and layout provided by the Department as provided by Section 104.3.3 - Duty to Notify Department If Ambiguities Discovered.

105.6.2.1 Survey Quality Control The Contractor is responsible for all construction survey quality control. Construction survey quality control is generally defined as, first, performing initial field survey layout of the Work and, second, performing an independent check of the initial layout using independent survey data to assure the accuracy of the initial layout; additional iterations of checks may be required if significant discrepancies are discovered in this process. Construction survey layout quality control also requires written documentation of

the layout process such that the process can be followed and repeated, if necessary, by an independent survey crew.

105.6.3 Survey Quality Assurance It is the Department's prerogative to perform construction survey quality assurance. Construction survey quality assurance may, or may not, be performed by the Department. Construction survey quality assurance is generally defined as an independent check of the construction survey quality control. The construction survey quality assurance process may involve physically checking the Contractor's construction survey layout using independent survey data, or may simply involve reviewing the construction survey quality control written documentation. If the Department elects to physically check the Contractor's survey layout, the Contractor's designated surveyor may be required to be present. The Department will provide a minimum notice of 48 hours to the Contractor, whenever possible, if the Contractor's designated surveyor's presence is required. Any errors discovered through the quality assurance process shall be corrected by the Contractor, at no additional cost to the Department.

105.6.4 Boundary Markers The Contractor shall preserve and protect from damage all monuments or other points that mark the boundaries of the Right-of-Way or abutting parcels that are outside the area that must be disturbed to perform the Work. The Contractor indemnifies and holds harmless the Department from all claims to reestablish the former location of all such monuments or points including claims arising from 14 MRSA § 7554-A. For a related provision, see Section 104.3.11 - Responsibility for Property of Others.

## SECTION 106 QUALITY

106.4.3 Testing Change the first sentence in paragraph three from "...maintain records of all inspections and tests." to "...maintain original documentation of all inspections, tests, and calculations used to generate reports."

106.6 Acceptance Add the following to paragraph 1 of A: "This includes Sections 401 - Hot Mix Asphalt, 402 - Pavement Smoothness, and 502 - Structural Concrete - Method A - Air Content."

Add the following to the beginning of paragraph 3 of A: "For pay factors based on Quality Level Analysis, and"

106.7.1 Standard Deviation Method Add the following to F: "Note: In cases where the mean of the values is equal to either the USL or the LSL, then the PWL will be 50 regardless of the computed value of s."

Add the following to H: "Method C Hot Mix Asphalt:  $PF = [55 + (\text{Quality Level} * 0.5)] * 0.01$ "

## SECTION 107 TIME

107.3.1 General Add the following: "If a Holiday occurs on a Sunday, the following Monday shall be considered a Holiday. Sunday or Holiday work must be approved by the Department,

except that the Contractor may work on Martin Luther King Day, President's Day, Patriot's Day, the Friday after Thanksgiving, and Columbus Day without the Department's approval."

107.7.2 Schedule of Liquidated Damages Replace the table of Liquidated Damages as follows:

<u>From More Than</u>	<u>Up to and Including</u>	<u>Amount of Liquidated Damages per Calendar Day</u>
\$0	\$100,000	\$100
\$100,000	\$300,000	\$200
\$300,000	\$500,000	\$400
\$500,000	\$1,000,000	\$575
\$1,000,000	\$2,000,000	\$750
\$2,000,000	\$4,000,000	\$900
\$4,000,000	and more	\$1,875

## SECTION 108 PAYMENT

108.4 Payment for Materials Obtained and Stored First paragraph, second sentence, delete the words "...Delivered on or near the Work site at acceptable storage places."

## SECTION 109 CHANGES

109.1.1 Changes Permitted Add the following to the end of the paragraph: "There will be no adjustment to Contract Time due to an increase or decrease in quantities, compared to those estimated, except as addressed through Contract Modification(s)."

109.1.2 Substantial Changes to Major Items Add the following to the end of the paragraph: "Contract Time adjustments may be made for substantial changes to Major Items when the change affects the Critical Path, as determined by the Department"

109.4.4 Investigation / Adjustment Third sentence, delete the words "subsections (A) - (E)"

109.5.1 Definitions - Types of Delays

B. Compensable Delay Replace (1) with the following; "a weather related Uncontrollable Event of such an unusually severe nature that a Federal Emergency Disaster is declared. The Contractor will only be entitled to an Equitable Adjustment if the Project falls within the geographic boundaries prescribed under the disaster declaration."

109.7.2 Basis of Payment Replace with the following: "Equitable Adjustments will be established by mutual Agreement for compensable items listed in Section 109.7.3- Compensable Items, based upon Unit or Lump Sum Prices. If Agreement cannot be reached, the Contractor shall accept payment on a Force Account basis as provided in Section 109.7.5 - Force Account Work, as full and complete compensation for all Work relating to the Equitable Adjustment."

109.7.3 Compensable Items Replace with the following: “The Contractor is entitled to compensation for the following items, with respect to agreed upon Unit or Lump Sum Prices:

1. Labor expenses for non-salaried Workers and salaried foremen.
2. Costs for Materials.
3. A 15 % markup on the totals of Items 1 and 2 of this subsection 109.7.3 for home office overhead and profit of the Contractor, its Subcontractors and suppliers, and any lower tier Subcontractors or suppliers, with no mark-ups on mark-ups.
4. Cost for Equipment, based on Blue Book Rates or leased rates, as set forth in Section 109.7.5(C), or the Contractor’s Actual Costs if determined by the Department to be lower.
5. Costs for extended job-site overhead.
6. Time.
7. Subcontractor quoted Work, as set forth below in Section 109.7.5 (F).”

109.7.5 Force Account Work

C. Equipment

Paragraph 2, delete sentence 1 which starts; “Equipment leased....”

Paragraph 6, change sentence 2 from “The Contractor may furnish...” to read “If requested by the Department, the Contractor will produce cost data to assist the Department in the establishment of such rental rate, including all records that are relevant to the Actual Costs including rental Receipts, acquisition costs, financing documents, lease Agreements, and maintenance and operational cost records.”

Add the following paragraph; “Equipment leased by the Contractor for Force Account Work and actually used on the Project will be paid for at the actual invoice amount plus 10% markup for administrative costs.”

Add the following section;

“F. Subcontractor Quoted Work When accomplishing Force Account Work that utilizes Subcontractors, the Contractor will be allowed a maximum markup of 5% for profit and overhead on the Subcontractor’s portion of the Force Account Work.”

SECTION 110  
INDEMNIFICATION, BONDING, AND INSURANCE

Delete the entire Section 110.2.3 and replace with the following:

110.2.3 Bonding for Landscape Establishment Period The Contractor shall provide a signed, valid, and enforceable Performance, Warranty, or Maintenance Bond complying with the Contract, to the Department at Final Acceptance.

The bond shall be in the full amount for all Pay Items for work pursuant to Sec 621, Landscape, payable to the “Treasurer - State of Maine,” and on the Department’s forms, on exact copies thereof, or on forms that do not contain any significant variations from the Department’s forms as solely determined by the Department.

The Contractor shall pay all premiums and take all other actions necessary to keep said bond in effect for the duration of the Landscape Establishment Period described in Special Provision 621.0036 - Establishment Period. If the Surety becomes financially insolvent, ceases to be licensed or approved to do business in the State of Maine, or stops operating in the United States, the Contractor shall file new bonds complying with this Section within 10 Days of the date the Contractor is notified or becomes aware of such change.

All Bonds shall be procured from a company organized and operating in the United States, licensed or approved to do business in the State of Maine by the State of Maine Department of Business Regulation, Bureau of Insurance, and listed on the latest Federal Department of the Treasury listing for “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies.”

By issuing a bond, the Surety agrees to be bound by all terms of the Contract, including those related to payment, time for performance, quality, warranties, and the Department’s self-help remedy provided in Section 112.1 - Default to the same extent as if all terms of the Contract are contained in the bond(s).

Regarding claims related to any obligations covered by the bond, the Surety shall provide, within 60 Days of Receipt of written notice thereof, full payment of the entire claim or written notice of all bases upon which it is denying or contesting payment. Failure of the Surety to provide such notice within the 60-day period constitutes the Surety’s waiver of any right to deny or contest payment and the Surety’s acknowledgment that the claim is valid and undisputed.

## SECTION 202 REMOVING STRUCTURES AND OBSTRUCTIONS

202.02 Removing Buildings Make the following change to the last sentence in the final paragraph, change “...Code of Maine Regulations 401.” to “...Department of Environmental Protection Maine Solid Waste Management Rules, 06-096 CMR Ch. 401, Landfill Siting, Design and Operation.”

## SECTION 203 EXCAVATION AND EMBANKMENT

203.01 Description Under b. Rock Excavation; add the following sentence: “The use of perchlorate is not allowed in blasting operations.”

SECTION 502  
STRUCTURAL CONCRETE

502.05 Composition and Proportioning; TABLE #1; NOTE #2; third sentence; Change "...alcohol based saline sealer..." to "alcohol based silane sealer...". Add NOTE #6 to Class S Concrete.

502.0502 Quality Assurance Method A - Rejection by Resident Change the first sentence to read: "For an individual subplot with test results failing to meet the criteria in Table #1, or if the calculated pay factor for Air Content is less than 0.80....."

502.0503 Quality Assurance Method B - Rejection by Resident Change the first sentence to read: "For material represented by a verification test with test results failing to meet the criteria in Table #1, the Department will....."

502.0505 Resolution of Disputed Acceptance Test Results Combine the second and third sentence to read: "Circumstances may arise, however, where the Department may ....."

502.10 Forms and False work

D. Removal of Forms and False work 1., First paragraph; first, second, and third sentence; replace "forms" with "forms and false work"

502.11 Placing Concrete

G. Concrete Wearing Surface and Structural Slabs on Precast Superstructures Last paragraph; third sentence; replace "The temperature of the concrete shall not exceed 24° C [75° F] at the time of placement." with "The temperature of the concrete shall not exceed 24° C [75° F] at the time the concrete is placed in its final position."

502.15 Curing Concrete First paragraph; replace the first sentence with the following; "All concrete surfaces shall be kept wet with clean, fresh water for a curing period of at least 7 days after concrete placing, with the exception of vertical surfaces as provided for in Section 502.10 (D) - Removal of Forms and False work."

Second paragraph; delete the first two sentences.

Third paragraph; delete the entire paragraph which starts "When the ambient temperature...."

Fourth paragraph; delete "approved" to now read "...continuously wet for the entire curing period..."

Fifth paragraph; second sentence; change "...as soon as it is possible to do so without damaging the concrete surface." to "...as soon as possible."

Seventh paragraph; first sentence; change "...until the end of the curing period." to "...until the end of the curing period, except as provided for in Section 502.10(D) - Removal of Forms and False work."

502.19 Basis of Payment First paragraph, second sentence; add "pier nose armor" to the list of items included in the contract price for concrete.

### SECTION 503 REINFORCING STEEL

503.06 Placing and Fastening Change the second paragraph, first sentence from: "All tack welding shall be done in accordance with Section 504, Structural Steel." to "All tack welding shall be done in accordance with AWS D1.4 Structural Welding Code - Reinforcing Steel."

### SECTION 504 STRUCTURAL STEEL

504.09 Facilities for Inspection Add the follow as the last paragraph: "Failure to comply with the above requirements will be consider to be a denial to allow access to work by the Contractor. The Department will reject any work done when access for inspection is denied."

504.18 Plates for Fabricated Members Change the second paragraph, first sentence from: "...ASTM A 898/A 898 M..." to "...ASTM A 898/A 898 M or ASTM A 435/A 435 M as applicable and..."

504.31 Shop Assembly Add the following as the last sentence: "The minimum assembly length shall include bearing centerlines of at least two substructure units."

504.64 Non Destructive Testing-Ancillary Bridge Products and Support Structures Change the third paragraph, first sentence from "One hundred percent..." to "Twenty five percent..."

### SECTION 535 PRECAST, PRESTRESSED CONCRETE SUPERSTRUCTURE

535.02 Materials Change "Steel Strand for Concrete Reinforcement" to "Steel Strand." Add the following to the beginning of the third paragraph; "Concrete shall be Class P conforming to the requirements in this section. 28 day compressive strength shall be as stated on the plans. Coarse aggregate...."

535.05 Inspection Facilities Add the follow as the last paragraph: "If the above requirements are not met, the Contractor shall be considered to be in violation of Standard Specification 104.2.5 – Right to Inspect Work. All work occurring during a violation of this specification will be rejected."

535.26 Lateral Post-Tensioning Replace the first paragraph; "A final tension..." with "Overstressing strands for setting losses cannot be accomplished for chuck to chuck lengths of 7.6 m [25 ft] and less. In such instances, refer to the Plans for all materials and methods. Otherwise, post-tensioning shall be in accordance with PCI standards and shall provide the anchorage force noted in the Plans. The applied jacking force shall be no less than 100% of the design jacking force."

SECTION 603  
PIPE CULVERTS AND STORM DRAINS

603.0311 Corrugated Polyethylene Pipe for Option III Replace the Minimum Mandrel Diameter Table with the following:

Nominal Size US Customary (in)	Minimum Mandrel Diameter (in)	Nominal Size Metric (mm)	Minimum Mandrel Diameter (mm)
12	11.23	300	280.73
15	14.04	375	350.91
18	16.84	450	421.09
24	22.46	600	561.45
30	28.07	750	701.81
36	33.69	900	842.18
42	39.30	1050	982.54
48	44.92	1200	1122.90

SECTION 604  
MANHOLES, INLETS, AND CATCH BASINS

604.02 Materials Add the following:

“Tops and Traps	712.07
Corrugated Metal Units	712.08
Catch Basin and Manhole Steps	712.09”

SECTION 605  
UNDERDRAINS

605.05 Underdrain Outlets Make the following change:

In the first paragraph, second sentence, delete the words “metal pipe”.

SECTION 606  
GUARDRAIL

606.02 Materials Delete the entire paragraph which reads “The sole patented supplier of multiple mailbox...” and replace with “Acceptable multiple mailbox assemblies shall be listed on the Department’s Approved Products List and shall be NCHRP 350 tested and approved.” Delete the entire paragraph which reads “Retroreflective beam guardrail delineators...” and replace with “Reflectorized sheeting for Guardrail Delineators shall meet the requirements of Section 719.01 - Reflective Sheeting. Delineators shall be fabricated from high-impact, ultraviolet and weather resistant thermoplastic.

606.09 Basis of Payment First paragraph; delete the second and third sentence in their entirety and replace with “Butterfly-type guardrail reflectorized delineators shall be mounted on all W-beam guardrail at an interval of every 10 posts [62.5 ft] on tangents sections and every 5 posts [31.25 ft] on curved sections as directed by the Resident. On divided highways, the delineators shall be yellow on the left hand side and silver/white on the right hand side. On two-way

roadways, the delineators shall be silver/white on the right hand side. All delineators shall have retroreflective sheeting applied to only the traffic facing side. Reflectorized guardrail delineators will not be paid for directly, but will be considered incidental to the guardrail items.”

## SECTION 609 CURB

609.04 Bituminous Curb f., Delete the requirement “Color Natural (White)”

## SECTION 615 LOAM

615.02 Materials Make the following change:

<u>Organic Content</u>	<u>Percent by Volume</u>
Humus	“5% - 10%”, as determined by Ignition Test

## SECTION 618 SEEDING

618.01 Description Change the first sentence to read as follows: “This work shall consist of furnishing and applying seed .....” Also remove “,and cellulose fiber mulch” from 618.01(a).

618.03 Rates of Application In 618.03(a), remove the last sentence and replace with the following: “These rates shall apply to Seeding Method 2, 3, and Crown Vetch.”

In 618.03(c) “1.8 kg [4 lb]/unit.” to “1.95 kg [4 lb]/unit.”

618.09 Construction Method In 618.09(a) 1, sentence two, replace “100 mm [4 in]” with “25 mm [1 in] (Method 1 areas) and 50 mm [2 in] (Method 2 areas)”

618.15 Temporary Seeding Change the Pay Unit from Unit to Kg [lb].

## SECTION 620 GEOTEXTILES

620.03 Placement Section (c)

Title: Replace “Non-woven” in title with “Erosion Control”.

First Paragraph: Replace first word “Non-woven” with “Woven monofilament”.

Second Paragraph: Replace second word “Non-woven” with “Erosion Control”.

620.07 Shipment, Storage, Protection and Repair of Fabric Section (a)

Replace the second sentence with the following: “Damaged geotextiles, as identified by the Resident, shall be repaired immediately.”

620.09 Basis of Payment

Pay Item 620.58: Replace “Non-woven” with “Erosion Control”

Pay Item 620.59: Replace “Non-woven” with “Erosion Control”

## SECTION 621 LANDSCAPING

621.0036 Establishment Period In paragraph 4 and 5, change “time of Final Acceptance” to “end of the period of establishment”. In Paragraph 7, change “Final Acceptance date” to “end of the period of establishment” and change “date of Final Acceptance” to “end of the period of establishment”.

## SECTION 626 HIGHWAY SIGNING

626.034 Concrete Foundations Add to the following to the end of the second paragraph: “Pre-cast and cast-in-place foundations shall be warranted against leaning and corrosion for two years after the project is completed. If the lean is greater than 2 degrees from normal or the foundation is spalling within the first two years, the Contractor shall replace the foundation at no extra cost.”

## SECTION 627 PAVEMENT MARKINGS

627.10 Basis of Payment Add to the following to the end of the third paragraph: “If allowed by Special Provision, the Contractor may utilize Temporary Bi-Directional Yellow and White(As required) Delineators as temporary pavement marking lines and paid for at the contract lump sum price. Such payment will include as many applications as required and removal.”

## SECTION 637 DUST CONTROL

637.06 Basis of Payment Add the following after the second sentence of the third paragraph: “Failure by the Contractor to follow Standard Specification or Special Provision - Section 637 and/or the Contractor’s own Soil Erosion and Pollution Control Plan concerning Dust Control and/or the Contractor’s own Traffic Control Plan concerning Dust Control and/or visible evidence of excessive dust problems, as determined by the Resident, will result in a reduction in payment, computed by reducing the Lump Sum Total by 5% per occurrence per day. The Department’s Resident or any other representative of the Department reserves the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Department shall not be held responsible for any delay in the work due to any suspension under this item. Additional penalties may also be assessed in accordance with Special Provision 652 - Work Zone Traffic Control and Standard Specification 656 - Temporary Soil Erosion and Water Pollution Control.”

## SECTION 639 ENGINEERING FACILITIES

639.04 Field Offices Change the forth to last paragraph from: “The Contractor shall provide a fully functional desktop copier...” to “...desktop copier/scanner...”

## SECTION 652

### MAINTENANCE OF TRAFFIC

652.2.3 Flashing Arrow Board Delete the existing 5 paragraphs and replace with the following: Flashing Arrow Panels (FAP) must be of a type that has been submitted to AASHTO's National Transportation Product Evaluation Program (NTPEP) for evaluation and placed on the Maine Department of Transportation's Approved Products List of Portable Changeable Message Signs & Flashing Arrow Panels.

FAP units shall meet requirements of the current Manual on Uniform Traffic Control Devices (MUTCD) for Type "C" panels as described in Section 6F.56 - Temporary Traffic Control Devices. An FAP shall have matrix of a minimum of 15 low-glare, sealed beam, Par 46 elements capable of either flashing or sequential displays as well as the various operating modes as described in the MUTCD, Chapter 6-F. If an FAP consisting of a bulb matrix is used, each element should be recess-mounted or equipped with an upper hood of not less than 180 degrees. The color presented by the elements shall be yellow.

FAP elements shall be capable of at least a 50 percent dimming from full brilliance. Full brilliance should be used for daytime operation and the dimmed mode shall be used for nighttime operation. FAP shall be at least 2.4 M x 1.2 M [96" x 48"] and finished in non-reflective black. The FAP shall be interpretable for a distance not less than 1.6 km [1 mile].

Operating modes shall include, flashing arrow, sequential arrow, sequential chevron, flashing double arrow, and flashing caution. In the three arrow signals, the second light from the arrow point shall not operate.

The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 nor more than 40 flashes per minute. All on-board circuitry shall be solid state.

Primary power source shall be 12 volt solar with a battery back-up to provide continuous operation when failure of the primary power source occurs, up to 30 days with fully charged batteries. Batteries must be capable of being charged from an onboard 110 volt AC power source and the unit shall be equipped with a cable for this purpose.

Controller and battery compartments shall be enclosed in lockable, weather-tight boxes. The FAP shall be mounted on a pneumatic-tired trailer or other suitable support for hauling to various locations, as directed. The minimum mounting height of an arrow panel should be 2.1 M [7 feet] from the roadway to the bottom of the panel.

The face of the trailer shall be delineated on a permanent basis by affixing retro-reflective material, known as conspicuity material, in a continuous line as seen by oncoming drivers.

A portable changeable message sign may be used to simulate an arrow panel display."

652.2.4 Other Devices Delete the last paragraph and add the following:  
"652.2.5 Portable Changeable Message Sign Trailer mounted Portable Changeable Message Signs (PCMS) must be of a type that has been submitted to AASHTO's National

Transportation Product Evaluation Program (NTPEP) for evaluation and placed on the Maine Department of Transportations' Approved Products List of Portable Changeable Message Signs & Flashing Arrow Panels. The PCMS unit shall meet or exceed the current specifications of the Manual on Uniform Traffic Control Devices (MUTCD), 6F.55.

The front face of the sign should be covered with a low-glare protective material. The color of the LED elements shall be amber on a black background. The PCMS should be visible from a distance of 0.8 km [0.5 mile] day and night and have a minimum 15° viewing angle. Characters must be legible from a distance of at least 200 M [650 feet].

The message panel should have adjustable display rates (minimum of 3 seconds per phase), so that the entire message can be read at least twice at the posted speed, the off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed. Each message shall consist of either one or two phases. A phase shall consist of up to eight characters per line. The unit must be capable of displaying at least three lines of text with eight characters per line. Each character shall be 457 mm [18"] high. Each character module shall use at least a five wide and seven high pixel matrix. The text of the messages shall not scroll or travel horizontally or vertically across the face of the sign.

Units shall automatically adjust their brightness under varying light conditions to maintain legibility.

The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable. Message must be changeable with either a notebook computer or an on-board keypad. The controller shall have the capability to store a minimum of 200 user-defined and 200 pre-programmed messages. Controller and battery compartments shall be enclosed in lockable, weather-tight boxes.

PCMS units shall have the capability of being made programmable by means of wireless communications. PCMS units shall also be fully capable of having an on-board radar system installed if required for a particular application.

PCMS' primary power source shall be solar with a battery back-up to provide continuous operation when failure of the primary power source occurs. Batteries must be capable of being charged from a 110 volt AC power source. The unit must also be capable of being operated solely from a 110 volt AC power source and be equipped with a cable for this purpose.

The PCMS shall be mounted on a trailer in such a way that the bottom of the message sign panel shall be a minimum of 2.1 M [7 ft] above the roadway in urban areas and 1.5 M [5 ft] above the roadway in rural areas when it is in the operating mode. PCMS trailers should be of a heavy duty type with a 51 mm [2"] ball hitch and a minimum of four leveling jacks (at each corner). The sign shall be capable of being rotated 360° relative to the trailer. The face of the trailer shall be delineated on a permanent basis by affixing retro-reflective material, known as conspicuity material, in a continuous line as seen by oncoming drivers."

652.3.3 Submittal of Traffic Control Plan In item e. change "A list of all certified flaggers..." to "A list of all the Contractor's certified flaggers..."

In the last paragraph add the following as the second sentence: “The Department will review and provide comments to the Contractor within 14 days of receipt of the TCP.”

652.3.5 Installation of Traffic Control Devices In the first paragraph, first sentence; change “Signs shall be erected...” to “Portable signs shall be erected..” In the third sentence; change “Signs must be erected so that the sign face...” to “Post-mounted signs must also be erected so that the sign face...”

652.4 Flaggers Replace the first paragraph with the following; “The Contractor shall furnish flaggers as required by the TCP or as otherwise specified by the Resident. All flaggers must have successfully completed a flagger test approved by the Department and administered by a Department-approved Flagger-Certifier who is employing that flagger. All flaggers must carry an official certification card with them while flagging that has been issued by their employer. Flaggers shall wear safety apparel meeting ANSI 107-1999 Class 2 risk exposure and clearly identify the wearer as a person, shall be visible at a minimum distance of 300 m [1000 ft], and shall wear a hardhat with retroreflectivity. For nighttime conditions, Class 3 apparel should be considered, retroreflective or flashing SLOW/STOP paddles shall be used, and except in emergency situations the flagger station shall be illuminated to assure visibility.”

Second paragraph, first sentence; change “...have sufficient distance to stop before entering the workspace.” to “...have sufficient distance to stop at the intended stopping point.” Third sentence; change “At a spot obstruction...” to “At a spot obstruction with adequate sight distance,...”

Fourth paragraph, delete and replace with “Flaggers shall be provided as a minimum, a 10 minute break, every 2 hours and a 30 minute or longer lunch period away from the work station. Flaggers may only receive 1 unpaid break per day; all other breaks must be paid. Sufficient certified flaggers shall be available onsite to provide for continuous flagging operations during break periods. Breaker flaggers will not be paid for separately, but shall be considered incidental to the appropriate pay item.”

652.8.2 Other Items Replace the last paragraph with the following: “There will be no payment made under any 652 pay items after the expiration of the adjusted total contract time.”

## SECTION 653 POLYSTYRENE PLASTIC INSULATION

653.05 Placing Backfill In the second sentence; change “...shall be not less than 150 mm [6 in] loose measure.” to “...shall be not less than 250 mm [10 in] loose measure.” In the third sentence; change “...crawler type bulldozer of not more than 390 kg/m<sup>2</sup> [80 lb/ft<sup>2</sup>] ground contact pressure...” to “...crawler type bulldozer of not more than 4875 kg/m<sup>2</sup> [2000 lb/ft<sup>2</sup>] ground contact pressure...”

653.06 Compaction In the last sentence; change “...not more than 390 kg/m<sup>2</sup> [80 lb/ft<sup>2</sup>] ground contact...” to “...not more than 4875 kg/m<sup>2</sup> [2000 lb/ft<sup>2</sup>] ground contact...”

## SECTION 656

### TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL

656.5.1 If Pay Item 656.75 Provided Replace the second paragraph with the following: "Failure by the Contractor to follow Standard Specification or Special Provision - Section 656 and/or the Contractor's own Soil Erosion and Pollution Control Plan will result in a reduction in payment, computed by reducing the Lump Sum Total by 5% per occurrence per day. The Department's Resident or any other representative of the Department reserves the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Department shall not be held responsible for any delay in the work due to any suspension under this item."

## SECTION 701

### STRUCTURAL CONCRETE RELATED MATERIALS

701.10 Fly Ash - Chemical Requirements Change all references from "ASTM C311" to "ASTM C114".

## SECTION 703

### AGGREGATES

703.05 Aggregate for Sand Leveling Change the percent passing the 9.5 mm [3/8 in] sieve from "85 - 10" to "85 - 100"

703.06 Aggregate for Base and Subbase Delete the first paragraph: "The material shall have..." and replace with "The material shall have a minimum degradation value of 15 as determined by Washington State DOT Test Method T113, Method of Test for Determination of Degradation Value (March 2002 version), except that the reported degradation value will be the result of testing a single specimen from that portion of a sample that passes the 12.5 mm [1/2 in] sieve and is retained on the 2.00 mm [No. 10] sieve, minus any reclaimed asphalt pavement used."

703.07 Aggregates for HMA Pavements Delete the fourth paragraph: "The composite blend shall have..." and replace with "The composite blend, minus any reclaimed asphalt pavement used, shall have a Micro-Deval value of 18.0 or less as determined by AASHTO T 327. In the event the material exceeds the Micro Deval limit, a Washington Degradation test shall be performed. The material shall be acceptable if it has a value of 30 or more as determined by Washington State DOT Test Method T 113, Method of Test for Determination of Degradation Value (March 2002 version) except that the reported degradation value will be the result of testing a single composite specimen from that portion of the sample that passes the 12.5mm [1/2 inch] sieve and is retained on the 2.00mm [No 10] sieve, minus any reclaimed asphalt pavement used."

703.18 Common Borrow Replace the first paragraph with the following: "Common borrow shall consist of earth, suitable for embankment construction. It shall be free from frozen material, perishable rubbish, peat, and other unsuitable material including material currently or

previously contaminated by chemical, radiological, or biological agents unless the material is from a DOT project and authorized by DEP for use.”

703.22 Underdrain Backfill Material Change the first paragraph from “...for Underdrain Type B...” to “...for Underdrain Type B and C...”

## SECTION 706 NON-METALLIC PIPE

706.06 Corrugated Polyethylene Pipe for Underdrain, Option I and Option III Culvert Pipe Change the first sentence from “...300 mm diameters to 900 mm” to “...300 mm diameters to 1200 mm” Delete, in it’s entirety, the last sentence which begins “This pipe and resins...” and replace with the following; “The manufacturing plants of polyethylene pipe shall be certified by the Eastern States Consortium. Polyethylene pipe shall be accepted based on third party certification by the AASHTO’s National Transportation Product Evaluation Program.”

## SECTION 709 REINFORCING STEEL AND WELDED STEEL WIRE FABIC

709.03 Steel Strand Change the second paragraph from “...shall be 12mm [½ inch] AASHTO M203M/M203 (ASTM A416/A416M)...” to “...shall be 15.24 mm [0.600 inch] diameter AASHTO M203 (ASTM A416)...”

## SECTION 710 FENCE AND GUARDRAIL

710.03 Chain Link Fabric Add the following sentence: “Chain Link fabric for PVC coated shall conform to the requirements of AASHTO M181, Type IV-Class B.”

710.07 Guardrail Posts Section b. change “...AASHTO M183/M183M...” to “...AASHTO M 270M/M 270 Grade 250 (36)...”

## SECTION 712 MISCELLANEOUS HIGHWAY MATERIALS

712.06 Precast Concrete Units In the first paragraph, change “...ASTM C478M...” to “...AASHTO M199...” Delete the second paragraph and replace with the following; “Approved structural fibers may be used as a replacement of 6 x 6 #10 gauge welded wire fabric when used at an approved dosage rate for the construction of manhole and catch basin units. The material used shall be one of the products listed on the Maine Department of Transportation’s Approved Product List of Structural Fiber Reinforcement.” Delete the fifth paragraph and replace with the following; “The concrete mix design shall be approved by the Department. Concrete shall contain 6% air content, plus or minus 1½% tolerance when tested according to AASHTO T152. All concrete shall develop a minimum compressive strength of 28 MPa [4000 psi] in 28 days when tested according to AASHTO T22. The absorption of a specimen, when tested according to AASHTO T280, Test Method “A”, shall not exceed nine percent of the dry mass.”

Add the following:

“712.07 Tops, and Traps These metal units shall conform to the plan dimensions and to the following specification requirements for the designated materials.

Gray iron or ductile iron castings shall conform to the requirements of AASHTO M306 unless otherwise designated.

712.08 Corrugated Metal Units The units shall conform to plan dimensions and the metal to AASHTO M36/M36M. Bituminous coating, when specified, shall conform to AASHTO M190 Type A.

712.09 Catch Basin and Manhole Steps Steps for catch basins and for manholes shall conform to ASTM C478M [ASTM C478], Section 13 for either of the following material:

- (a) Aluminum steps-ASTM B221M, [ASTM B211] Alloy 6061-T6 or 6005-T5.
- (b) Reinforced plastic steps Steel reinforcing bar with injection molded plastic coating copolymer polypropylene. Polypropylene shall conform to ASTM D 4101.

712.23 Flashing Lights Flashing Lights shall be power operated or battery operated as specified.

- (a) Power operated flashing lights shall consist of housing, adapters, lamps, sockets, reflectors, lens, hoods and other necessary equipment designed to give clearly visible signal indications within an angle of at least 45 degrees and from 3 to 90 m [10 to 300 ft] under all light and atmospheric conditions.

Two circuit flasher controllers with a two-circuit filter capable of providing alternate flashing operations at the rate of not less than 50 nor more than 60 flashes per minute shall be provided.

The lamps shall be 650 lumens, 120 volt traffic signal lamps with sockets constructed to properly focus and hold the lamp firmly in position.

The housing shall have a rotatable sun visor not less than 175 mm [7 in] in length designed to shield the lens.

Reflectors shall be of such design that light from a properly focused lamp will reflect the light rays parallel. Reflectors shall have a maximum diameter at the point of contact with the lens of approximately 200 mm [8 in].

The lens shall consist of a round one-piece convex amber material which, when mounted, shall have a visible diameter of approximately 200 mm [8 in]. They shall distribute light and not diffuse it. The distribution of the light shall be asymmetrical in a downward direction. The light distribution of the lens shall not be uniform, but shall consist of a small high intensity portion with narrow distribution for long distance throw and a larger low intensity portion with wide distribution for short distance throw. Lenses shall be marked to indicate the top and bottom of the lens.

(b) Battery operated flashing lights shall be self-illuminated by an electric lamp behind the lens. These lights shall also be externally illuminated by reflex-reflective elements built into the lens to enable it to be seen by reflex-reflection of the light from the headlights of oncoming traffic. The batteries must be entirely enclosed in a case. A locking device must secure the case. The light shall have a flash rate of not less than 50 nor more than 60 flashes per minute from minus 30 °C [minus 20 °F] to plus 65 °C [plus 150 °F]. The light shall have an on time of not less than 10 percent of the flash cycle. The light beam projected upon a surface perpendicular to the axis of the light beam shall produce a lighted rectangular projection whose minimum horizontal dimension shall be 5 degrees each side of the horizontal axis. The effective intensity shall not have an initial value greater than 15.0 candelas or drop below 4.0 candelas during the first 336 hours of continuous flashing. The illuminated lens shall appear to be uniformly bright over its entire illuminated surface when viewed from any point within an angle of 9 degrees each side of the vertical axis and 5 degrees each side of the horizontal axis. The lens shall not be less than 175 mm [7 in] in diameter including a reflex-reflector ring of 13 mm [½ in] minimum width around the periphery. The lens shall be yellow in color and have a minimum relative luminous transmittance of 0.440 with a luminance of 2854° Kelvin. The lens shall be one-piece construction. The lens material shall be plastic and meet the luminous transmission requirements of this specification. The case containing the batteries and circuitry shall be constructed of a material capable of withstanding abuse equal to or greater than 1.21 mm thick steel [No. 18 U.S. Standard Gage Steel]. The housing and the lens frame, if of metal shall be properly cleaned, degreased and pretreated to promote adhesion. It shall be given one or more coats of enamel which, when dry shall completely obscure the metal. The enamel coating shall be of such quality that when the coated case is struck a light blow with a sharp tool, the paint will not chip or crack and if scratched with a knife will not powder. The case shall be so constructed and closed as to exclude moisture that would affect the proper operation of light. The case shall have a weep hole to allow the escape of moisture from condensation. Photoelectric controls, if provided, shall keep the light operating whenever the ambient light falls below 215 lx [20 foot candles]. Each light shall be plainly marked as to the manufacturer's name and model number.

If required by the Resident, certification as to conformance to these specifications shall be furnished based on results of tests made by an independent testing laboratory. All lights are subject to random inspection and testing. All necessary random samples shall be provided to the Resident upon request without cost to the Department. All such samples shall be returned to the Contractor upon completion of the tests.

712.32 Copper Tubing Copper tubing and fittings shall conform to the requirements of ASTM B88M Type A [ASTM B88, Type K] or better.

712.33 Non-metallic Pipe, Flexible Non-metallic pipe and pipe fittings shall be acceptable flexible pipe manufactured from virgin polyethylene polymer suitable for transmitting liquids intended for human or animal consumption.

712.34 Non-metallic Pipe, Rigid Non-metallic pipe shall be Schedule 40 polyvinylchloride (PVC) that meets the requirement of ASTM D1785. Fittings shall be of the same material.

712.341 Metallic Pipe Metallic pipe shall be ANSI, Standard B36.10, Schedule 40 steel pipe conforming to the requirements of ASTM A53 Types E or S, Grade B. End plates shall be steel conforming to ASTM A36/A36M.

Both the sleeve and end plates shall be hot dip galvanized. Pipe sleeve splices shall be welded splices with full penetration weld before galvanizing.

712.35 Epoxy Resin Epoxy resin for grouting or sealing shall consist of a mineral filled thixotropic, flexible epoxy resin having a pot life of approximately one hour at 10°C [50°F]. The grout shall be an approved product suitable for cementing steel dowels into the preformed holes of curb inlets and adjacent curbing. The sealant shall be an approved product, light gray in color and suitable for coating the surface.

712.36 Bituminous Curb The asphalt cement for bituminous curb shall be of the grade required for the wearing course, or shall be Viscosity Grade AC-20 meeting the current requirements of Subsection 702.01 Asphalt Cement. The aggregate shall conform to the requirements of Subsection 703.07. The coarse aggregate portion retained on the 2.36 mm [No. 8] sieve may be either crushed rock or crushed gravel.

The mineral constituents of the bituminous mixture shall be sized and graded and combined in a composite blend that will produce a stable durable curbing with an acceptable texture.

Bituminous material for curb shall meet the requirements of Section 403 - Hot Bituminous Pavement.

712.37 Precast Concrete Slab Portland cement concrete for precast slabs shall meet the requirements of Section 502 - Structural Concrete, Class A.

The slabs shall be precast to the dimension shown on the plans and cross section and in accordance with the Standard Detail plans for Concrete Sidewalk Slab. The surface shall be finished with a float finish in accordance with Subsection 502.14(c). Lift devices of sufficient strength to hold the slab while suspended from cables shall be cast into the top or back of the slab.

712.38 Stone Slab Stone slabs shall be of granite from an acceptable source, hard, durable, predominantly gray in color, free from seams which impair the structural integrity and be of smooth splitting character. Natural color variations characteristic of the deposit will be permitted. Exposed surfaces shall be free from drill holes or indications of drill holes. The granite slabs in any one section of backslope must be all the same finish.

The granite slabs shall be scabble dressed or sawed to an approximately true plane having no projections or depressions over 13 mm [ $\frac{1}{2}$  in] under a 600 mm [2 ft] straightedge or over 25 mm [1 in] under a 1200 mm [4 ft] straightedge. The arris at the intersection of the top surface and exposed front face shall be pitched so that the arris line is uniform throughout the length of the installed slabs. The sides shall be square to the exposed face unless the slabs are to be set on a radius or other special condition which requires that the joints be cut to fit, but in any case shall be so finished that when the stones are placed side by side no space more than 20 mm [ $\frac{3}{4}$  in] shall show in the joint for the full exposed height.

Liftpin holes in all sides will be allowed except on the exposed face.

SECTION 717  
ROADSIDE IMPROVEMENT MATERIAL

717.03 C. Method #3 - Roadside Mixture #3 Change the seed proportions to the following:

Crown Vetch	25%
Perennial Lupine	25%
Red Clover	12.5%
Annual Rye	37.5%

717.05 Mulch Binder Change the third sentence to read as follows:

“Paper fiber mulch may be used as a binder at the rate of 2.3 kg/unit [5 lb/unit].”

SECTION 720  
STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND  
TRAFFIC SIGNALS

720.08 U-Channel Posts Change the first sentence from “..., U-Channel posts...” to “..., Rib Back U-Channel posts...”

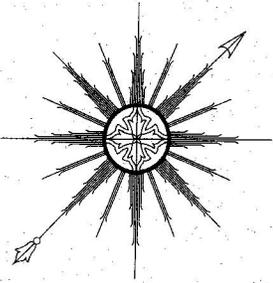
SECTION 722  
GEOTEXTILES

722.01 Stabilization/Reinforcement Geotextile Add the following to note #3; “The strengths specified in the columns labeled”<50%” and “≥ 50%” refer to the elongation at which the geotextile material was tested. For example; if a fabric is tested at 15% elongation then it must meet or exceed the minimum strength shown in the “<50%” column. Submittals must include the percent elongation at which the material was tested.”

722.02 Drainage Geotextile Add the following to note #3; “The strengths specified in the columns labeled”<50%” and “≥ 50%” refer to the elongation at which the geotextile material was tested. For example; if a fabric is tested at 15% elongation then it must meet or exceed the minimum strength shown in the “<50%” column. Submittals must include the percent elongation at which the material was tested.”

722.01 Erosion Control Geotextile Add the following note to Elongation in the Mechanical Property Table; “The strengths specified in the columns labeled”<50%” and “≥ 50%” refer to the elongation at which the geotextile material was tested. For example; if a fabric is tested at 15% elongation then it must meet or exceed the minimum strength shown in the “<50%” column. Submittals must include the percent elongation at which the material was tested.”





# ALL-POINTS TECHNOLOGY CORPORATION, P.C.

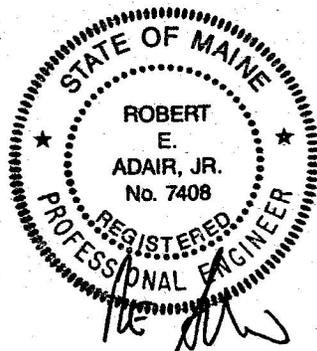
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## STRUCTURAL ANALYSIS REPORT 180' SELF-SUPPORTING TOWER COOPER, MAINE

Prepared for  
MACRO Corporation

**Site: Cooper Mountain**

August 31, 2007



APT Project #ME247270

**STRUCTURAL ANALYSIS REPORT**  
**180' SELF-SUPPORTING TOWER**  
**COOPER, MAINE**  
prepared for  
**Macro Corporation**

**EXECUTIVE SUMMARY:**

All-Points Technology Corporation, P.C. (APT) performed a structural analysis of this 180-foot self-supporting tower. The analysis was performed for additional antennas as detailed below.

Our analysis indicates the tower meets the requirements of TIA-222 and IBC 2003 with the proposed additions.

**INTRODUCTION:**

A structural analysis was performed on the above-mentioned communications tower by APT for Macro Corporation. The tower is located on Cooper Mountain in Washington County, Maine.

The structure is a 180-foot galvanized steel self-supporting tower manufactured by Radian Communications. APT did not visit the tower site. This analysis relied solely on information provided by others, which included ROHN tower and foundation drawings, Engineering File No. 0602414 dated January 2006; recent photographs; and existing and proposed loading.

The analysis was performed in accordance with TIA-222 Revision G using the following antenna inventory:

<b>Antenna</b>	<b>Elev.</b>	<b>Mount</b>	<b>Coax.</b>
Sinclair SRL 110A-2	160'	4' sidearm	7/8"
Sinclair SY350 yagi	140'	4' sidearm	7/8"
Andrew/Decibel ASP-682	120'	4' sidearm	7/8"
Decibel DB224	120'	4' sidearm	7/8"
Decibel DB224	108'	4' sidearm	7/8"
Decibel DB224	100'	4' sidearm	7/8"
Andrew 4' dish with radome (P4-9C)	100'	Pipe on leg	1-1/4"
Decibel DB224	98'	4' sidearm	7/8"
Sinclair SV3022 corner reflector	80'	Leg	7/8"

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All-Points Technology Corporation

150 Old Westside Road  
North Conway, NH 03860  
(603) 496-5853

3 Saddlebrook Drive  
Killingworth, CT 06419  
(860) 663-1697

## STRUCTURAL ANALYSIS:

### Methodology:

The structural analysis was done in accordance with TIA-222, Revision G (TIA), Structural Standard for Antenna Supporting Structures and Antennas; and the Maine Model Building Code, IBC 2003.

The analysis was conducted using a 3-second gust wind speed of 100 miles per hour with no ice and 50-mph with 3/4" radial ice, exceeding requirements of the TIA-222-G standard for Washington County, Maine. The following additional design criteria were used:

Structure Class: III (essential communications facility)  
Topographic Category: 1  
Exposure Category: B

### Analysis:

Our analysis determined the existing tower is capable of supporting the proposed antennas and associated equipment. The following table summarizes the results of the analysis based on stresses of individual leg and bracing members:

Elevation	Leg Capacity	Bracing Capacity
160'-180'	3%	8%
140'-160'	15%	18%
120'-140'	25%	15%
100'-120'	33%	20%
80'-100'	36%	29%
60'-80'	36%	43%
40'-60'	29%	27%
20'-40'	38%	48%
0'-20'	44%	39%

### Splice, Bracing, and Anchor Bolts:

The structure's connection bolts were evaluated under the proposed loading. All bolts were found to be adequately sized.

### Base Foundations:

The base foundations were evaluated from manufacturer's drawings provided. The foundations were found to be adequate.

Base reactions imposed with the proposed antenna changes were calculated as follows:

Uplift:	100.8 kips
Compression:	131.5 kips
Shear:	14.0 kips
Overturning Moment:	1964 ft-kips

### **CONCLUSIONS AND RECOMMENDATIONS:**

Our structural analysis indicates the 180-foot self-supporting tower located on Cooper Mountain in Washington County, Maine meets the requirements of TIA-222 and IBC 2003 with the proposed antenna changes.

### **LIMITATIONS:**

This report is based on the following:

1. Tower is properly installed and maintained.
2. All members are in non-corroded condition.
3. All required members are in place.
4. All bolts are in place and are properly tightened.
5. Tower is in plumb condition.

All-Points Technology Corporation, P.C. (APT) is not responsible for any modifications completed prior to or hereafter which APT is not or was not directly involved. Modifications include but are not limited to:

1. Replacing or reinforcing bracing members.
2. Reinforcing leg members in any manner.
3. Installing antenna mounts or side arms.
4. Extending tower.

APT hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations, and conclusions are based upon the information contained and set forth herein. If you are aware of any information which is contrary to that which is contained herein, or you are aware of any defects arising from the original design, material, fabrication and erection deficiencies, you should disregard this report and immediately contact APT. APT disclaims all liability for any representation, recommendation, or conclusion not expressly stated herein.

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All-Points Technology Corporation

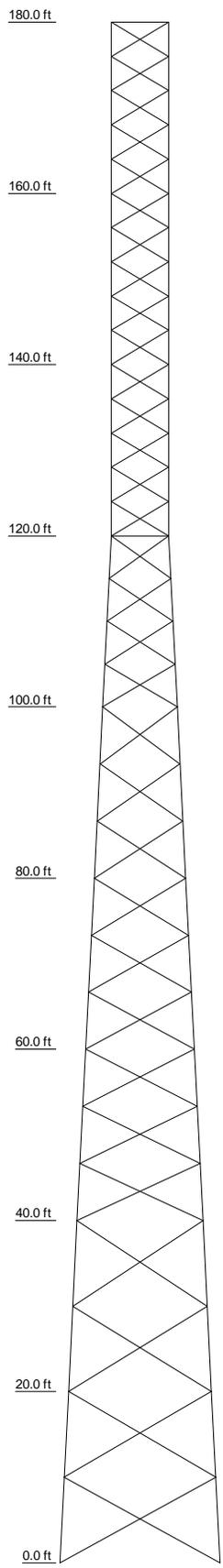
150 Old Westside Road  
North Conway, NH 03860  
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(860) 663-1697

# ***Appendix A***

*Tower Schematic*

Section	T1	T2	T3	T4	T5	T6	T7	T8	T9
Legs	SR 2 1/4		SR 2 1/2	SR 2 3/4	SR 3 1/4	SR 3 1/2	SR 4	SR 4 1/2	
Leg Grade					A572-50				
Diagonals	L1 3/4x1 3/4x3/16		L2x2x1/4		L2 1/2x2 1/2x3/16		L3x3x1/4		L3 1/2x3 1/2x1/4
Diagonal Grade					A36				
Top Girts	L2x2x1/8			L2x2x1/8			N.A.		
Face Width (ft)	6.59375				8.61024		12.6432		16.6762
# Panels @ (ft)			15 @ 4	4 @ 5		9 @ 6.66667		4 @ 10	
Weight (lb)		1300.8	1740.7	1944.8	2243.5	2705.7	3810.2	4345.8	4654.8
									24232.7



**DESIGNED APPURTENANCE LOADING**

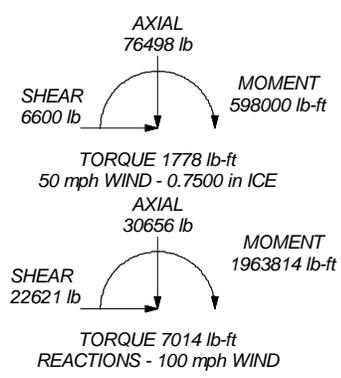
TYPE	ELEVATION	TYPE	ELEVATION
SRL110A-2	160	DB224-A	108
4' sidearm	160	4' sidearm	108
SY350	140	DB224-A	100
4' sidearm	140	4' sidearm	100
ASP-682	120	4' dish with radome	100
4' sidearm	120	4' sidearm	98
DB224-A	120	DB224-A	98
4' sidearm	120	SV3022	80

**MATERIAL STRENGTH**

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

**MAX. CORNER REACTIONS AT BASE:**

DOWN: 131529 lb  
 UPLIFT: -100836 lb  
 SHEAR: 13993 lb



<b>All-Points Technology Corp.</b> 150 Old Westside Road North Conway, NH 03860 Phone: 603-496-5853 FAX: 603-356-5214	<b>Job: 180' Self-Supporting Tower</b>		
	Project: <b>ME247270 Cooper Mtn</b>		
	Client: Macro Corp.	Drawn by: Robert E. Adair, P.E.	App'd:
	Code: TIA-222-G	Date: 08/31/07	Scale: NTS
	Path:		Dwg No. E-1

©Documents and Settings\Robert Adair\My Documents\Job\Main ME247270 Cooper Mtn\ME247270 Cooper Mtn.dwg

# ***Appendix B***

*Photographs*

MACRO CORPORATION  
180' SELF-SUPPORTING TOWER  
COOPER MOUNTAIN  
WASHINGTON COUNTY, MAINE



Photo showing existing antennas.

*Photo provided by Maine OIT.*

# *Appendix C*

*Calculations*

<b><i>RISATower</i></b>  <b><i>All-Points Technology Corp.</i></b> <i>150 Old Westside Road</i> <i>North Conway, NH 03860</i> <i>Phone: 603-496-5853</i> <i>FAX: 603-356-5214</i>	<b>Job</b>	180' Self-Supporting Tower	<b>Page</b>	1 of 6
	<b>Project</b>	ME247270 Cooper Mtn	<b>Date</b>	14:45:23 08/31/07
	<b>Client</b>	Macro Corp.	<b>Designed by</b>	Robert E. Adair, P.E.

## Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 ft above the ground line.

The face width of the tower is 6.59 ft at the top and 18.69 ft at the base.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Basic wind speed of 100 mph.

Structure Class III.

Exposure Category B.

Topographic Category 1.

Nominal ice thickness of 0.7500 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 50 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

Pressures are calculated at each section.

Stress ratio used in tower member design is 1.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

## Tower Section Geometry

<i>Tower Section</i>	<i>Tower Elevation</i>	<i>Assembly Database</i>	<i>Description</i>	<i>Section Width</i>	<i>Number of Sections</i>	<i>Section Length</i>
	<i>ft</i>			<i>ft</i>		<i>ft</i>
T1	180.00-160.00			6.59	1	20.00
T2	160.00-140.00			6.59	1	20.00
T3	140.00-120.00			6.59	1	20.00
T4	120.00-100.00			6.59	1	20.00
T5	100.00-80.00			8.61	1	20.00
T6	80.00-60.00			10.63	1	20.00
T7	60.00-40.00			12.64	1	20.00
T8	40.00-20.00			14.66	1	20.00
T9	20.00-0.00			16.68	1	20.00

<i>Tower Section</i>	<i>Tower Elevation</i>	<i>Diagonal Spacing</i>	<i>Bracing Type</i>	<i>Has K Brace End Panels</i>	<i>Has Horizontals</i>	<i>Top Girt Offset</i>	<i>Bottom Girt Offset</i>
	<i>ft</i>	<i>ft</i>				<i>in</i>	<i>in</i>
T1	180.00-160.00	4.00	X Brace	No	No	0.0000	0.0000
T2	160.00-140.00	4.00	X Brace	No	No	0.0000	0.0000
T3	140.00-120.00	4.00	X Brace	No	No	0.0000	0.0000
T4	120.00-100.00	5.00	X Brace	No	No	0.0000	0.0000
T5	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T6	80.00-60.00	6.67	X Brace	No	No	0.0000	0.0000
T7	60.00-40.00	6.67	X Brace	No	No	0.0000	0.0000
T8	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T9	20.00-0.00	10.00	X Brace	No	No	0.0000	0.0000

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	<b>Client</b>	Macro Corp.	<b>Designed by</b>	Robert E. Adair, P.E.

### Tower Section Geometry (cont'd)

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.00-160.00	Solid Round	2 1/4	A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T2 160.00-140.00	Solid Round	2 1/4	A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T3 140.00-120.00	Solid Round	2 1/2	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T4 120.00-100.00	Solid Round	2 3/4	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T5 100.00-80.00	Solid Round	3 1/4	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 80.00-60.00	Solid Round	3 1/2	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 60.00-40.00	Solid Round	4	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T8 40.00-20.00	Solid Round	4 1/2	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T9 20.00-0.00	Solid Round	4 1/2	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 180.00-160.00	Equal Angle	L2x2x1/8	A36 (36 ksi)			A36 (36 ksi)
T4 120.00-100.00	Equal Angle	L2x2x1/8	A36 (36 ksi)			A36 (36 ksi)

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.										
T1 180.00-160.00	Flange	0.8750 A325N	4	0.6250 A325N	1	0.6250 A325N	1	0.3750 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 160.00-140.00	Flange	0.8750 A325N	4	0.6250 A325N	1	0.3750 A325N	0	0.3750 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 140.00-120.00	Flange	0.8750 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 120.00-100.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 100.00-80.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 80.00-60.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 60.00-40.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 40.00-20.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T9 20.00-0.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

# RISATower

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150 Old Westside Road  
North Conway, NH 03860  
Phone: 603-496-5853  
FAX: 603-356-5214

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<b>Client</b>	Macro Corp.	<b>Designed by</b>	Robert E. Adair, P.E.

## Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
7/8	A	Yes	Ar (CaAa)	160.00 - 6.00	1	1	1.1100	1.1100		0.54
7/8	A	Yes	Ar (CaAa)	140.00 - 6.00	1	1	1.1100	1.1100		0.54
7/8	A	Yes	Ar (CaAa)	120.00 - 6.00	2	1	0.5000	1.1100		0.54
7/8	B	Yes	Ar (CaAa)	108.00 - 6.00	1	1	0.0000	1.1100		0.54
7/8	B	Yes	Ar (CaAa)	99.00 - 6.00	2	1	0.0000	1.1100		0.54
1 1/4	A	Yes	Ar (CaAa)	100.00 - 6.00	1	1	0.5000	1.5500		0.66
7/8	B	Yes	Ar (CaAa)	80.00 - 6.00	1	1	0.0000	1.1100		0.54

## Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	Placement ft	CAAA Front ft <sup>2</sup>	CAAA Side ft <sup>2</sup>	Weight lb	
SRL110A-2	A	From Leg	4.00	0.0000	160.00	No Ice	18.00	18.00	60.00
			0.00			1/2" Ice	21.94	21.94	182.00
			0.00			1" Ice	25.88	25.88	304.00
4' sidearm	A	None		0.0000	160.00	No Ice	2.43	1.22	50.00
						1/2" Ice	3.50	1.75	100.00
						1" Ice	4.50	2.25	175.00
SY350	A	From Leg	4.00	0.0000	140.00	No Ice	0.28	0.28	10.00
			0.00			1/2" Ice	0.42	0.42	12.62
			0.00			1" Ice	0.58	0.58	16.95
4' sidearm	A	None		0.0000	140.00	No Ice	2.43	1.22	50.00
						1/2" Ice	3.50	1.75	100.00
						1" Ice	4.50	2.25	175.00
ASP-682	A	From Leg	4.00	0.0000	120.00	No Ice	3.24	3.24	0.00
			0.00			1/2" Ice	4.88	4.88	24.97
			0.00			1" Ice	6.55	6.55	60.19
4' sidearm	A	None		0.0000	120.00	No Ice	2.43	1.22	50.00
						1/2" Ice	3.50	1.75	100.00
						1" Ice	4.50	2.25	175.00
DB224-A	C	From Leg	4.00	0.0000	120.00	No Ice	3.15	3.15	32.00
			0.00			1/2" Ice	5.67	5.67	41.60
			0.00			1" Ice	8.19	8.19	51.20
4' sidearm	C	None		0.0000	120.00	No Ice	2.43	1.22	50.00
						1/2" Ice	3.50	1.75	100.00
						1" Ice	4.50	2.25	175.00
DB224-A	C	From Leg	4.00	0.0000	108.00	No Ice	3.15	3.15	32.00
			0.00			1/2" Ice	5.67	5.67	41.60
			0.00			1" Ice	8.19	8.19	51.20
4' sidearm	C	None		0.0000	108.00	No Ice	2.43	1.22	50.00
						1/2" Ice	3.50	1.75	100.00
						1" Ice	4.50	2.25	175.00
DB224-A	C	From Leg	4.00	0.0000	100.00	No Ice	3.15	3.15	32.00
			0.00			1/2" Ice	5.67	5.67	41.60
			0.00			1" Ice	8.19	8.19	51.20
4' sidearm	C	None		0.0000	100.00	No Ice	2.43	1.22	50.00
						1/2" Ice	3.50	1.75	100.00
						1" Ice	4.50	2.25	175.00
DB224-A	A	From Leg	4.00	0.0000	98.00	No Ice	3.15	3.15	32.00
			0.00			1/2" Ice	5.67	5.67	41.60
			0.00			1" Ice	8.19	8.19	51.20
4' sidearm	A	None		0.0000	98.00	No Ice	2.43	1.22	50.00
						1/2" Ice	3.50	1.75	100.00

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight	
			Horz Lateral Vert ft	°						ft
SV3022	A	None			0.0000	80.00	1" Ice	4.50	2.25	175.00
							No Ice	1.04	0.51	30.00
							1/2" Ice	2.08	1.04	50.00
							1" Ice	3.13	1.56	70.00

### Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight	
				Horz Lateral Vert ft	°							°
4' dish with radome	A	Paraboloid w/Radome	From Leg	1.00	0.0000			100.00	4.00	No Ice	12.57	150.00
										1/2" Ice	13.10	217.22
										1" Ice	13.62	284.44

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## Solution Summary

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	1.245	12	0.0599	0.0263
T2	160 - 140	0.992	12	0.0593	0.0263
T3	140 - 120	0.743	12	0.0548	0.0181
T4	120 - 100	0.525	12	0.0447	0.0127
T5	100 - 80	0.355	12	0.0331	0.0083
T6	80 - 60	0.225	12	0.0243	0.0049
T7	60 - 40	0.128	12	0.0165	0.0025
T8	40 - 20	0.062	12	0.0102	0.0014
T9	20 - 0	0.020	12	0.0052	0.0006

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	6.315	2	0.3028	0.1343
T2	160 - 140	5.040	2	0.3001	0.1342
T3	140 - 120	3.778	2	0.2774	0.0926
T4	120 - 100	2.669	2	0.2269	0.0647
T5	100 - 80	1.808	2	0.1679	0.0423
T6	80 - 60	1.148	2	0.1237	0.0250
T7	60 - 40	0.653	2	0.0840	0.0128
T8	40 - 20	0.319	2	0.0521	0.0069
T9	20 - 0	0.104	2	0.0264	0.0028

## Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load/Allowable	Allowable Ratio	Criteria
T1	180	Leg	A325N	0.8750	4	444.34	40589.10	0.011 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	615.18	11044.70	0.056 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	1	57.96	8156.25	0.007 ✓	1	Member Bearing
T2	160	Leg	A325N	0.8750	4	2785.45	40589.10	0.069 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	1414.77	11044.70	0.128 ✓	1	Bolt Shear
T3	140	Leg	A325N	0.8750	4	6580.79	40589.10	0.162 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	2211.37	11044.70	0.200 ✓	1	Bolt Shear
T4	120	Leg	A325N	1.0000	4	9458.67	53014.40	0.178 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	1769.17	11044.70	0.160 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	1	245.99	8156.25	0.030 ✓	1	Member Bearing
T5	100	Leg	A325N	1.0000	4	12405.00	53014.40	0.234 ✓	1	Bolt Tension

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Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load Allowable	Allowable Ratio	Criteria
T6	80	Diagonal	A325N	0.6250	1	2511.06	11044.70	0.227 ✓	1	Bolt Shear
		Leg	A325N	1.0000	4	15570.90	53014.40	0.294 ✓	1	Bolt Tension
T7	60	Diagonal	A325N	0.6250	1	2820.09	11044.70	0.255 ✓	1	Bolt Shear
		Leg	A325N	1.0000	4	18697.50	53014.40	0.353 ✓	1	Bolt Tension
T8	40	Diagonal	A325N	0.6250	1	3247.84	11044.70	0.294 ✓	1	Bolt Shear
		Leg	A325N	1.0000	4	21545.60	53014.40	0.406 ✓	1	Bolt Tension
T9	20	Diagonal	A325N	0.6250	1	3889.40	11044.70	0.352 ✓	1	Bolt Shear
		Leg	A325N	1.0000	6	16357.80	53014.40	0.309 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	1	4277.45	11044.70	0.387 ✓	1	Bolt Shear

### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$\phi P_{allow}$ lb	% Capacity	Pass Fail
T1	180 - 160	Leg	2 1/4	3	-2999.97	99223.60	3.0	Pass
		Diagonal	L1 3/4x1 3/4x3/16	11	-615.18	7711.29	8.0	Pass
		Top Girt	L2x2x1/8	6	-57.96	2763.72	2.1	Pass
T2	160 - 140	Leg	2 1/4	39	-14776.60	99223.60	14.9	Pass
		Diagonal	L1 3/4x1 3/4x3/16	43	-1414.77	7711.29	18.3	Pass
T3	140 - 120	Leg	2 1/2	72	-33272.20	135539.00	24.5	Pass
		Diagonal	L2x2x1/4	76	-2211.37	14375.60	15.4	Pass
T4	120 - 100	Leg	2 3/4	105	-47718.60	144366.00	33.1	Pass
		Diagonal	L2x2x1/4	113	-1769.17	8908.70	19.9	Pass
		Top Girt	L2x2x1/8	106	-245.99	2781.79	8.8	Pass
T5	100 - 80	Leg	3 1/4	135	-62760.30	173123.00	36.3	Pass
		Diagonal	L2 1/2x2 1/2x3/16	140	-2511.06	8600.98	29.2	Pass
T6	80 - 60	Leg	3 1/2	156	-78673.40	221449.00	35.5	Pass
		Diagonal	L2 1/2x2 1/2x3/16	161	-2820.09	6636.80	42.5	Pass
T7	60 - 40	Leg	4	177	-95304.10	333950.00	28.5	Pass
							35.3 (b)	
		Diagonal	L3x3x1/4	182	-3247.84	11976.30	27.1	Pass
T8	40 - 20	Leg	4 1/2	198	-110880.00	293349.00	37.8	Pass
							40.6 (b)	
		Diagonal	L3x3x1/4	203	-3889.40	8140.58	47.8	Pass
T9	20 - 0	Leg	4 1/2	213	-127658.00	293349.00	43.5	Pass
		Diagonal	L3 1/2x3 1/2x1/4	218	-4277.45	11037.90	38.8	Pass
Summary								
Leg (T9)							43.5	Pass
Diagonal (T8)							47.8	Pass
Top Girt (T4)							8.8	Pass
Bolt Checks							40.6	Pass
<b>RATING =</b>							<b>47.8</b>	<b>Pass</b>

# **SECTION 1**

## **Special Provision**

### **Specification for Relocating an Existing**

### **Radio Communications Self-Supporting Tower**

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# 1. General

## 1.1 Introduction

This specification covers the requirements for designing, furnishing, installing and commissioning a tower foundation on the Cooper Hill site and moving an existing 180' galvanized-steel, lattice-type self-supporting tower structure and associated components to the new foundation. The tower will be used to support radio communications antennas.

### Description of Major Work Elements

- A. Design, Furnish & Install:
  - 1. Reinforced Concrete Tower Foundation.
  - 2. Additional antennae and feedline as specified
  - 3. Cable Bridge/Ice Shield
- B. Relocate an existing 180 foot Radian SSVSR tower and antennae to the new foundation.
- C. Remove three existing tower foundation piers
- D. All site planning, preparation and development.
- E. All engineering design certification and documentation.
- F. Provide design and specifications stamped by a State of Maine licensed Professional Engineer of the foundation design.
- G. Other work as specified elsewhere in this document.

## 1.2 Qualifications

- A. General
  - 1. The Contractor shall have demonstrated experience in design, furnishing and installing communications tower(s) on a turn-key basis.
  - 2. The Contractor shall have demonstrated experience as one-source responsible for tower warranty, parts, and service.
- B. Tower
  - 1. All field-work associated with the tower shall be performed by a contractor having no less than 5 contiguous years experience in the erection of communications type towers.

C. Foundation

1. All work associated with the tower foundation shall be performed by a contractor having no less than 5 years experience in the erection of communications type poles or towers.

D. Cable Bridge/Ice-Shield

1. The manufacturer shall have no less than 5 contiguous years in the fabrication of cable bridge/shields.

### **1.3 Regulatory Requirements**

A. Unless specified otherwise in this section, materials and installation shall conform to the applicable requirements of:

1. Local & National Codes.
2. Maine Electrical Code.
3. Electronics Industries Association (EIA/TIA).
4. American Society for Testing & Materials (ASTM).
5. American Concrete Institute (ACI).
6. American National Standards Institute (ANSI).
7. Federal Aviation Administration (FAA).
8. American Institute of Steel Construction (AISC).
9. American Iron and Steel Institute (AISI).
10. Occupational Safety & Health Administration (OSHA).
11. National Fire Protection Association (NFPA).
12. Institute of Electrical & Electronics Engineers (IEEE).
13. Underwriters Laboratories (UL)
14. Motorola R-56 or approved equal
15. Federal Communications Commission (FCC)

### **1.4 Quantities & Locations**

A single 180' tower shall be located as shown on the site plans.

## **2. Products**

## **2.1 Tower**

### **2.1.1 General**

- A. The existing tower shall be relocated.
- B. Any necessary replacement tower members and accessories shall be new and of current fabrication.
- C. All structural members and associated hardware shall be manufactured of steel and hot-dipped galvanized at the manufacturer's facility.

### **2.1.2 Physical & Structural**

- A. The physical properties of the tower shall not be degraded by the move.
- B. The structural integrity of the tower shall be maintained as specified in the attached structural analysis "Exhibit A"
- C. Wind and ice loading shall be per TIA 222-G, Class III, latest edition for this location with all antennas, feedlines, waveguides, and other appurtenances installed.

## **2.2 Antenna Systems**

The State shall furnish one six foot grid type dish antenna and mounting hardware.

The Contractor shall furnish all remaining antennas, side arms, pipe mounts, stabilizing bars, radomes, feedlines and related accessories, and mounting hardware necessary for a complete and fully functional installation as specified in the accompanying "Cooper Hill Tower Diagram".

### **2.2.1 Dish Antennas – 960 MHz**

Furnished by State of Maine

### **2.2.2 VHF Antenna Systems**

Installed VHF antennas shall be as specified in the accompanying "Cooper Hill Tower Diagram". All antenna mounts and associated mounting hardware shall be manufactured of steel and hot-dipped galvanized at the manufacturer's facility.

## **2.2.3 Antenna Feedlines & Accessories**

### **2.2.3.1 Main Cable**

Main antenna feedlines shall be foam-dielectric coaxial transmission cable as manufactured by the Andrew Corporation, or approved equivalent.

The size of the 960 MHz feedline shall be 1-1/4" minimum.

The diameter of the VHF feedline shall be 7/8" minimum.

All main line connectors shall be as appropriate to the size of feedline cable being supplied.

Main feedline connectors shall be female type 'N', silver-plated.

Feedline ground straps shall be furnished in accordance with the State's installation standards and practices.

Straps shall be from the same manufacturer as the main antenna feedlines.

Feedline lightning suppression devices shall be furnished in accordance with the State's installation standards and practices.

All feedline mounts and associated mounting hardware shall hot-dipped galvanized or stainless steel.

Each main feedline shall be furnished with a cable entry port boot.

The 960 MHz feedline shall be furnished with a cable entry port boot plus one (1) spare boot.

### **2.2.3.2 Transition Cables**

Transition jumper cables from the main antenna feedlines to the station and antennas shall be furnished as required.

The cables shall be of the flexible type.

All transition cable connectors shall be as required.

Transition cable connectors shall be type 'N', silver-plated.

### **2.2.3.3 Interconnect Cables**

Field-installed interconnect cables between stations and filtering/coupling devices shall be of the double-shielded type.

All interconnecting cable connectors shall be male type 'N', silver-plated.

### **2.2.4 Antenna Support Side Arms - LMR**

- A. Side arms shall be three foot side arms designed to support a single 620 series fiberglass-whip Omni-directional antenna as manufactured by Radio Frequency Systems (RFS) or equivalent. (800-437-3045 or [www.rfswprld.com](http://www.rfswprld.com))
- B. All side arms shall be identical in, type, fabrication and finish.
- C. All side arms shall include antenna pipe mounts.

## **2.3 Cable Ladder**

The structure cable ladder shall be upgraded with a cable ladder for each of two (2) structure legs in the tapered portion.

A single ladder is permissible in the non-tapered portion.

The ladder design shall allow for supporting cables on both sides of the ladder.

Ladder width shall not be less than 18-inches.

## **2.4 Climbing Devices**

### **2.4.1.1 Ladder**

The structure shall be equipped with a climb ladder.

The Contractor shall determine if the existing climbing ladder is adequate.

The ladder shall be equipped with a safety-cable climbing system.

The safety-cable system shall be such as to protect two (2) persons while climbing the tower.

### **2.4.1.2 Bolts or Pegs**

The existing climbing bolts or pegs on the tower shall be retained as is, with the exception that any bolts or pegs below 12-feet above ground level shall be removed.

## **2.5 Ground Strap Bussbar**

- A. If the existing ground bar is deemed by the contractor to not meet spec a replacement copper ground bussbar and associated mounting hardware shall be furnished and installed at the base of the structure to facilitate connection of the antenna feedline and waveguide ground-straps.

## **2.6 Lighting & Painting**

The structure shall be lit and/or painted in accordance with FCC/FAA requirements, as necessary.

## **2.7 Foundation**

- A. All foundation design, materials and construction practices shall be as required per State of Maine Professional Engineer stamped drawings and specifications for the tower foundation.

## **2.8 Cable Bridge/Ice-Shield**

### **2.8.1 General**

- A. An elevated cable bridge ice-shield shall support, and protect from falling ice, LMR antenna feed lines and microwave antenna waveguides from the equipment shelter to the tower.
- B. All structural members and associated hardware shall be manufactured of steel and hot-dipped galvanized at the manufacturer's facility.

### **2.8.2 Physical & Structural**

- A. The bridge shall be no less than 18-inches in width.
- B. The Bridge shall span the length between the equipment shelter and the tower.
- C. All antenna feedlines and waveguides shall be supported below the ice-shield.
- D. The height of the bridge above ground shall be such to allow, to the greatest extent, for straight horizontal runs of feedlines and waveguides.
- E. The bridge shall use support posts along its length as needed to preserve its support and falling-ice protection properties.
- F. Impact Load: Capable of withstanding the impact of 20-lbs from a 180-foot height without affecting system operation.

## 2.9 General Site Access Information

SITE	ACCESS
Cooper Hill	Maintained gravel road off State Highway

## 2.10 Delivery & Storage of Materials

### 2.10.1 General

The contractor shall be responsible for all aspects of shipment, transportation, and delivery of materials and equipment to their final destination, as necessary. State personnel shall be excluded from performing any of these activities unless otherwise approved by the State.

The contractor shall be responsible for coordinating, unloading, inspecting, accepting and storing all material and equipment deliveries, as necessary. State personnel shall be excluded from performing any of these activities.

All claims necessary as a result of damage or loss during shipment shall be the responsibility of the contractor.

All stored materials and equipment shall remain the responsibility of the contractor until installed and accepted by the State. Acceptance is described in Section 2.1.5.

## 2.11 Decommissioning & Disposal

All decommissioning and disposal shall be done in accordance with Federal and State of Maine laws, regulations and policies. The State of Maine actively encourages recycling. Certain materials including metals, batteries, and fencing materials shall be disposed of in a manner that ensures they are not placed in solid waste landfills.

The State may wish to reuse certain assets such as radio equipment and generators, in such cases the designated equipment shall be delivered to the State in Augusta or other specified location. The contractor shall present documentation as necessary to confirm proper disposal.

**No site, system or part thereof will be decommissioned until all communications needs have been cleared from those parts of the infrastructure to be decommissioned.**

## 2.12 Description of Major Work Elements

### 2.12.1.1 Performed by State

The following work will be performed by the State:

- A. Acquisitions:
  - Perform site acquisition activities, as required.
- B. Ownership:
  - Conduct property title/deed searches.
- C. Surveying
  - Perform boundary and topographical site surveys.
- D. Zoning:
  - Assist contractor with zoning approval process, as required, when deemed by the State.
- E. Permitting:
  - Assist contractor with permitting process, as required, when deemed by the State.
- F. Leases:
  - Secure site leases, as required.
- G. Environmental Impact Studies.

### 2.12.1.2 Performed by Contractor

Unless otherwise noted, the following work is required by the contractor:

- A. Disassemble, and re-erect the relocated existing tower.
- B. Design, Furnish & Install:
  - Tower Foundations.
  - Cable Bridges.
- C. Furnish & Install:
  - Tower Painting and/or lighting as required.
  - Antenna and Antenna Support Side Arms.
  - Cable Ladders.

- Ground Bussbars and associated hardware.
  - Grounding of tower to the earth ground grid system
  - Grounding of cable bridge to the earth ground grid system.
  - Signage
- D. Remove existing tower foundation piers to a minimum of two feet below finished grade and backfill to existing grade.
- E. All site planning, clearing, preparation and development, as required.
- Sediment Control see SP 656 SEWPCP
- F. All engineering design certification and documentation.
- G. Planning, Zoning & Permitting
- Prepare all site planning documents necessary for zoning and permitting, as required.
  - State to review and approve all planning documents prior to zoning and permitting.
  - Obtain all zoning approvals, as required.
  - Obtain all site permitting, as required. Fees will be borne by the State.
  - Coordinate all permitting inspections, as required.
- H. Soil Borings & Geological Tests
- Conduct all necessary tests for the design.
  - Department to review and approve statement-of-work prior to tests.
  - Provide test results to the Department.
- I. Design & Construction
- Prepare all pre-stamped drawings and specifications necessary for the designs and construction, as applicable.
  - Contractor shall not reuse any tower components damaged during disassembly or relocation.
  - Contractor shall determine the need for and be responsible to procure any replacement tower members, hardware and associated components necessary to re-erect the tower to the manufactures original specification.
  - Contractor shall certify that the completed tower meets the TIA-222-G, Class III specification at the stated load.

- State shall review and approve pre-stamped drawings and specifications prior to zoning, permitting and ordering.
- Provide State of Maine PE stamped drawings and specifications to the Department.

J. Utility Services

- All commercial utility service relocations and/or improvements necessary for the installation.

K. Access

- All access road improvements and clearing as necessary for delivery of all materials.
- All access road repairs after the delivery. Road shall be restored to its pre-installation condition, as approved by the Department.

L. Premises

- To the greatest applicable and practical extent, the contractor shall restore the premises to its pre-installation condition.
- Removing all rubbish and debris associated with site preparation, unpacking of shipping materials, and/or the installation, from the premises.

M. Other work as needed to ensure a complete installation whether or not specified or shown elsewhere in this document.

N. Decommissioning

Decommissioning at the Cooper Hill Site will consist of dismantling and reusing, recycling or disposing of as appropriate:

- The existing tower foundation piers
- Fence around existing tower base
- Existing antennas
- A foundation for a previous guyed tower and remaining guy anchors
- An existing fire lookout tower and guy anchors
- A small wooden support building adjacent to the lookout tower
- Additional items specified in other sections of this specification.

- O. The Contractor will coordinate the disposition of all items with the State of Maine Program Management Office prior to the removal or disposal of any item from the site.

## **2.13 Installation**

The contractor shall organize and implement a formalized installation model to plan, prepare, install, configure, test, optimize, certify, document, and release to the State all furnished components of this Contract throughout the Contract Term. The contractor shall staff its installation team with individuals sufficiently skilled and experienced in the various functions needed to execute the duties for this contract.

The contractor will not be responsible for relocating any third-party or tenant communications or communication related equipment to the shelter to be furnished under this contract.

The contractor shall be responsible for:

- The installation of the tower, antennae, ice bridge and components.
- Providing all materials, labor and tools to ensure a complete installation whether or not specified or shown.
- Installing the tower and components in accordance with the professional engineer's design, as applicable and as approved by the Department.
- Fulfilling all FAA requirements including but not limited to tower lighting, signage and filing FAA construction notices
- Neat and professional workmanship.
- Coordination with other trades, as necessary

### **2.13.1 Radio Communications Tower**

#### **2.13.1.1 General**

Install all materials in accordance with State of Maine PE stamped drawings and specifications.

Contractor to provide written certification to State that tower was installed in accordance with a State of Maine PE stamped drawings and specifications.

Prior to installation, the Contractor shall coordinate the exact site placement and/or orientation of the following items with the Department:

1. Tower Foundation.
2. Tower.
3. VHF antennas as specified.
4. Cable ladder and other accessories.
5. Cable Bridge/Ice-Shield.
6. Antenna Side Arms.
7. Ground Strap Bussbar
8. Fall arrest system

#### **2.13.1.2 Orientation**

A visible and permanent weather-resistant marker shall be embedded into the foundation.

The marker shall indicate the direction of 'True North'.

The size, type, and location of the marker shall be coordinated with the State.

The tower shall be oriented so that one leg faces westerly.

#### **2.13.2 Foundation**

Contractor to provide written certification to the Department that foundation was constructed in accordance with a State of Maine PE stamped drawings and specifications and meets TIA 222-G, Class III, latest edition standards for this location.

#### **2.13.3 Antenna Support Side Arms**

Install all materials in accordance with the State's specifications, if any, and manufacturer's instructions as approved by the Department. Reference "Cooper Hill Tower Diagram"

#### **2.13.4 Cable Bridge/Ice Shield**

Install all materials in accordance with the State's specifications, if any, and manufacturer's instructions.

Except as otherwise noted, the height and placement of the cable bridge shall be such as to allow, to the greatest extent, for straight runs of feedlines and waveguides.

### **2.13.5 Climbing Devices**

Inspect the existing system to ensure conformity with the state specification (section 2.4) above. At a minimum the fall arrest cable system and climbing bolts or pegs shall be maintained to the same condition they were in prior to relocation except that all bolts or pegs below 12 feet above ground level shall be removed.

### **2.13.6 Signage**

Size, contents and location of the signs shall be coordinated with the State.

### **2.13.7 Ground Strap Bussbar**

Install all materials in accordance with the State's specifications.

### **2.13.8 Antenna systems**

The contractor shall install all antennas as indicated in the "Cooper Hill Tower Diagram" below.

### **2.13.9 Grounding**

#### **2.13.9.1 General**

The contractor shall be responsible for providing all materials and labor for the installation of grounding, and lightning and power surge protection devices in accordance with the manufacturer's recommendations, the State's standards, or the contractor's practices. Refer to Section 5 "Specification for a Radio Communications Site Earth Ground and Lightning Protection System".

The State has adopted Motorola's "STANDARDS & GUIDELINES FOR COMMUNICATIONS SITES" document, latest edition, to serve as its standard for the grounding of communications structures and equipment. This document is sometimes referred to as the "R56 Manual" and is available from Motorola as hard copy (part # 6881089E50-B) and in CD (part # 9880384V83).

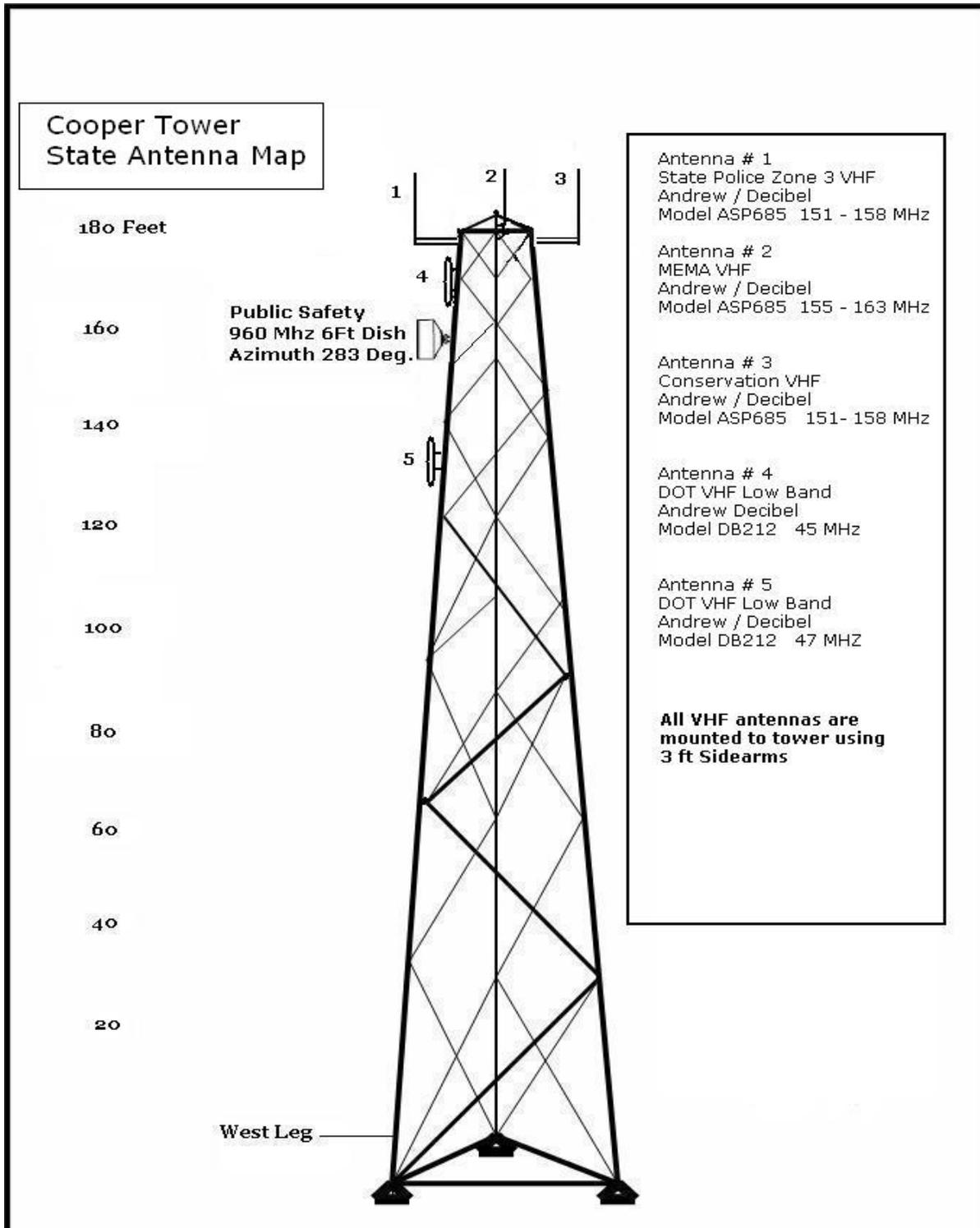
In the event certain aspects of the recommendations, the standards, or the practices are in conflict, then the most stringent shall prevail.

#### **2.13.9.2 Certification**

Contractor shall provide written certification to State that grounding was performed in accordance with the State's standards, manufacturer's recommendations, and/or the contractor's practices as specified in the General section above.

## 2.14 Cooper Hill Tower Diagram

The following diagram is for reference only to identify and determine placement for the required antennae



## **2.15 Inspection & Acceptance**

### **2.15.1 Field Inspection**

- A. After installation of all the components furnished under this section, the Contractor along with the Department, at its discretion, shall perform a field inspection to verify that the installation of the components furnished under this contract has been performed and completed in accordance with the following, as applicable.
  - 1. The professional engineer's design.
  - 2. The manufacturer's instructions and recommendations.
  - 3. The contract specifications.
  - 4. The contractor's installation practices and standards as approved by the Department.
- B. The Contractor shall provide all items, instrumentation, materials, equipment, and personnel necessary to conduct the inspection.
- C. Prior to the commencement of this activity, the contractor shall deliver a preliminary field inspection plan to the Department for review and approval.
- D. At the conclusion of this activity, the contractor shall present to the Department written certification that the inspection performed was in accordance with, and that the results of the inspection were in compliance with, the approved field inspection plan.
- E. The Department's signature on the certification shall constitute acceptance by the Department of the inspection.

### **2.15.2 Final Acceptance**

- A. General
  - 1. After acceptance of all the inspections and all the tests conducted under this section, the contractor shall present to the Department written certification that the activities were performed in accordance with, and that the results were in compliance with, the approved plans.
  - 2. This certification shall include the original signed copy of the individual inspection and test certifications previously accepted by the Department.
  - 3. Final acceptance will be deemed final when the Department's signature appears on this certification.

B. Post-Final Acceptance Documentation

1. After final system acceptance, the contractor shall deliver to the Department, in both printed and electronic form, the following documents, on a per-site basis, in one consolidated package.
  - a. Copies of all signed certifications.
  - b. Copies of all approved inspection and test plans.

## **2.16 Warranty**

- A. The Contractor shall warrant their workmanship and all aspects of the installation for a period of one year after final acceptance by the State.
- B. The Contractor shall include a copy of the manufacturer's standard commercial warranty for all furnished tower and associated components in their response.

## **2.17 Training**

- A. The Contractor shall conduct a single, on-site, hands-on training session for selected Department personnel.
- B. The training location and schedule shall be by mutual agreement between the Department and Contractor.
- C. The session shall be conducted after final acceptance.
- D. The contents of the session shall include familiarizing the Department with special structure attributes, recommended inspection procedures, recommended maintenance procedures, ground connections, etc.

## **2.18 Documentation**

### **2.18.1 With the Contractor's Bid**

- A. The Contractor's bid shall include specification sheets for the following items on this basis.
  1. Tower Foundation
  2. Furnished antennae and accessories

## **2.18.2 Post-Contract Award**

### **A. General**

1. Thorough documentation of all major tower components, and their respective installations, will be required from the Contractor. This documentation will be comprised of both factory-provided and field-generated documents and/or manuals.
2. Every document exchanged between Department and Contractor shall be in paper and/or electronic form, as mutually agreed. Electronic documents shall use the latest version of the application software or by a mutually agreed version. The following applications are preferred:
  - a. Text - Microsoft Word
  - b. Spreadsheets - Microsoft Excel
  - c. Databases - Microsoft Access
  - d. Scanned documents - Adobe Acrobat
  - e. Simple Diagrams & Charts - Microsoft Visio or Excel
  - f. Large Drawings – mutually agreed software program
  - g. Schedules - Microsoft Project
3. The Department shall approve the contents and organization of all field-generated documents supplied by the contractor.
4. Costs associated with documentation shall be clearly and individually identified in the pricing section of the response.

### **B. Factory Provided – Technical & Service Manuals**

1. All factory-provided documentation shall be available on CD media.
2. All factory available manuals shall be provided for the major components installed under this contract.
3. The following sets of manuals are to be furnished prior to project closeout on a per-site basis:
  - a. Five (5) complete paper-form sets
  - b. Five (5) complete electronic-form sets

### **C. Field Generated - As-Built**

1. All field-generated documentation shall be prepared in a format suitable for storage in loose-leaf 3-ring binders. This documentation shall also be supplied on CD media.

2. All field-generated drawings shall be prepared using a mutually agreed software program.
3. The following documentation shall be provided. Specification or catalog cut sheets for each of the major items illustrated in the documents shall be included with the submittals to the Department.
  - a. Foundation – side elevation view diagram illustrating both above and below grade portions.
  - b. A site plan illustrating the installed location of the components supplied under this contract relative to other existing major site components (e.g., shelters, fences, towers, etc.). Plan shall be to scale; and the new and existing components shall be contrasted by the use of a gray scale.
  - c. The site plan shall identify the interconnection between the tower legs or accessories to the site electrical ground grid system.
4. The following sets of field-generated documentation are to be furnished prior to project closeout:
  - a. Five (5) complete paper-form sets
  - b. Five (5) complete electronic-form sets

### **3. Measurement of Payment**

#### **3.1.1 Method of Measurement**

ITEM #	DESCRIPTION
643.97	Radio Communication Tower, Self-Supporting, Erected
643.971	Radio Communication Tower---Inspection and Acceptance, Field Inspection
643.972	Radio Communication Tower---Inspection and Acceptance, Final Acceptance
643.973	Radio Communication Tower---Inspection and Acceptance, Training
643.974	Antennas---installed

#### **3.1.2 Basis of Payment**

The accepted Radio Communication Tower items will be paid for at the contract lump sum prices which will include payment for all respective items as called for in the contract, designed, delivered, stored, constructed, installed, tested, documented, all clearing, preparation, demolition, removal, site restoration, materials, labor, equipment, training and incidentals necessary to complete the work.

Payment will be made under:

ITEM #	DESCRIPTION	UNIT
643.97	Radio Communication Tower, Self-Supporting, Erected	LS
643.971	Radio Communication Tower---Inspection and Acceptance, Field Inspection	LS
643.972	Radio Communication Tower---Inspection and Acceptance, Final Acceptance	LS
643.973	Radio Communication Tower---Inspection and Acceptance, Training	LS
643.974	Antennas---installed	LS

**END OF DOCUMENT**

**“Exhibit A”**

**Structural Analysis Report**

**For a**

**180 foot Self Supporting Tower**

**At**

**Cooper, Maine**

## **SECTION 2**

### **Special Provision**

#### **Specification for a**

#### **Communications Equipment Shelter Modular, Pre-Fabricated, Pre-Outfitted**

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# 1. General

## Introduction

This specification covers the requirements for designing, furnishing, installing and commissioning a modular, pre-fabricated, pre-outfitted telecommunications-type shelter and other associated components. The shelter and associated components shall be new, of current production, and as specified herein.

The contractor may include a site constructed/assembled shelter option in its proposal. The site constructed option will meet the same operational requirements and standards as a pre-fabricated shelter.

## Description of Major Work Elements

- A. Design, Furnish & Install:
  - 1. Shelter (12' x 24').
  - 2. Other Shelter Components as Specified.
  - 3. Shelter Foundation (14' x 26').
- B. All site planning, preparation and development.
- C. All engineering design certification and documentation.
- D. Provide design and specifications stamped by a State of Maine licensed Professional Engineer of the Shelter Foundation Design.
- E. Other work as specified elsewhere in this document.

## Qualifications

- A. General
  - 1. The Contractor shall have demonstrated experience in design, furnishing, and installing communication shelters on a turn-key basis.
  - 2. The Contractor shall have demonstrated experience in furnishing and installing generators on a turn-key basis.
  - 3. The Contractor shall function as one-source responsible for shelter warranty, parts and service.
- B. Shelter
  - 1. The manufacturer shall have no less than 5 contiguous years in the fabrication of communications type shelters.

2. All field-work associated with the shelter shall be performed by a contractor having no less than 5 years experience in the installation of pre-fabricated communications equipment shelters.
- C. Foundation
1. All work associated with the shelter foundation shall be performed by a contractor having no less than 5 years experience in the installation of pre-fabricated communications equipment shelters.

## **Regulatory Requirements**

- A. Unless specified otherwise, materials and installation shall conform to the applicable requirements of:
1. Local & National Codes.
  2. Maine Electrical Code.
  3. American Concrete Institute (ACI).
  4. American Institute of Steel Construction (AISC).
  5. American Iron and Steel Institute (AISI).
  6. American National Standards Institute (ANSI).
  7. American Society for Testing & Materials (ASTM).
  8. Electronics Industries Association (EIA/TIA).
  9. Institute of Electrical & Electronics Engineers (IEEE).
  10. National Fire Protection Association (NFPA).
  11. Occupational Safety & Health Administration (OSHA).
  12. Underwriters Laboratories (UL)
  13. Motorola R-56 standard or approved equal.

## **2. Products**

### **Shelter**

#### **2.1.1 General**

- A. The shelter shall be 12' x 24'
- B. The shelter shall be of a pre-fabricated, pre-outfitted design.

- C. A site constructed option may be included (but not replace the pre-fabricated shelter)
- D. The shelter and accessories shall be new and of current fabrication.
- E. The shelter will be used to house radio telecommunications equipment.
- F. Equipment and generator will be located in separate rooms isolated by a closed partition.
- G. The equipment and generator rooms shall have separate exterior doors.
- H. Unless otherwise noted, at a minimum, the shelters shall meet all of the applicable ANSI/NFPA/TIA standards for communications equipment shelters.

## **2.1.2 Construction**

### **2.1.2.1 Shelter Base**

Shelter base shall be fabricated of rot resistant material.

### **2.1.2.2 Floor**

Insulation: R-Value = 27, minimum.

Weight Load: 750 lbs per square foot.

Finish: Commercial grade, electro-static discharge floor tiles.

Fire Retardant: 1-hour rated, minimum.

The floor shall accommodate equipment rack anchor bolts.

### **2.1.2.3 Floor Plate**

A solid metal plate or panel shall protect the underside of the floor.

Thickness: 1/16 inches.

Material: aluminum.

### **2.1.2.4 Roof**

Weight Load: 100-lbs per square foot.

Impact Load: 20-lbs from a 180-foot height.

Pitch: sloped downward from shelter centerline for drainage.

Wind Load: Wind loading shall be per TIA-222-G, Class III.

#### **2.1.2.5 Ceiling**

Insulation: R-Value = 27, minimum.

Finish: fiberglass reinforced plastic laminate.

Interior Height: 9-feet, minimum.

Pitch: none.

Fire Retardant: 1-hour rated, minimum.

#### **2.1.2.6 Walls**

Insulation: R-Value = 11, minimum.

Wind Load: Wind loading shall be per TIA-222-G, Class III.

Interior Finish: fiberglass reinforced plastic laminate.

Exterior Finish: natural stone aggregate.

Fire retardant: 1-hour rated, minimum.

Bullet Resistance: none.

#### **2.1.2.7 Interior Electrical Service Wiring**

All electrical wiring shall be in conduit and/or raceways, as required.

All conduit, raceways, and outlet or junction boxes shall be exposed and attached to the interior surfaces of the shelter.

All conduit, raceways, fittings, and hardware shall be of galvanized or stainless steel.

Service wiring raceways shall be separate and isolated and from any communications or antenna cable trays.

All service runs shall be continuous.

All wiring shall be per applicable electrical codes and owner standards.

#### **2.1.3 Interior Partition**

The interior of the Communications Equipment Room shall be partitioned with a relocateable wire divider. The divider shall be furnished with a 36 inch wide (minimum) locking sliding gate (preferred) or hinged door. The height shall be as close to the ceiling as practical and shall be of sufficient height to prevent access from one area to the other. The exact location shall be coordinated with the Department.

## **2.1.4 Electrical**

### **2.1.4.1 Interior main distribution panel**

200-amp service, 120 VAC, single-phase.

40-branch circuit capacity, equipped as needed.

### **2.1.4.2 Surge Protection - Service Entrance**

Transient Voltage Surge Suppressor (TVSS)

Liebert Corporation Model Type SS Hybrid or equivalent.

Dry-contact, form-C (NO/NC) closure alarm.

### **2.1.4.3 Utility Outlets**

Quad receptacles on individual breakers, labeled on both the receptacle and main distribution panel.

Rating: 15-amp.

Wall-mounted, 24-inches above finished floor.

As needed, 4-feet on-center spaced evenly on all walls.

### **2.1.4.4 Equipment Outlets – Equipment Rack Mounted**

Quad receptacles.

Rating: 20-amp.

As needed, per equipment rack.

## **2.1.5 Lighting**

### **2.1.5.1 Interior**

Lighting shall be via fluorescent light fixtures.

Fixtures shall be 48-inches in length.

Fixtures shall use dual, straight tube bulbs.

Fixtures shall protect bulbs via wire guard or translucent cover.

As needed to provide a minimum of 150 foot-candles of illumination at floor level.

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

### **2.1.5.2 Interior - Emergency**

Integrated, solid-state design emergency light fixture for each doorway.

Self-contained in single, interior, wall-mountable housing.

Medium to heavy-duty industrial-use rated.

1-hour operation rated, minimum.

10-year operating life rated.

Dual light beams lamps.

Sealed maintenance-free rechargeable battery.

Battery viewport.

Automatic battery charger.

Low battery cutoff.

Voltmeter.

Indicators: 1) On; 2) Charging.

Test Switch, externally accessible.

Dry-contact, form-C (NO/NC) closure alarm.

### **2.1.5.3 Exterior**

Light fixture for each exterior doorway.

Bulb: Halogen, standard screw-base, 150-watt rated, minimum.

Bulb Life: 10,000-hour rated, minimum.

Shatter/tamper resistant lens.

Remote activated by key fob or garage-door-opener type device.

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

## **2.1.6 Door - Exterior**

### **2.1.6.1 Fabrication**

Door: galvanized or stainless steel, welded fabrication.

14-gauge, minimum

42-inches x 7-feet.

Polyurethane insulation.

Gasket Sealed.

Frame: hi-strength, galvanized or stainless steel.

#### **2.1.6.2 Accessories**

Lockset: stainless steel; replaceable cores; keyed alike.

Interior pull handle.

Anti- prying exterior plate, hi-strength, galvanized or stainless steel.

Vandal resistant, non-removable hinge pins.

Hydraulic-damper closer with sliding passage set.

Wind check or chain.

Over door exterior drip awning, galvanized or stainless steel, or aluminum.

Intrusion sensor with a dry-contact, form-C (NO/NC) closure alarm.

#### **2.1.7 Air Conditioning System**

Two (2) self-contained, integrated wall mount units.

Units shall be of the high energy-efficient design.

System shall be sized to provide an interior temperature of 65 degrees F during exterior temperature of +100 degrees F, no equipment heat loads considered.

System shall be equipped with:

- Auto-restart.
- Economizer cycle.
- Pre-wired thermostat.
- Lead/lag controller.
- Dry contact, form-C (NO/NC) closure alarm.

#### **2.1.8 Heating System**

Baseboard electric heat strips.

Units shall be of the high energy-efficient design.

System shall be sized to provide an interior temperature of 70 degrees F during exterior temperature of – 30 degrees F, no equipment heat loads considered.

System shall be equipped with:

- Auto-restart.

- Pre-wired thermostat.
- On/off visual indicator.
- Dry contact, form-C (NO/NC) closure alarm.

## **2.1.9 Ventilation System**

### **2.1.9.1 Design**

12-inch motorized fan, minimum.

Wall-mounted controls.

Programmable/adjustable start-up cycle timer.

Programmable/adjustable run cycle timer.

Dual, parallel thermostats, manually adjustable.

### **2.1.9.2 Intake**

Mechanically activated louver/damper.

Galvanized or stainless steel, or aluminum weather hood.

Galvanized or stainless steel, or aluminum screen to prevent insect or rodent intrusion.

Filtered.

### **2.1.9.3 Exhaust**

Gravity-type louver/damper.

Galvanized or stainless steel, or aluminum weather hood.

Galvanized or stainless steel, or aluminum screen to prevent insect or rodent intrusion.

## **2.1.10 Antenna Cable Accessories**

### **2.1.10.1 Cable Entry Panel**

Size: 16-individual, 4-inch ports, minimum.

As manufactured by Polyphaser (2 ea., 8 PEEP-M) or equivalent and supplied by Tessco Technologies.

Furnish exterior UV-protected weather-boots for all ports. Include nine (9) spare port boots.

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

### **2.1.10.2 Interior Cable Tray**

Type: Ladder style, ceiling hung.

Width: 18-inches, minimum.

Length: as required to support two (2) equipment rack rows and the cable entry panel.

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

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

## **2.1.11 Communication Cable Accessories**

### **2.1.11.1 Interior Cable Tray**

Communications cables can share the interior antenna cable tray.

### **2.1.11.2 Termination Backboard**

Size: 4-feet x 8-feet x 3/4 inches. Material: plywood sheet, 1-hour fire retardant rated.

Furnish backboard with 3-inch standoffs.

Painting: gray or black, fire retardant.

## **2.1.12 Heat/Smoke/CO Detection & Fire Suppression**

### **2.1.12.1 Heat**

The shelter shall be equipped with heat detectors, as needed, spaced for maximum coverage.

Detectors shall be equipped with a dry-contact, form-C (NO/NC) closure alarm.

Combination heat, smoke and CO detectors are not acceptable.

### **2.1.12.2 Smoke**

The shelter shall be equipped with smoke detectors spaced for maximum coverage.

Detectors shall be of the photoelectric and ionization type.

Detectors shall be equipped with a dry-contact, form-C (NO/NC) closure alarm.

Combination heat, smoke and CO detectors are not acceptable.

### **2.1.12.3 Carbon Monoxide (CO)**

The shelter shall be equipped with carbon monoxide detectors spaced for maximum coverage.

Detectors shall be equipped with a dry-contact, form-C (NO/NC) closure alarm.

Combination heat, smoke and CO detectors are not acceptable.

#### **2.1.12.4 Fire Suppression**

The shelter shall be equipped with one (1) wall-mounted fire extinguisher.

Type: Class ABC all purpose dry chemical.

Size: 10 lbs.

#### **2.1.13 Ground System**

##### **2.1.13.1 Interior Perimeter Halo**

Tinned-bare solid-copper conductor no less than #2 AWG.

Furnish insulated standoffs as required.

### **Foundation**

- A. Foundation materials shall conform to the requirements of Sate of Maine Department of Transportation Standard Specifications, Revision of December 2002. Foundation design, plans and drawings shall be stamped by a professional engineer licensed in the State of Maine.
  - 1. Dimensions: Shall be 14' x 26'.
  - 2. Materials: Class A concrete.
- B. Contractor to provide written certification to Department that foundation was constructed in accordance with a State of Maine PE stamped drawings and specifications.

### **3. Execution**

#### **Delivery & Storage of Materials**

- A. The contractor shall be responsible for all aspects of shipment and/or transportation of materials to their destination.
- B. The contractor shall be responsible for coordinating, unloading, inspecting, accepting and storing all material deliveries.
- C. All stored materials shall remain the responsibility of the contractor until final acceptance by the Department.

## **Decommissioning & Disposal**

All decommissioning and disposal shall be done in accordance with Federal and State of Maine laws, regulations and policies. The State of Maine actively encourages recycling. Certain materials including metals, batteries, and fencing materials shall be disposed of in a manner that ensures they are not placed in solid waste landfills.

The State may wish to reuse certain assets such as radio equipment and generators, in such cases the designated equipment shall be delivered to the State in Augusta or other specified location. The contractor shall present documentation as necessary to confirm proper disposal.

**No site, system or part thereof will be decommissioned until all communications needs have been cleared**

## **Installation**

### **3.1.1 General**

- A. Prior to installation, the contractor shall coordinate the exact site placement and/or orientation of the following items with the Department:
  - 1. Shelter Foundation.
  - 2. Shelter.
  
- B. The contractor shall be responsible for:
  - 1. Providing all materials, labor and tools to ensure a complete installation whether or not specified or shown.
  - 2. All workmanship shall conform to applicable standards and prevailing practices as approved by the Department.
  - 3. Delivery of all materials to the site.
  - 4. Restoring the site to its original pre-installation condition.
  - 5. All access road improvements and clearing as necessary for delivery as approved by the Department.
  - 6. All access road repairs after delivery. Road shall be restored to original pre-installation condition as approved by the Department.
  - 7. All commercial electric utility service necessary for the installation as approved by the Department.
  - 8. Removing all rubbish and debris associated with all aspects of the installation.

9. The installation of the shelter and components.
10. Providing all materials, labor and tools to ensure a complete installation whether or not specified or shown.
11. Installing the shelter and components in accordance with the professional engineer's design, as applicable and as approved by the department.
12. Neat and professional workmanship.
13. Coordination with other trades, as necessary.
14. Design, Furnish & Install:
  - Shelter.
  - Shelter Foundation.
  - Electrical & Lighting.
  - HVAC Systems.
15. Furnish & Install:
  - Shelter accessories.
  - Grounding materials and bonding hardware.
  - Connection of accessories to the shelter's ground system.
  - Connection of shelter to earth ground grid system.
16. All site planning, clearing, preparation and development, as required.
17. All engineering design certification and documentation.
18. Soil Borings & Geological Tests
  - Conduct all necessary tests for the design.
  - Department to review and approve statement-of-work prior to tests.
  - Provide test results to the Department.
19. Design & Construction
  - Prepare all pre-stamped drawings and specifications necessary for the designs and construction, as applicable.
  - Department to review and approve pre-stamped drawings and specifications prior to zoning, permitting, and ordering.
  - Provide State of Maine PE stamped drawings and specifications to the Department.

20. Utility Services

- All commercial utility service relocations and/or improvements necessary for the installation.

21. Access

- All access road improvements and clearing as necessary for delivery of all materials.
- All access road repairs after the delivery. Road shall be restored to its pre-installation condition.

22. Premises

- To the greatest applicable and practical extent, the contractor shall restore the premises to its pre-installation condition. See SP 656 SEWPCP
- Removing all rubbish and debris associated with site preparation, unpacking of shipping materials, and/or the installation, from the premises.

23. Other work as needed to ensure a complete installation whether or not specified or shown elsewhere in this document.

**3.1.1.1 Shelter**

Install all materials in accordance with State of Maine PE stamped drawings and specifications.

Contractor to provide written certification to the Department that shelter was installed in accordance with a State of Maine PE stamped drawings and specifications.

**3.1.1.2 Foundation**

Construct in accordance with State of Maine PE stamped drawings and specifications.

Contractor to provide written certification to the Department that foundation was constructed in accordance with a State of Maine PE stamped drawings and specifications.

**3.1.1.3 Anchoring**

The shelter shall be anchored to the foundation in such a manner as to withstand displacement in prevailing high wind conditions as indicated in the technical specifications.

**3.1.1.4 Locations & Placement**

The exact location of all shelter components and/or accessories shall be coordinated with the Project Management Office of the State's Radio Project Office and the Department before ordering.

The shelter shall be placed at least 20-feet from site towers to minimize exposure to falling ice.

### **3.1.1.5 Electrical**

#### **3.1.1.5.1 Outlets**

Mounting of ceiling outlets to communications cable trays is not acceptable.

Each half of a ceiling mounted quad outlet shall be wired to a separate circuit breaker and labeled at both the receptacle and main distribution panel.

Utility wall duplex outlets can be doubled to a single circuit breaker.

All outlets shall be labeled with its associated circuit breaker or labeled with its circuit number.

#### **3.1.1.5.2 Lighting**

All interior and exterior lighting shall be dispersed between 2 circuit breakers, at a minimum.

Interior emergency lighting shall be mounted above each entry door.

#### **3.1.1.5.3 Interior Wiring**

All wiring shall be per applicable electrical codes.

All electrical wiring shall be in conduit and/or raceways, as required.

All conduit, raceways, fittings, and hardware shall be of galvanized or stainless steel.

All conduit, raceways, and outlet or junction boxes shall be exposed and attached to the interior surfaces of the shelter.

Service wiring raceways shall be separate and isolated from any communications or antenna cable trays.

All service wiring runs shall be continuous.

#### **3.1.1.5.4 Switchgear - Interior Service**

Bypass and isolation switchgear, as needed.

Switchgear shall allow for service and testing without disrupting power to critical loads.

#### **3.1.1.6 Alarms**

All dry-contact alarms shall be terminated at a demarcation point inside the shelter.

### **3.1.1.7 Grounding & Surge Protection**

#### **3.1.1.7.1 General**

The contractor shall be responsible for providing all materials and labor for the installation of grounding, and lightning and power surge protection devices in accordance with the manufacturer's recommendations, the Department's standards, or the contractor's practices.

The State has adopted Motorola's "STANDARDS & GUIDELINES FOR COMMUNICATIONS SITES" document, latest edition, to serve as its standard for the grounding of communications structures and equipment. This document is sometimes referred to as the "R56 Manual" and is available from Motorola as hard copy (part # 6881089E50-B) and in CD (part # 9880384V83).

In the event certain aspects of the recommendations, the standards, or the practices are in conflict, then the most stringent shall prevail.

#### **3.1.1.7.2 Test Well**

A grounding test well shall be placed at an exterior location near the cable entry panel.

Coordinate exact location with the Department.

#### **3.1.1.7.3 Certification**

Contractor shall provide written certification to the Department that grounding was performed in accordance with the State's standards, manufacturer's recommendations, or the contractor's practices as specified in the General section above.

### **3.1.2 External Grounding**

1. Connection to the site's earth ground grid system (EGGS) shall be required.
2. All bonded welds shall be of the exothermal-type.
3. Wire conductors size shall be no less than 2/0 AWG.
4. Wire conductors shall be bare, tinned, solid copper.
5. Ground the shelter to the EGGS.
6. Conductors shall be weld-bonded to the closest EGGS ground rod.
7. Conductors shall be weld-bonded to the tower leg.

## **Inspection & Acceptance**

### **3.1.3 Field Inspection**

- A. After installation of all the components furnished under this section, the contractor along with the Department, at its discretion, shall perform a field inspection, to verify that the installation of the components furnished under this contract has been performed and completed in accordance with the following, as applicable.
  - 1. The professional engineer's design.
  - 2. The manufacturer's instructions and recommendations.
  - 3. The Department's specifications.
  - 4. The Contractor's installation practices and standards as approved by the Department.
- B. The Contractor shall provide all items, instrumentation, materials, equipment, and personnel necessary to conduct the inspection.
- C. Prior to the commencement of this activity, the contractor shall deliver a preliminary field inspection plan to the Department for review and approval.
- D. At the conclusion of this activity, the contractor shall present to the Department written certification that the inspection performed was in accordance with, and that the results of the inspection was in compliance with, the approved field inspection plan.
- E. The Department's signature on the certification shall constitute acceptance by the Department of the inspection.

### **3.1.4 Final Acceptance**

- A. General
  - 1. After acceptance of all the inspections and all the tests. Conducted under this section, the contractor shall present to the Owner written certification that the activities were performed in accordance with, and that the results were in compliance with, the approved plans.
  - 2. This certification shall include the original signed copy of the individual inspection and test certifications previously accepted by the Owner.
  - 3. Final acceptance will be deemed final when the Owner's signature appears on this certification.

B. Post-Final Acceptance Documentation

1. After final system acceptance, the contractor shall deliver to the Owner, in both printed and electronic form, the following documents, on a per-site basis, in one consolidated package.
  - a. Copies of all signed certifications.
  - b. Copies of all approved inspection and test plans.

## Warranty

- A. The Contractor shall include a copy of the manufacturer's standard commercial warranty for all furnished shelter and associated components in their response (excluding generator which is covered in the generator section).

## Training

- A. The contractor shall conduct a single, on-site, hands-on training session for selected Department personnel.
- B. The training location and schedule shall be by mutual agreement between the Department and contractor.
- C. The session shall be conducted after final acceptance.
- D. The contents of the session shall include familiarizing the Department with special structure attributes, recommended inspection procedures, recommended maintenance procedures, ground connections, etc.
- E. Costs associated with the training defined in this section shall be clearly and individually identified in the pricing section of the response.

## **Documentation**

### **3.1.5 With the Contractor's Bid**

- A. The Contractor's bid shall include a catalog or specification sheet for this site as described in Section 2.1.

### **3.1.6 Post-Contract Award**

#### A. General

1. Thorough documentation of all major shelter components, and their respective installations, will be required from the Contractor. This documentation will be comprised of both factory-provided and field-generated documents and/or manuals.
2. Every document exchanged between Department and contractor shall be in paper and/or electronic form, as mutually agreed. Electronic documents shall use the latest version of the application software or by a mutually agreed version. The following applications are preferred:
  - a. Text - Microsoft Word
  - b. Spreadsheets - Microsoft Excel
  - c. Databases - Microsoft Access
  - d. Scanned documents - Adobe Acrobat
  - e. Simple Diagrams & Charts - Microsoft Visio or Excel
  - f. Large Drawings – mutually agreed software program
  - g. Schedules - Microsoft Project
3. The Department shall approve the contents and organization of all field-generated documents supplied by the contractor.
4. Costs associated with documentation shall be clearly and individually identified in the pricing section of the response.

#### B. Factory Provided – Technical & Service Manuals

1. All factory-provided documentation shall be available on CD media.
2. Manuals shall be provided for the following components on a per-site basis:
  - a. All available manufacture's manuals for the building and major components.
3. The following sets of manuals are to be furnished prior to project closeout on a per-site basis:
  - a. Five (5) complete paper-form sets

- b. Five (5) complete electronic-form sets
- C. Field Generated - As-Built
  - 1. All field-generated documentation shall be prepared in a format suitable for storage in loose-leaf 3-ring binders. This documentation shall also be supplied on CD media.
  - 2. All field-generated drawings shall be prepared using a mutually agreed software program.
  - 3. The following documentation shall be provided on a per-site basis. Specification or catalog cut sheets for each of the major items illustrated in the documents shall be included with the submittals to the Department.
    - a. Shelter & foundation – top view diagram.
    - b. Foundation – side elevation view diagram illustrating both above and below grade portions.
    - c. Shelter – 4-sided elevation view diagram.
    - d. Shelter – interior layout w/list of materials.
    - e. A site plan illustrating the installed location of the components supplied under this contract relative to other existing major site components (e.g., towers, fences, generators, etc.). Plan shall be to scale; and the new and existing components shall be contrasted by the use of a gray scale.
    - f. The site plan shall identify the interconnection between the shelter or accessories to the site electrical ground grid system.
  - 4. The following sets of field-generated documentation are to be furnished prior to project closeout:
    - a. Five (5) complete paper-form sets
    - b. Five (5) complete electronic-form sets
- D. Costs associated with the post-contract award documentation defined in this section shall be clearly and individually identified in the pricing section of the response.

## 4. MEASUREMENT AND PAYMENT

### 4.1 Method of measurement.

Method of Measurement: The following items will be paid for by the lump sum:

ITEM #	DESCRIPTION
645.91	Communications Equipment Shelter, Refurbished
645.92	Communications Equipment Shelter, Inspection and Acceptance, Field Testing
645.93	Communications Equipment Shelter, Inspection and Acceptance, Final Acceptance

645.94	Communications Equipment Shelter, Inspection and Acceptance, Training
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#### 4.2 Basis of payment.

The accepted Communications Equipment Shelter items will be paid for at the contract lump sum prices which will include payment for all respective items as called for in the contract, designed, delivered, stored, placed, constructed, installed, tested, documented, all clearing, demolition, remediation, preparation, materials, labor, equipment, training and incidentals necessary to complete the work.

Payment will be made under:

ITEM #	DESCRIPTION	UNIT
645.91	Communications Equipment Shelter, Modular, Refurbished	LS
645.92	Communications Equipment Shelter, Inspection and Acceptance, Field Testing	LS
645.93	Communications Equipment Shelter, Inspection and Acceptance, Final Acceptance	LS
645.94	Communications Equipment Shelter, Inspection and Acceptance, Training	LS

**END OF DOCUMENT**

## **SECTION 3**

### **Special Provision**

### **Specification for an Emergency Power Generator System**

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# **1. General**

## **1.1 Introduction**

This specification identifies the requirements for designing, furnishing, installing and commissioning an emergency power generator system and associated components. The generator will be used to support radio communications equipment and as specified herein. The system and associated components shall be new, and of current production.

## **1.2 Description of Major Work Elements**

- A. Design, Furnish & Install:
  - 1. Emergency Power Generator 25KW with electric start
  - 2. Automatic Transfer Switch, 200 Amp Min, sized by contractor
  - 3. Fuel Line to Existing Sub-system
- B. Fuel Line to Tank
  - 1. Connection of generator to the earth ground grid system.
  - 2. Connection of transfer switch to the earth ground grid system.
  - 3. Connection of fuel sub-system to the earth ground grid system.
- C. All site planning, preparation and development.
- D. All engineering design certification and documentation.
- E. Provide design and specifications stamped by a Maine licensed Professional Engineer of:
  - 1. Generator Mounting Design
  - 2. Inter building electrical connections.
- F. Other work as specified elsewhere in this document.

## **1.3 Qualifications**

- A. General
  - 1. The Contractor shall have demonstrated experience in furnishing, installing, testing and fully commissioning systems on a turn-key basis.
  - 2. The Contractor shall have demonstrated experience as one-source responsible for generator

warranty, parts, and service.

**B. Contractor**

1. The Contractor shall have been in the furnishing, installation and servicing of emergency power generator systems for no less than 5 contiguous years.
2. The Contractor shall be the generator manufacturer's authorized distributor.

**C. Generator**

1. The manufacturer shall have been in the manufacture of motor-driven generators for no less than 5 contiguous years.
2. All field work associated with the generator shall be performed by a contractor having no less than 5 contiguous years of experience in the installation of emergency power generators.

**D. Automatic Transfer Switch**

1. The manufacturer shall have been in the manufacture of automatic transfer switches for no less than 5 contiguous years.

## **1.4 Regulatory Compliance**

The generator system shall meet or exceed all of the requirements of:

1. NFPA 110 (most recent edition).
2. Local and National Codes.
3. Underwriters Laboratory (UL).
4. Occupational Safety & Health Administration (OSHA)

## **1.5 Quantities & Locations**

Site: Cooper Hill

**a. Generator**

- Size: 25KW
- Installation: interior as approved by the Department.

**b. Transfer Switch**

- a. Size: Sized by contractor with the Departments approval.
- b. Installation: Inside Equipment Shelter Generator Room As approved by the Department

c. Fuel

1. Type: Liquid Propane (LP)

Tank Capacity: 1000 Gals. Refer to chart in the installation section of this document.

2. Tank Installation: Above Ground as approved by the Department.

## **2. Products**

### **2.1 Power Generator**

#### **2.1.1 General**

The generator system shall be new and of current production.

The generator shall be rated for industrial/commercial use.

Generators manufactured by Onan/Cummins are preferred.

#### **2.1.2 Output Requirements**

- 120/240 VAC.
- Single-Phase.
- Three -wire.
- 60 Hertz.
- Full single-phase output @ 1.0 pf.
- Voltage regulation +/- 2% of rated voltage for constant load between no-load and full-load.
- Frequency regulation 0.5 % from steady state no-load to steady state rated-load.
- Single Step Load Pickup 100% of rated output power, less applicable derating factors, with the engine and generator at operating temperature.
- The generator shall be equipped with an integral UL listed, thermal-magnetic type rated, main output circuit breaker.

#### **2.1.3 Engine**

##### **2.1.3.1 General**

- The engine shall be of the propane internal combustion type.
- The engine shall be of the stationary type.
- The engine shall be mounted on a heavy-duty steel skid base.

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

#### **2.1.3.2 Starting System**

- Shall be electric, 12 VDC negative ground, sourced from gel cell, maintenance free type storage batteries.
- Batteries shall be mounted to the generator unit, insulated from both the generator and the floor.
- A float/equalize battery charger shall be mounted to the generator unit.
- The charger shall be of a constant voltage/current limiting design and sized appropriately.
- At a minimum, the charger shall be equipped with the following:
  1. On/Off Switch
  2. DC Voltmeter
  3. DC Ammeter
  4. Equalizer-Charger Timer
- The equalizer timer shall provide for a minimum of 12-hours of equalization time.
- Upon termination of the equalization cycle, the charger shall automatically revert to float charging.

#### **2.1.3.3 Lubricating Oil System**

- Shall be capable of using both petroleum and synthetic motor oils.
- Shall include an oil level dipstick.
- Oil filter shall be of the replaceable type.
- System shall provide a low oil pressure visual indicator on the generator's control panel.
- Indicator shall remain active until reset by service personnel.
- Activation of the low oil pressure indicator shall trigger a dry-contact, form-C (NO/NC) alarm output.

#### **2.1.3.4 Lubricating Level Maintaining System**

- Shall be equipped with an automatic oil level maintaining system.

- The system shall include an oil supply tank.
- The tank shall be sized to supply oil for 15-days of continuous operation.
- The tank shall include a see-thru oil level gauge.
- The tank shall include a shutoff valve.
- Shall be equipped with an integral, dry-contact, form-C (NO/NC) alarm for low oil level before shutdown.
- Shall be equipped with an integral, dry-contact, form-C (NO/NC) alarm for low oil level shutdown.

#### **2.1.3.5 Cooling System**

- Shall be either air-cooled, or liquid-cooled using a fan radiator. Liquid-cooled engines are preferred.
- For liquid-cooled engines, the radiator should be mounted to the generator unit and in such a way that the fan's airflow is drawn over the engine.
- System shall provide a high temperature visual indicator on the generator's control panel.
- Indicator shall remain active until reset by service personnel.
- Activation of the high temperature indicator shall trigger a dry-contact, form-C (NO/NC) alarm output.
- The generator unit shall be equipped with the necessary ducts, flanges, adapters, and/or other hardware to allow ducting of heated air to the outside.
- The generator unit shall be equipped with the necessary controls to activate motorized ventilation louvers or dampers.

#### **2.1.3.6 Exhaust System**

- A critical muffler shall be supplied with the unit.
- The connection between the muffler and the exhaust manifold shall be of the flexible type.
- The muffler shall be equipped with a condensation trap with a manual drain valve.
- The muffler shall have thermal insulation.
- The exhaust/manifold shall be shrouded

#### **2.1.3.7 Fuel System**

- Aspirated air shall be filtered through a replaceable dry-element filter.

- The system shall include all necessary accessories for full functionality including, but not limited to fuel lines, gauges, level-sensors, valves, fittings, filters, piping, insulation, wiring, and pumps, as necessary.
- For propane fueled systems, fuel lines from storage tank shall be of sufficient size to meet the engine's vaporization requirements in ambient outside temperatures as low as -30F.

## **2.1.4 Engine Controls & Alarms**

### **2.1.4.1 Control Panel**

- All controls, indicators, meters and alarms specified herein shall be consolidated into a control panel capable to being installed at a remote location.
- One remote panel shall be furnished for installation within the shelter's radio room.
- One remote panel shall be furnished for installation within the shelter's generator room.

### **2.1.4.2 Run/Stop Switch**

- A manual run/stop switch shall be provided.
- This switch shall be capable of being controlled remotely.

### **2.1.4.3 Gauges & Meters**

- The unit shall be equipped with the following:
  1. Oil pressure gauge.
  2. Temperature gauge.
  3. Charge rate ammeter.
  4. Running time meter.
  5. Analog output-frequency meter.

### **2.1.4.4 Governor**

- The unit shall be equipped with a governor to maintain speed regulation to within 5% from no-load to full-load output.
- The governor shall maintain frequency regulation to within +/- 0.25% of rated frequency under steady state load conditions.
- The governor shall be of the mechanical or electronic-type.

#### **2.1.4.5 Over Crank Control**

- The control unit shall provide a minimum of 3 cranking cycles of no less than 10 seconds before shutdown and activation of the over crank alarm.
- The control unit shall be equipped with the capability of manually-resetting the over crank alarm.
- The control unit shall be equipped with the capability of remotely-resetting the over crank alarm.

#### **2.1.4.6 Automatic Shutdown**

- The unit shall be equipped for automatic engine shutdown for the following conditions:
  1. Over Crank.
  2. Over Speed.
  3. Under Speed.
  4. Frequency regulation beyond design tolerances.
  5. Voltage regulation beyond design tolerances.
  6. Low Oil Pressure.
  7. High Temperature.

#### **2.1.4.7 Fault Reset**

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

#### **2.1.4.8 Condition Indicators**

- At a minimum, the following visual indicators shall be available on each control panel furnished:
  1. Generator running.
  2. Over Crank shutdown.
  3. Over Speed shutdown.
  4. Under Speed shutdown.
  5. Low oil pressure shutdown.
  6. High temperature shutdown.

7. Low fuel level.

#### **2.1.4.9 Alarms**

- A generator running condition shall activate a dry-contact, form-C (NO/NC) alarm.
- A second dry-contact, form-C (NO/NC) alarm shall be activated, at a minimum, by any one of the following alarm conditions:
  1. Over Crank shutdown.
  2. Over Speed shutdown.
  3. Under Speed shutdown.
  4. Low oil pressure shutdown.
  5. High temperature shutdown.
  6. Low fuel level.

### **2.1.5 Main Fuel Storage Tank**

#### **2.1.5.1 General**

The tank shall be new and of current production.

#### **2.1.5.2 Size & Type**

The size of the tank shall be as per table in the Installation Section.

Tank shall be suitable for exterior, above-ground installations.

Cylindrical shaped tanks are preferred.

All fixed installation fuel tanks shall be of the horizontal type.

Tank manufacture shall be as required by local, state and/or federal codes.

Tanks shall include warning and information signs on all sides as required by codes, laws, and/or the Department.

#### **2.1.5.3 Features & Accessories**

The storage tank features and accessories are as follows:

- Shall be equipped with a lockable fuel cap.
- Shall be equipped with a tank-mounted fuel gauge.

- Fuel gauge levels shall also be monitored from an interior on-site location such as an equipment shelter.
- The tank shall be equipped with a low fuel level sensor.
- A low fuel level condition shall activate a visual indicator on the generator's control panel.
- Indicator shall remain active until reset by service personnel.
- Activation of the low level indicator shall trigger a dry-contact, form-C (NO/NC) alarm output. Contacts shall be remoted to an interior on-site location.
- The tank shall include all necessary accessories for full functionality including, but not limited to fuel lines, gauges, level sensors, valves, fittings, filters, piping, insulation, wiring, and pumps, as necessary.
- The fuel line to the engine shall be equipped with a manually-controlled, emergency fuel-shutoff valve. The valve shall comply with all applicable codes.
- For propane-fueled systems, fuel lines to the engine shall be of sufficient size to meet the engine's vaporization requirements in ambient outside temperatures as low as -30F.

## **2.2 Switchgear - Transfer, Bypass & Isolation**

### **2.2.1 General**

The switchgear shall be new and of current production.

The transfer switch shall be of the automatic type.

Bypass and isolation switchgear shall allow the system to be serviced and tested without disrupting power to the critical loads.

### **2.2.2 Size**

The contractor shall size the switchgear with the Departments approval.

### **2.2.3 Housing**

All switchgear shall be contained within a single or multiple, key-lockable, U.L. listed, indoor wall-mount, NEMA cabinet(s).

### **2.2.4 Features & Functions**

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

- AC line under-voltage sensor.

- Time delay on-start.
- Time delay on-transfer.
- Time delay on-retransfer.
- Time delay on-stop.
- Exerciser Clock.
- Test Switch

### **2.2.5 Exerciser Clock**

The exerciser clock shall be equipped, at a minimum, with the following:

- Day-of-week set.
- Time-of-day set.
- Duration-of-exercise set.

## **2.3 Monitoring & Control Sub-System**

The system shall be equipped with a monitoring and control sub-system capable, at a minimum, of accessing the generators and transfer switches.

The sub-system shall allow for local and remote access.

The sub-system shall be microprocessor and IP-network based.

At a minimum, the sub-system shall be capable of:

- monitoring system performance and fault conditions
- display and annunciation of alarms
- controlling system functions
- real-time data collection, retention and report generation

All external IP-network based hardware such as routers, switches and workstations will be furnished by the Department.

## **3. Execution**

### **3.1.1 Description of Major Work Elements**

#### **3.1.2 Performed by Contractor**

##### **3.1.2.1 General**

- A. Design, Furnish & Install:
    - Emergency Power Generator.
    - Transfer Switchgear.
    - Fuel Sub-system.
  
    - Connections to the site equipment shelter
  
  - B. Furnish & Install:
    - Bypass & isolation switchgear.
    - Monitoring & Control Sub-System
    - Connection of generator to the earth ground grid system.
    - Connection of transfer switch to the earth ground grid system.
    - Connection of fuel sub-system to the earth ground grid system, if applicable.
  
  - C. All site planning, clearing, preparation and development, as required.
  
  - D. All engineering design certification and documentation.
  
  - E. Planning, Zoning & Permitting
    - Prepare all site planning documents necessary for zoning and permitting, as required.
    - Department to review and approve all planning documents prior to zoning and permitting.
    - Obtain all zoning approvals, as required.
    - Obtain all site permitting, as required. Fees will be borne by the State.
    - Coordinate all permitting inspections, as required.
  
  - F. Design & Construction
    - Prepare all pre-stamped drawings and specifications necessary for the designs and construction, as applicable.
    - Department to review and approve pre-stamped drawings and specifications prior to zoning, permitting and ordering.
-

- Provide State of Maine PE stamped drawings and specifications to Department. Obtain all site permitting, as required. Fees will be borne by the State.

G. Utility Services

- Coordinate commercial utility service relocations and/or improvements necessary for the installation.

H. Access

- All access road improvements and clearing as necessary for delivery of all materials.
- All access road repairs after the delivery. Road shall be restored to its pre-installation condition. Refer to SP 656 SEWPCP for more information.

I. Premises

- To the greatest applicable and practical extent, the contractor shall restore the premises to its pre-installation condition.
- Removing all rubbish and debris associated with site preparation, unpacking of shipping materials, and/or the installation, from the premises.

- J. Other work as needed to ensure a complete installation whether or not specified or shown elsewhere in this document.

## 3.2 Delivery & Storage of Materials

- A. The contractor shall be responsible for coordinating, unloading, inspecting, accepting and storing all material deliveries.
- B. All claims necessary as a result of damage or loss during shipment shall be the responsibility of the Contractor.
- C. All stored materials shall remain the responsibility of the contractor until final acceptance by the Department. Final acceptance is described later in this document.

## 3.3 Installation

### 3.3.1.1 General

The contractor shall be responsible for:

- The installation, wiring, testing and commissioning of the system.

- Providing all materials, labor and tools to ensure a complete installation whether or not specified or shown.
- Installing the system components in accordance with the professional engineer’s design, as applicable and as approved by the Department.
- Neat and professional workmanship.
- Coordination with other trades, as necessary.

**3.3.1.2 Generator**

The generator shall be installed inside the refurbished cement block shelter.

Prior to installation, the contractor shall coordinate the exact placement of the generator and accessories with the Project Management Office of the State’s Radio Project Office.

**3.3.1.3 Switchgear**

Prior to installation, the contractor shall coordinate the exact placement of the switchgear and accessories with the Project Management Office of the State’s Radio Project Office.

All switchgear shall be installed inside the site equipment shelter in the same room as the generator.

**3.3.1.4 Monitoring & Control Sub-System**

Install and optimized in one (1) Department furnished workstation.

**3.3.1.5 Alarms**

All Form C (NO/NC) dry contact alarms shall be terminated at a demarcation point inside the shelter.

**3.3.1.6 Fuel Tank**

AG = Above Ground      SBC = Sized by Contractor

SITE	Genset	Genset Install	Xfer Switch	Switch Install	Fuel	Fuel Tank	Tank Install
Cooper Hill.	25 KW continuous	In new shelter	SBC 200 Amp min	In new shelter	LP	1000 Gal	AG

All fuel tanks furnished by the contractor shall be installed in an above ground exterior location.

At fixed-tank sites, the contractor shall be responsible for the tank’s foundation design and construction, as necessary.

Prior to installation, the contractor shall coordinate the exact site placement of the fuel tank and accessories with the Project Management Office of the State's Radio Project Office.

The installation of the tank and construction of foundation shall be in accordance with local, state and/or federal codes, as applicable.

The foundation shall be of a pad and/or pier design.

The foundation shall be made of reinforced concrete.

The top of the foundation shall be elevated above grade.

The foundation design shall securely anchor an empty tank in wind load per TIA/EIA 222, Class III latest edition for this location.

Control, sensor and/or alarm wiring, as applicable, to/from generator shall be run inside rigid, weatherproof conduit.

Fuel lines to/from generator shall be insulated.

### **3.3.1.7 Engine Exhaust**

Prior to installation, the contractor shall coordinate the exact placement of the exhaust with the Project Management Office of the State's Radio Project Office.

The exterior exhaust pipe (EEP) shall penetrate an exterior wall. Roof penetrations are prohibited.

The EEP shall be oriented vertically.

The EEP shall clear the roof overhang by a minimum of 1-foot in all applicable directions.

The EEP shall extend a minimum of 2-feet above the roof line.

The EEP shall be furnished with a rain cap.

### **3.3.1.8 Grounding & Surge Protection**

#### **3.3.1.8.1 General**

The contractor shall be responsible for providing all materials and labor for the installation of grounding, and lightning and power surge protection devices in accordance with the manufacturer's recommendations, the Department's standards, or the contractor's practices.

The State has adopted Motorola's "STANDARDS & GUIDELINES FOR COMMUNICATIONS SITES" document, latest edition, to serve as its standard for the grounding of communications structures and equipment.

This document is sometimes referred to as the “R56 Manual” and is available from Motorola as hard copy (part # 6881089E50-B) and in CD (part # 9880384V83).

In the event certain aspects of the recommendations, the standards, or the practices are in conflict, then the most stringent shall prevail.

Unless otherwise noted, the contractor shall assume the existence of a transient voltage surge suppression (TVSS) device at the main electrical service entrance at all sites.

### **3.3.1.8.2 Certification**

Contractor shall provide written certification to Department that grounding was performed in accordance with the State’s standards, manufacturer’s recommendations, or the contractor’s practices as specified in the General section above.

- A. The Contractor shall be fully responsible for the installation, wiring, testing and commissioning of the system.
- B. The Contractor is responsible for providing all materials, labor and tools to ensure a complete installation.
- C. Prior to installation, the Contractor shall coordinate the exact site placement of the following items with the Department:
  - 1. Generator.
  - 2. Fuel line from existing propane tank to equipment shelter.
  - 3. Automatic Transfer Switch. The switch shall be installed inside of the refurbished shelter.
- D. The Contractor shall be responsible for:
  - 1. Removing all rubbish and debris associated with all aspects of the installation.
  - 2. All commercial electric utility improvements necessary for the installation
  - 3. All engineering design certification and documentation.

### **3.3.2 Foundation Pad – Generator & Fuel Tank**

- A. Generator foundation shall be reinforced concrete, attached directly to the floor.
- B. Fuel lines to/from generator shall:
  - 1. Be installed in a protective device approved by the Department.
  - 2. Exterior fuel line above grade shall be insulated.

## **3.4 Inspection, Testing & Acceptance**

### **3.4.1 Field Inspection**

- A. After installation of all the components furnished under this section, the contractor along with the Department shall perform a field inspection, on a per-site basis, to verify that the installation of the components furnished under this contract has been performed and completed in accordance with the Department's specifications; the contractor's installation practices and standards; and that workmanship has been performed in a neat and professional manner.
- B. The Contractor shall provide all items, instrumentation, materials, equipment, and personnel necessary to conduct the inspection.
- C. Prior to the commencement of this activity, the contractor shall deliver a preliminary field inspection plan to the Department for review and approval.
- D. At the conclusion of this activity, the contractor shall present to the Department written certification that the inspection performed was in accordance with, and that the results of the inspection was in compliance with, the approved field inspection plan.
- E. The Department's signature on the certification shall constitute the Department's acceptance.

### **3.4.2 Testing**

- A. After installation of all the components furnished under this section, the Contractor along with the Department shall perform the test(s) described herein, on a per-site basis, to demonstrate that the emergency power generator system has been properly configured and optimized, and that it is operating fully and correctly.
- B. The Contractor shall provide all items, instrumentation, materials, equipment, and personnel necessary to conduct the test(s).
- C. This test(s) shall be performed after the inspection defined earlier in this section has been accepted.
- D. Prior to the commencement of this activity, the Contractor shall deliver a preliminary test plan to the Department for review and approval.
- E. At the conclusion of this activity, the Contractor shall present to the Department written certification that the test(s) performed were in accordance with, and that the results of the test(s) were in compliance with, the approved test plan.
- F. The Department's signature on the certification shall constitute the Department's acceptance.
- G. Costs associated with the test(s) defined in this section shall be clearly and individually identified in the pricing section of the response.

### **3.4.3 Final Acceptance**

#### **A. General**

1. After acceptance of all the inspections and all the tests conducted under this section, the Contractor shall present to the Department written certification that the activities were performed in accordance with, and that the results were in compliance with, the approved plans.
2. This certification shall include the original copy of the individual inspection and test certifications previously accepted by the Department.
3. Final acceptance will be deemed final when the Department's signature appears on this certification.

#### **B. Post-Final Acceptance Documentation**

1. After final system acceptance, the contractor shall deliver to the Department, in both printed and electronic form, the following documents, on a per-site basis, in one consolidated package.
  - a. Copies of all signed certifications.
  - b. Copies of all approved inspection and test plans.

### **3.5 Warranty**

#### **A. System**

1. The entire system, less genset batteries, shall be warranted to be free from defects in material and workmanship for a period of two (2) years after final acceptance.
2. The warranty shall include all costs for labor and materials, inclusive of travel.
3. Costs associated with the warranty defined in this section shall be clearly and individually identified in the pricing section of the response.

#### **B. Batteries**

1. The batteries shall have a 5-year pro-rata warranty.

### **3.6 Preventive Maintenance**

A. Preventive maintenance shall be performed on the system during the warranty period.

B. The preventive maintenance shall adhere to the manufacturers suggested schedule and, at a minimum, include all maintenance required by the manufacturer to prevent the warranty from being voided.

### **3.7 Training**

A. The Contractor shall conduct a single, on-site, hands-on training session for selected Department personnel.

- B. The training location and schedule shall be by mutual agreement between the Department and Contractor.
- C. The session shall be conducted after final acceptance.
- D. The contents of the session shall include demonstrations on the location, proper operation, and visual checks of all mechanical and electrical elements of the system.

## **3.8 Documentation**

### **3.8.1 With the Contractor's Bid**

- A. The Contractor's bid shall include a catalog or specification sheet for the following items:
  - 1. Generator
  - 2. Automatic Transfer Switch

### **3.8.2 Post-Contract Award**

- A. General
  - 1. Thorough documentation of all generator, transfer switch, gauges and switches, and any auxiliary components, and their respective installations, will be required from the Contractor. This documentation will be comprised of both factory-provided and field-generated documents and/or manuals.
  - 2. Every document exchanged between Department and Contractor shall be in paper and electronic form, as appropriate. Electronic documents shall use the latest version of the application software or by a mutually agreed version. The following applications are preferred:
    - a. Text - Microsoft Word
    - b. Spreadsheets - Microsoft Excel
    - c. Databases - Microsoft Access
    - d. Scanned documents - Adobe Acrobat
    - e. Simple Diagrams & Charts - Microsoft Visio or Excel
    - f. Large Drawings – mutually agreed software program
    - g. Schedules - Microsoft Project
  - 3. The Department shall approve the contents and organization of all field-generated documents supplied by the Contractor.
- B. Factory Provided – Technical & Service Manuals
  - 1. All factory-provided documentation shall be available on CD media.

2. Manuals shall be provided for the following categories of equipment on a per-site basis:
    - a. Generator
    - b. Automatic Transfer Switch
  3. The following sets of manuals are to be furnished prior to project closeout on a per-site basis:
    - a. Five (5) complete paper-form sets
    - b. Five (5) complete electronic-form sets
- C. Field Generated - As-Built
1. All **field-generated documentation** shall be prepared in a format suitable for storage in loose-leaf 3-ring binders. This documentation shall also be supplied on CD media.
  2. All field-generated drawings shall be prepared using a mutually agreed software program.
  3. The following documentation shall be provided. Specification or catalog cut sheets for each of the major items illustrated in the diagrams shall be included with the submittals to the Department.
    - a. Interconnection power wiring schematic diagram(s).
    - b. Interconnection control wiring schematic diagrams(s).
    - c. Alarm wiring schematic diagram(s).
    - d. Interconnection ground wiring schematic diagram(s).
    - e. Wiring between generator, transfer switch and electrical distribution panel(s).
    - f. A simple floor plan illustrating the installed location of the equipment supplied under this contract relative to other existing major components (e.g., doors, HVAC units, electrical distribution panels, etc.). Plan shall be approximately to scale; and the new and existing components shall be contrasted by the use of a gray scale.
    - g. A detailed inventory of each major equipment component installed. This shall include model and serial numbers
  4. The following sets of field-generated documentation is to be furnished prior to project closeout on this site:
    - a. Five (5) complete paper-form sets
    - b. Five (5) complete electronic-form sets
-

## 4. MEASUREMENT AND PAYMENT

### 4.1 Method of Measurement:

ITEM #	DESCRIPTION
643.98	Emergency Power Generator, Installed
643.981	Emergency Power Generator----Inspection and Acceptance, Field Inspection
643.982	Emergency Power Generator----Inspection and Acceptance, Testing
643.983	Emergency Power Generator----Inspection and Acceptance, Final Acceptance

### 4.2 Basis of Payment

The accepted Communications Equipment Shelter items will be paid for at the contract lump sum prices which will include payment for all respective items as called for in the contract, designed, delivered, stored, placed, constructed, installed, tested, documented, all clearing, demolition, remediation, preparation, materials, labor, equipment, training and incidentals necessary to complete the work.

Payment will be made under:

ITEM #	DESCRIPTION	UNIT
643.98	Emergency Power Generator, Installed	LS
643.981	Emergency Power Generator----Inspection and Acceptance, Field Inspection	LS
643.982	Emergency Power Generator----Inspection and Acceptance, Testing	LS
643.983	Emergency Power Generator----Inspection and Acceptance, Final Acceptance	LS

**END OF DOCUMENT**

## **SECTION 4**

### **Special Provision**

### **Specification for a Communications Site Perimeter Fence**

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# **1. Perimeter Fence System**

## **1.1 Fence**

### **1.1.1 General**

The fence and associated components shall be new and of current fabrication. Used, re-rolled and/or re-galvanized materials are not acceptable.

The fence and associated components shall be industrial or commercial-grade rated.

Unless otherwise noted, all components and associated hardware shall be fabricated of steel and hot-dipped galvanized at the manufacturer's facility.

### **1.1.2 Physical & Structural**

The fence shall be of the chain-link type.

The height of the fence shall be eight (8)-feet excluding the security barrier.

### **1.1.3 Posts**

Post height: as required.

Post insertion: below frost line if loose soil or anchored if ledge.

Post-type: tubular, high-strength (Schedule 40).

### **1.1.4 Chain-link Fabric**

Weave: 2-inch diamond-mesh pattern.

Wire Size: 9 AWG, minimum.

Top and bottom selvage edges shall be twisted and barbed.

## **1.2 Gate**

### **1.2.1 Physical**

Swing-type, twin-leaf.

Leaf Width: 5-feet

Fabric: same as fence.

Gate-leaf frame members shall be welded together.

### **1.2.2 Hinges**

Hinges shall use vandal resistant, non-removable hinge pins.

Hinges shall allow for 180-degree swing for each gate-leaf from closed to open position.

### **1.2.3 Latch**

Latch shall be of a horizontal-bar design. Drop-rod or plunger-bar type designs are not acceptable.

Latch shall be of a vandal-resistant design.

Latch shall permit operation from either side of gate.

Padlock hasp shall be an integral part of latch.

### **1.2.4 Keeper**

Device to secure gate-leaf in the full-open position.

One (1) keeper per gate-leaf.

Auto-engage.

Manual release.

Devices of an in-ground, drop-rod or plunger-bar type design are not acceptable.

## **1.3 Security Barrier**

### **1.3.1 General**

The fence system shall include a top-mounted security barrier made of barbed-wire. The security barrier wire and tape shall be fabricated of galvanized or stainless steel.

### **1.3.2 Barbed-Wire**

Barrier shall be comprised of 3-lines of barbed-wire.

The length of the barrier shall span the perimeter of the fence including the gate.

Barbed-wires shall be supported by 45-degree top-mounted extension arms tilted outward.

Each barbed-wire shall be fabricated of two (2) individual wire strands, at a minimum.

Barb clusters shall be of a 4-point design and spaced evenly on 3-inch centers.

## **1.4 Gravel layer within fence perimeters.**

**1.4.1** A gravel layer shall be installed within the entire fenced in area encompassing the equipment shelter and tower. The gravel layer shall be preceded by a weed barrier.

**1.4.2** A gravel layer shall be installed within the entire fenced in area encompassing generator shelter and fuel tank. The gravel layer shall be preceded by a weed barrier.

## **1.5 Signage**

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

At a minimum, signs shall meet the following:

- Industry Standards
- Municipal or Local Codes
- Specific requirements of the State

## **1.6 Perimeter Fence System**

### **1.6.1 Description of Major Work Elements**

#### **1.6.1.1 Performed by State**

The following work will be performed by the State:

- A. Acquisitions:
  - Perform site acquisition activities, as required.
- B. Ownership:
  - Conduct property title/deed searches.

- C. Surveying
  - Perform boundary and topographical site surveys.
- D. Zoning:
  - Assist contractor with zoning approval process, as required, when deemed by the State.
- E. Permitting:
  - Assist contractor with permitting process, as required, when deemed by the State.

**1.6.1.2 Performed by Contractor**

- A. Furnish & Install:
  - Fences.
  - Gates.
  - Security Barriers.
  - Grounding of fence system to the earth ground grid system.
  - Gravel layer within fence perimeters.
  - Signage.
- B. All site planning, clearing, preparation and development, as required.
- C. All engineering design certification and documentation.
- F. Design & Construction
  - Prepare all pre-stamped drawings and specifications necessary for the designs and construction, as applicable.
  - State to review and approve pre-stamped drawings and specifications prior to zoning, permitting and ordering.
  - Provide State of Maine PE stamped drawings and specifications to State.
- G. Utility Services
  - All commercial utility service relocations and/or improvements necessary for the installation.

H. Access

- All access road improvements and clearing as necessary for delivery of all materials.
- All access road repairs after the delivery. Road shall be restored to its pre-installation condition.

I. Premises

- To the greatest applicable and practical extent, the contractor shall restore the premises to its pre-installation condition.
- Removing all rubbish and debris associated with site preparation, unpacking of shipping materials, and/or the installation, from the premises.

J. Other work as needed to ensure a complete installation whether or not specified or shown elsewhere in this document.

**1.6.1.3 Site Specific**

Refer to the site plan for the location of the perimeter fence. Contractors shall assume that 400 linear feet will be adequate to encircle the tower and shelter and 200 linear feet for the generator shelter and fuel tank.

The exact location of the fence and gravel layer and weed barrier shall be coordinated with the Department prior to installation.

SITE	PERIMETER	GRAVEL LAYER
Cooper Hill	Encircle tower & equipment shelter.	Yes
	Encircle generator shelter & fuel tank.	Yes

**1.6.2 Installation**

**1.6.2.1 General**

The contractor shall be responsible for:

- The installation of the fence systems and components.
- The installation of the gravel layers.
- Providing all materials, labor and tools to ensure a complete installation whether or not specified or shown.

- Installing the fences and components in accordance with the manufacturer's instructions and recommendations.
- Installing the fences and gravel components in accordance with the State's specifications, practices and standards.
- Installing the fences and gravel components in accordance with the professional engineer's design, as applicable.
- Installing the fences and gravel components in accordance with local, state and/or federal codes, as applicable.
- Removing the existing perimeter fence.
- Neat and professional workmanship.
- Coordination with other trades, as necessary.

#### **1.6.2.2 Fences**

Install all materials in accordance with the manufacturer's drawings, specifications, instructions and recommendations.

Fence posts shall be ground-anchored in concrete.

Fence posts shall be weather-tight capped.

Contractor to provide written certification to State that fence was installed in accordance with the manufacturer's drawings, specifications, instructions and recommendations.

#### **1.6.2.3 Gates**

Install all materials in accordance with the manufacturer's drawings, specifications, instructions and recommendations. Locations of the gates will be depicted on the site plan and shall be coordinated with the Department.

#### **1.6.2.4 Security Barriers**

Install all materials in accordance with the manufacturer's drawings, specifications, instructions and recommendations.

#### **1.6.2.5 Buffer Zone**

At a minimum, where practical and available, a 10-foot buffer zone between the fence, the tower/shelters and fuel tank shall be maintained.

### **1.6.2.6 Gravel Layers**

6" (nominal) depth  $\frac{3}{4}$ " crushed stone gravel layer over the entire area within the perimeter fences. The gravel layer may extend a short distance beyond the fence.

Gravel layers shall be preceded with a weed barrier layer.

### **1.6.2.7 Signage**

Size, contents and location of the signs shall be coordinated with the State.

## **1.6.3 Grounding**

### **1.6.3.1 General**

All fence grounding shall be integrated into the site ground system.

A ground rod shall be installed at intervals for each 25 linear feet of fence and at all corners and gates. This ground rod shall be installed from the closest fence post to the site ground. The fence shall be electrically connected so that it forms a single electrical unit.

Exothermic welds shall be used to connect each fence post to its associated ground rod and to the site ground system. All gates shall be connected to grounded components using exothermic welds and stranded copper wire.

All exothermic welds on fence posts shall be treated with cold galvanizing spray.

The contractor shall be responsible for providing all materials and labor for the installation of grounding, and lightning and power surge protection devices in accordance with the manufacturer's recommendations, the State's standards, or the contractor's practices.

The State has adopted Motorola's "STANDARDS & GUIDELINES FOR COMMUNICATIONS SITES" document, latest edition, to serve as its standard for the grounding of communications structures and equipment. This document is sometimes referred to as the "R56 Manual" and is available from Motorola as hard copy (part # 6881089E50-B) and in CD (part # 9880384V83).

In the event certain aspects of the recommendations, the standards, or the practices are in conflict, then the most stringent shall prevail. Refer to Section 5 "Specification for a Radio Communications Site Earth Ground and Lightning Protection System.

### **1.6.3.2 Certification**

Contractor shall provide written certification to State that grounding was performed in accordance with the State's standards, manufacturer's recommendations, or the contractor's practices as specified in the General section above.

### **1.6.4 Warranty**

The Contractor shall warrant workmanship and all materials provided for a period of one year.

### **1.6.5 Field Inspection**

- A. After installation of all the components furnished under this section, the contractor along with the Department, at its discretion, shall perform a field inspection, to verify that the installation of the components furnished under this contract has been performed and completed in accordance with the following, as applicable.
  - 1. The manufacturer's instructions and recommendations.
  - 2. The Department's specifications including testing and certifying the site's earth ground grid system meets R-56 requirements.
  - 3. The Contractor's installation practices and standards as approved by the Department.
- B. The Contractor shall provide all items, instrumentation, materials, equipment, and personnel necessary to conduct the inspection.
- C. Prior to the commencement of this activity, the contractor shall deliver a preliminary field inspection plan to the Department for review and approval.
- D. At the conclusion of this activity, the contractor shall present to the Department written certification that the inspection performed was in accordance with, and that the results of the inspection was in compliance with, the approved field inspection plan.
- E. The Department's signature on the certification shall constitute acceptance by the Department of the inspection.

### **1.6.6 Final Acceptance**

- A. General
  - 1. After acceptance of all the inspections and all the tests. Conducted under this section, the contractor shall present to the Owner written certification that the activities were performed in accordance with, and that the results were in compliance with, the approved plans.

2. This certification shall include the original signed copy of the individual inspection and test certifications previously accepted by the Owner.
3. Final acceptance will be deemed final when the Owner's signature appears on this certification.

## 1.6.7 Measurement of Payment

### 1.6.7.1 Method of Measurement:

The following items will be paid for by the lump sum

ITEM #	DESCRIPTION
642.91	Perimeter Fences and Gravel Layers Accepted

### 1.6.7.2 Basis of Payment:

The accepted radio communications site Perimeter Fence and Gravel Layer. Installed items will be paid for at the contract lump sum prices which will include payment for all respective items called for in the contract designed, delivered, stored, placed, constructed, installed, tested, inspected, accepted, documented, all clearing demolition, remediation, site work, materials, labor, equipment and incidentals required to complete

ITEM #	DESCRIPTION	UNIT
642.91	Perimeter Fences and Gravel Layers Accepted	LS

**END OF DOCUMENT**

## **SECTION 5**

### **Special Provision**

#### **Specification for a**

### **Radio Communications Site Earth Ground and Lightning Protection System**

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# 1. Grounding & Lightning Protection

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

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

## 1.1 General

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

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

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

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

The interior building ground system and exterior site ground system shall be integrated into a common, single-point ground system.

## 2. Description of Major Work Elements

- A. Design, furnish and install the site ground system.
- B. The Contractor shall use this specification in conjunction with the grounding portions contained in the other special provisions of this request for bid to provide a complete, common, single point ground system for the entire site.

## **2.1 References**

### **2.1.1 State Standards**

The State has adopted Motorola's "STANDARDS & GUIDELINES FOR COMMUNICATIONS SITES" document, latest edition, to serve as its standard for the grounding of communications structures and equipment. This document is sometimes referred to as the "R56 Manual" and is available from Motorola as hard copy (part # 6881089E50-B) and in CD (part # 9880384V83).

In the event that certain grounding practices, methods or standards are in conflict with the standards adopted by the State, then the most stringent shall prevail.

### **2.1.2 Other Government and Industrial Standards**

The following is a list of government and industrial grounding standards listed in the order of governing precedence:

- National Fire Protection Association (NFPA) 780 Lightning Protection Code
- National Electrical Code NFPA 70
- Institute of Electrical and Electronics Engineers Emerald Book - Powering and Grounding Sensitive Electronics Equipment

Practices, methods and/or standards contained in these documents can be used to compliment or supplement the standards adopted by the State.

## **2.2 Undesirable Methods and Materials**

### **2.2.1 Ufer Grounds**

Ufer or concrete-encased grounding systems are prohibited for use in MSCommNet, especially as part of the tower or building foundation, for use on new construction of communications facilities.

### **2.2.2 Aluminum**

Aluminum conductors are forbidden for use on new construction of communications facilities.

### **2.2.3 Chemical Grounds**

Methods of acquiring lower ground resistance by adding ionized salts (soil doping) and other chemicals are unacceptable for new construction of communications facilities. The only acceptable method of lowering the ground resistance is addition of ground rods and ground radials.

## **2.3 External Grounding Design and Installation**

### **2.3.1 Grounding**

An earth electrode subsystem shall be installed for each communications facility. For each site, the earth electrode subsystem shall consist of a buried external site ground system of a bare copper conductor connected to ground rods as required to obtain the overall grounding resistance goals.

### **2.3.2 Ground Resistance**

The integrated, common, single-point ground system shall be designed to achieve a ground resistance of 5-ohms or less.

### **2.3.3 Grounding for Building, Architectural, and Structural Steel**

All building, architectural, and structural steel shall be electrically grounded and connected into a single electrically-conductive unit. Acceptable grounding connection methods include clamps, bolting, exothermic welds and welding.

The building structural steel system shall be connected to the grounded conductor of the incoming AC supply system at the service entrance, and to the main cold-water piping and sewer systems, if the building is provided with water or sewer service and continuous metallic piping is used.

### **2.3.4 Site Ground System**

Each facility shall be provided with an interconnected buried ground system for all structures. These structures include but are not limited to the following: building, sheds, towers, fuel tanks, generators, generator supports, fences and other structures.

This ground system shall be connected to the building's (or any other structure's) structural steel system and to any electrical and metallic piping systems that cross it. Connection shall occur at the nearest point to the intersection between the ground system and the item being connected.

The system shall be continuously connected into one electrical system. The ground shall be buried at a minimum distance of 24 inches from the foundation, and shall be buried at a minimum depth of 30 inches or below the frost line, which ever is greater. In hard rock locations, the 30 inches deep grounding wire installation requirement is waived.

### **2.3.5 Ground Test Well**

A buried ground test well shall be furnished and placed at an exterior site location near the cable entry panel of the shelter.

The test well will be used for:

- Periodic soil resistivity and ground system resistance checks.
- Connection node for future expansion of the ground system.

The well shall:

- rise no less than two (2) inches and no more than four (4) inches above grade.
- be no less than six (6) inches in width.
- be protected inside a weatherproof non-corrosive metal or plastic-type conduit or pipe.
- be capped with a screw-type top.
- be furnished with a weatherproof identification sign.
- be placed at a location coordinated with the State.

### **2.3.6 Grounding for Lightning Protection**

Lightning rods (air terminals) shall be connected to the tower.

### **2.3.7 Tower Grounding**

The antenna tower shall be connected to the site ground system. The preferred attachment method for grounding conductors to the tower is by an exothermic weld attached near the base of each tower leg.

All grounding cables and wires attached to the tower, transmission lines, ice bridges and other exterior appurtenances shall be installed leading in a constantly descending manner with no sharp bends or loops. This tower ground shall be connected to the site ground system.

### **2.3.8 Guy Wire Grounding**

A ground rod shall be installed at each guy anchor. This guy wire ground shall be connected to the site ground. A single ground cable shall be clamped to each guy wire above the anchor plate. This cable shall be installed in a constantly descending direction with no sharp bends or loops.

### **2.3.9 Fence Grounding**

A ground rod shall be installed at intervals for each 25 linear feet of fence and at all corners and gates. This ground rod shall be installed from the closest fence post to the site ground. The fence shall be electrically connected so that it forms a single electrical unit.

Exothermic welds shall be used to connect each fence post to its associated ground rod and to the site ground system. All gates shall be connected to grounded components using exothermic welds and stranded copper wire.

All exothermic welds on fence posts shall be treated with cold galvanizing spray.

### **2.3.10 Grounding for AC Service**

The commercial AC service and any generators shall connect the AC grounds and neutrals to the site ground. This connection to the site ground shall be adjacent to the master ground buss-bar.

All AC power metal equipment parts, such as enclosures, raceways or conduits, and equipment grounding conductors, and all earth grounding electrodes shall be connected into a continuous electrically conductive system.

### **2.3.11 Grounding for Telephone Services**

The commercial telephone service ground shall be connected to the site ground. This connection to the site ground system shall be adjacent to the ground bar.

All telephone equipment's metal parts, such as enclosures, raceways or conduits, and equipment grounding conductors, and all earth grounding electrodes shall be connected into a continuous electrically conductive system.

### **2.3.12 Transmission Lines**

The outer conductor of all coaxial transmission lines and waveguides shall be bonded to the tower at:

- its highest practical point on the tower
- midpoints along the length of the transmission lines and waveguides in accordance with the State's standards.
- the lowest point on the tower
- to the ground bar at the point of entrance to the building.

A common ground point consisting of a copper grounding bar shall be provided to ground the transmission lines at the entrance to the building. This ground bar shall be bonded to the nearest external ground point on the site ground system with two 6" copper straps. These straps shall be connected to the internal building ground bar.

This can be achieved by use of internal and an external ground bar connected with copper straps or a commercially available transmission line entrance assembly.

### **2.3.13 Other Grounding**

All other metallic items at each communications site shall be grounded. These include but are not limited to the following items: metal hatches and doors, metal downspouts, roofing and siding, all metal fuel-storage tanks, telephones, electrical and other utility equipment, generators and supports, solar photovoltaic panel supporting structures, and exterior and interior cable trays and ice shields.

## **2.4 Internal Building Grounding**

### **2.4.1 Ground Bar**

A connection to the site ground system shall enter the building at a single point and terminate at a master ground bar. At a minimum, the ground bar shall be pre-drilled, be 18-inches in width, be 8-inches in height, and be .25-inches in thickness.

This ground bar shall be installed adjacent to the AC ground system, and shall consist of a single copper bar with attachment points for internal building grounding. The copper bar shall be connected to the external ground system by exothermic welds, brazing, or welding.

All internal equipment shall be connected to this master ground bar. This includes the telephone system, the electrical system, and RF systems connected via the internal ground bus.

### **2.4.2 Internal Building Ground Halo**

An internal building ground halo system shall be installed to allow low impedance ground connections to individual pieces of equipment.

The internal building halo system may be constructed of 3/4" or 1" copper pipe bus network or of green insulated #2/0 AWG stranded copper wire.

This system shall be isolated from building steel and other electrical conductors such as metallic water pipes, conduits or structural steel.

The internal building ground halo shall be connected to the site ground system at a single point at the master ground bar.

### **2.4.3 Connection to Equipment**

All stand-alone equipment shall be connected to the internal building ground bus. Care shall be taken to minimize the length of the connection to the internal building ground bus.

#### **2.4.4 Connection to Electronic Equipment Racks**

All electronic equipment racks, console cabinets, and transmitter cabinets shall be connected to the internal building ground bus using #2/0 AWG stranded copper wire.

#### **2.4.5 Transmission Lines**

The outer conductor of all coaxial transmission lines and waveguides shall be bonded to the tower at the lowest point on the tower and to the ground bar at the point of entrance to the building.

A common ground point consisting of a copper grounding bar shall be provided to ground the transmission lines at the entrance to the building. This ground bar shall be bonded to the nearest external ground point on the site ground system with two 6" copper straps.

#### **2.4.6 Roof Mounted Antennas**

The steel structure used to support roof-mounted antennas shall be connected to the nearest point on the site ground system.

Each building roof-mounted antenna shall be individually grounded to the master ground buss bar.

### **2.5 Grounding Components**

#### **2.5.1 Ground Rods**

All ground rods shall be made of copper or copperclad steel and shall be a minimum of 5/8 inch in diameter and 10 feet in length.

In soils where there is difficulty driving ground rods, 3/4 inch diameter ground rod shall be used.

Sections of ground rods may be coupled together using exothermic welds or threaded connectors.

Connection from the ground rod to the site ground system conductor shall employ an exothermic weld.

Ground rods shall be driven using the proper tool to prevent deformation of the rod.

The top of each ground rod shall be driven to the depth of the site ground system.

Ground rods shall be driven to a minimum depth of 10 feet below the site ground system conductor.

In soil conditions where it is practical, ground rods shall be driven to 20 feet below the site ground system conductor.

In low conductivity soils, ground rods shall be driven as deep as practical to provide a satisfactory ground resistance.

Ground rods shall be located a minimum of 30 inches from foundation walls, concrete tower piers or concrete footings. Ground rods shall be approximately equally spaced along the site ground system.

At sites located on solid rock, or where the subsurface layer is solid rock, where ground rods cannot be installed using conventional methods, a star-shaped ground made up of #2/0 AWG bare copper conductor shall be installed in place of a ground rod.

The number and length of individual conductors in this ground system shall be configured to obtain the grounding resistance goal.

The ground system shall be buried as deeply as practical for the soil conditions.

### **2.5.2 Ground Wire, Cable Strap and Pipe**

Wire for buried ground conductors surrounding buildings (main ground wire) and other structures shall be #2/0 AWG at a minimum according to NFPA 780 Lightning Protection Code, 1992 Edition Table 3-5.

All other grounding wire and connection wire shall consist of bare or green insulated #2/0 AWG or #6/0 AWG copper conductors (bonding ground wire).

In general, solid wire is to be used in locations where there is no movement between the connections, and stranded wire is to be used where movement is expected.

For low impedance signal grounds, copper strap and copper pipe is preferred. An internal copper pipe ground bus is acceptable.

### **2.5.3 Lightning Rods**

Lightning rods (air terminals) shall consist of solid copper rod with a minimum diameter of 5/8 inches and a minimum length of 18 inches.

The lightning rod shall extend above all tower mounted systems such as tower lights, antennas and tower mounted preamps, which require protection.

The "area of protection" is defined by a 30° cone which extends downward from the top of the lightning rod.

All antennas, buildings and other structures within the communications site shall be protected from lightning according to NFPA 780 Lightning Protection Code, 1992 Edition. Lightning rods shall extend a minimum of 18 inches above device to be protected.

All lightning rods shall be connected to the steel supporting tower or connected to #2/0 AWG wire and connected to the site ground system.

#### **2.5.4 Ground Connectors**

Exothermic welds shall be used for all ground connections exposed to the elements. In places where exothermic welds are not possible, brazing, silver solder and bolted clamps are acceptable under authorization from the State of Maine.

Ground connections shall be according to tower manufacturers' guidelines.

All clamps, connectors, bolts, washers, nuts, and other hardware used in the grounding system shall be copper or bronze, except that nuts, bolts, and washers may be stainless steel.

Dissimilar metal mechanical connections shall be made with components specifically designed to reduce the likelihood of galvanic corrosion.

Dissimilar metal connections are permissible only when connecting the ground system to other systems and appropriate methods to alleviate galvanic corrosion have been made.

#### **2.5.5 Underground Ground Connectors**

All buried ground connections shall use exothermic welding techniques except where it presents a specific hazard such as connections to fuel tanks.

All underground metallic structures such as tanks, water lines, sewer lines, and armored cable shall be connected to the grounding system with bare copper cable with a minimum size of #2/0 AWG.

Appropriate measures shall be taken to prevent corrosion.

#### **2.5.6 Rack Mounted Equipment**

All electronic equipment racks shall be provided with a single copper bar, with attachment points for grounding electronic equipment.

All equipment shall have a low-impedance connection to the rack ground bar.

The rack shall be connected to the rack ground bar, and the rack ground bar shall be connected to the internal building ground system or ground bus.

#### **2.5.7 Fuel Tanks and Generators**

All fuel tanks and generators shall be grounded in accordance with the State's standards.

## **2.5.8 Dissimilar Metals**

All ground systems shall consist of copper components.

No aluminum shall be used within any grounding system.

Connection to racks and other systems where the connection is to a dissimilar metal shall be made with components specifically designed to reduce the likelihood of galvanic corrosion.

All screws and hardware used on racks and other electronic connections shall be constructed from similar metals or from stainless steel.

Where interconnection between copper ground system components or buswork and aluminum equipment cabinets or frames is unavoidable, such connections shall be made by using prepared bimetallic strips or by a tinplate to the copper surface where it contacts aluminum.

All dissimilar metal grounding connections (aluminum-tin, copper-zinc galvanizing) in exterior locations shall be painted with waterproof sealing compound (Perma-tex or equal) for at least 2 inches on each side of the dissimilar metal connection.

## **2.6 Surge Protection**

This Section describes the standards for transient voltage surge suppression (TVSS) equipment for the proposed new System.

These standards are to be used in conjunction with engineering judgment for the design, modification, retrofit, installation and maintenance of communications AC power systems, RF equipment, microwave equipment, and other equipment associated with the new System.

The system designers shall consider site-specific information such as cost, site location, relative lightning risk, and power distribution facilities at existing State and local government site communications facilities to be shared by State, adjacent communication facilities and other pertinent information to design the optimum AC Power Surge Protection system for each site.

### **2.6.1 Overview**

All electronic equipment within the new System shall be protected with transient voltage surge suppression (TVSS) systems. This is to assure that there are no equipment faults due to power line fluctuations or lighting events.

Contractor shall also provide TVSS systems for all transmission lines, waveguides and data and telephone lines, or any other electrical conductors that extend off of the premises (such as tower lighting) of the

communications facility. These systems shall, to the extent possible, be located at the point of entry into the equipment area or equipment shelter.

Contractor shall design an appropriate TSSV system for each application. Documentation shall be provided to demonstrate that the proposed system provides adequate TVSS protection for each application.

## **2.6.2 References**

### **2.6.2.1 State Standards**

The State has adopted Motorola's "STANDARDS & GUIDELINES FOR COMMUNICATIONS SITES" document, latest edition, to serve as its standard for the grounding of communications structures and equipment. This document is sometimes referred to as the "R56 Manual" and is available from Motorola as hard copy (part # 6881089E50-B) and in CD (part # 9880384V83).

In the event that certain grounding practices, methods or standards are in conflict with the standards adopted by the State, then the most stringent shall prevail.

### **2.6.2.2 Other Government and Industrial Standards**

The following is a list of government and industrial grounding standards listed in the order of governing precedence:

- National Electrical Code
- Institute of Electrical and Electronics Engineers Emerald Book - Powering and Grounding Sensitive Electronics Equipment
- IEEE/ANSI C62.41-199, C62.45-1992, c62.1 and C62.11
- Underwriters Laboratories UL 1449, UL 1283, UL 489 and UL198

Practices, methods and/or standards contained in these documents can be used to compliment or supplement the standards adopted by the State.

## **2.6.3 Undesirable Methods and Materials**

### **2.6.3.1 Aluminum**

Aluminum conductors are forbidden for use on new construction of communications facilities.

### **2.6.3.2 Sacrificial Components**

To the extent that is possible TVSS systems shall not rely on components that cease to function after a single TVSS event. In systems that use this type of technology the system shall have adequate front panel notification that the failed component requires replacement.

Systems with sacrificial components shall be designed to withstand multiple TVSS events equivalent to 10 years of typical service without component replacement.

### **2.6.4 TVSS Equipment Location**

To the extent possible, all TVSS equipments shall be located as close as possible to the AC mains entrance or the building entrance of telephone or data lines after demark point. TVSS equipment on transmission lines and waveguides shall be incorporated into the transmission line or waveguide entry port ground bus panel.

### **2.6.5 Physical Conditions**

#### **2.6.5.1 Environmental Conditions**

Equipment shall function properly under the following environmental conditions:

- Temperature: -10°C to +50°C
- Storage: -40°C to +65°C
- Humidity: 5% to 95% non-condensing
- Altitude: up to 15,000 ft. (4,267 meters).

### **2.6.6 Operating Requirements**

#### **2.6.6.1 Maximum Continuous Operating Voltage**

The TVSS system shall be able to provide continuous operation of electrical service when voltage conditions vary within  $\pm 15\%$  of normal line voltage.

#### **2.6.6.2 Operating Frequency**

The operating frequency shall be  $60\text{Hz} \pm 5\%$ .

#### **2.6.6.3 Protection Modes**

Protection shall be provided for all electrical configuration modes, Line-to-Line, Line-to Neutral, Line-to-Ground and Neutral-to-Ground protection as appropriate for WYE or Delta line configurations.

For telco and transmission line TVSS devices, these devices shall be in-line and shall prevent any equipment-damaging TVSS event from entering the building.

#### **2.6.6.4 Transmission Line and Waveguide TVSS**

These devices shall be an inline device that presents a VSWR of no more than 1.1:1 to the RF circuit and an insertion loss of no more than 0.05 dB.

The devices shall be sufficient to protect all downstream equipment from any TVSS event. In cases where a tower top amplifier is used the system shall provide adequate protection for this amplifier and associated equipment.

If there are any TVSS devices that are tower-mounted they shall provide remote control, alarm and test functions to the main facility.

#### **2.6.6.5 Tower Lighting Protection**

All tower lighting circuits shall have TVSS devices to protect the building equipment from any TVSS event that can enter in the tower lighting circuits.

These devices shall be located within 2 feet of the tower lighting entry point or wall penetration.

All tower lighting cables shall be run in dedicated conduits to the entry/exit point. They shall not be bundled with other cabling.

### **3. Field Inspection**

- A. After installation of all the components furnished under this section, the contractor along with the Department, at its discretion, shall perform a field inspection, to verify that the installation of the components furnished under this contract has been performed and completed in accordance with the following, as applicable.
  1. The professional engineer's design.
  2. The manufacturer's instructions and recommendations.
  3. The Department's specifications including testing and certifying the site's earth ground grid system meets R-56 requirements.
  4. The Contractor's installation practices and standards as approved by the Department.
- B. The Contractor shall provide all items, instrumentation, materials, equipment, and personnel necessary to conduct the inspection.
- C. Prior to the commencement of this activity, the contractor shall deliver a preliminary field inspection plan to the Department for review and approval.

- D. At the conclusion of this activity, the contractor shall present to the Department written certification that the inspection performed was in accordance with, and that the results of the inspection was in compliance with, the approved field inspection plan.
- E. The Department's signature on the certification shall constitute acceptance by the Department of the inspection.

### **3.1 Final Acceptance**

#### A. General

1. After acceptance of all the inspections and all the tests. Conducted under this section, the contractor shall present to the Owner written certification that the activities were performed in accordance with, and that the results were in compliance with, the approved plans.
2. This certification shall include the original signed copy of the individual inspection and test certifications previously accepted by the Owner.
3. Final acceptance will be deemed final when the Owner's signature appears on this certification.

## 4. Measurement of Payment

### 4.1 Method of Measurement:

The following items will be paid for by the lump sum

ITEM #	DESCRIPTION
644.91	Radio Comm. Site Earth Ground and Lightning Protection System, Installed
644.92	Radio Comm. Site Earth Ground and Lightning Protection System, Field Inspected
644.93	Radio Comm. Site Earth Ground and Lightning Protection System, Final Acceptance

### 4.2 Basis of Payment:

The accepted radio communications site earth ground and lightning protection system item will be paid for at the contract lump sum prices which will include payment for all respective items called for in the contract designed, delivered, stored, placed, constructed, installed, tested, inspected, accepted, documented, all clearing demolition, remediation, site work, materials, labor, equipment and incidentals required to complete

ITEM #	DESCRIPTION	UNIT
644.91	Radio Comm. Site Earth Ground and Lightning Protection System, Installed	LS
644.92	Radio Comm. Site Earth Ground and Lightning Protection System, Field Inspected	LS
644.93	Radio Comm. Site Earth Ground and Lightning Protection System, Final Acceptance	LS

**END OF SECTION**

## **SECTION 6**

### **Special Provision**

#### **Specification for**

#### **Refurbishing an Existing Shelter and Equipping it for an Emergency Power Generator Installation**

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# 1. General

## 1.1 Introduction

This specification covers the requirements for designing, furnishing, repairing, refurbishing, installing and commissioning an existing 10 foot x 10 (approx) foot telecommunications-type shelter and equipping it to house an emergency power generator and associated components.

## 1.2 Description of Major Work Elements

### 1.2.1 Performed by the State:

#### A. Acquisitions:

- Perform site acquisition activities, as required.

#### B. Ownership:

- Conduct property title/deed searches.

#### C. Surveying

- Perform boundary and topographical site surveys.

#### D. Zoning:

- Assist contractor with zoning approval process, as required, when deemed by the State.

#### E. Permitting:

- Assist contractor with permitting process, as required, when deemed by the State.

#### F. Leases:

- Secure site leases, as required.

Environmental Impact Studies.

### 1.2.2 Performed by Contractor

#### A. Design, Furnish, Repair, Refurbish & Install as applicable:

1. Shelter
2. Generator ventilation
3. Other Shelter Components as Specified.

#### B. All site planning, preparation and development.

- C. All engineering design certification and documentation.
- D. Provide Shelter design and specifications stamped by a State of Maine licensed Professional Engineer.
- E. Other work as specified elsewhere in this document.

### **1.2.3 Qualifications**

- A. General
  - 1. The Contractor shall have demonstrated experience in design, furnishing, and installing communication shelters on a turn-key basis.
  - 2. The Contractor shall have demonstrated experience in furnishing and installing generators on a turn-key basis.
  - 3. The Contractor shall function as one-source responsible for shelter warranty, parts and service.
- B. Shelter
  - 1. All field-work associated with the shelter shall be performed by a contractor having no less than 5 years contiguous years in the fabrication of communications type shelters.
- C. Generator
  - 1. Refer to qualifications in the generator specifications under Section 3.

### **1.2.4 Regulatory Requirements**

- A. Unless specified otherwise, materials and installation shall conform to the applicable requirements of:
  - 1. Local & National Codes.
  - 2. Maine Electrical Code.
  - 3. American Concrete Institute (ACI).
  - 4. American Institute of Steel Construction (AISC).
  - 5. American Iron and Steel Institute (AISI).
  - 6. American National Standards Institute (ANSI).
  - 7. American Society for Testing & Materials (ASTM).
  - 8. Electronics Industries Association (EIA/TIA).
  - 9. Institute of Electrical & Electronics Engineers (IEEE).

10. National Fire Protection Association (NFPA).
11. Occupational Safety & Health Administration (OSHA).
12. Underwriters Laboratories (UL)
13. Motorola R-56 standard or approved equal.

## **2. Products**

### **2.1 Shelter**

#### **2.1.1 General**

- A. The existing shelter external dimensions are approximately 10 Ft X 10 Ft
- B. The shelter foundation is constructed of cement
- C. The shelter walls are constructed of cement block
- D. The shelter roof is wood frame, metal covered.
- E. The shelter will be refurbished and used to house an emergency power generator.
- F. Unless otherwise noted, at a minimum, the shelters shall meet all of the applicable ANSI/NFPA/TIA standards for communications equipment shelters.

#### **2.1.2 Construction**

##### **2.1.2.1 Shelter Base**

The existing shelter foundation and floor will be inspected, repaired and upgraded if necessary to support the building and meet or exceed the generator manufactures minimum specifications.

Cement floor to be remediated as necessary and finished with a maintenance free, slip and oil resistant finish as approved by the Department.

##### **2.1.2.2 Roof**

The Contractor shall be responsible for inspection and repair of roof trusses and decking and existing metal roof. If replacement is necessary, a Standing Seam Metal Roofing material installed to manufacturer standard/industry practice is specified.

##### **2.1.2.3 Rain Trough**

The Contractor shall install a Rain Trough to guide water away from door/front step.

#### **2.1.2.4 Ceiling**

The existing plywood ceiling shall be refinished with a maintenance free material.

#### **2.1.2.5 Walls**

**Interior Finish:** maintenance free, as approved by the Department.

**Exterior Finish:** natural stone aggregate, similar in color and texture to the site communications equipment shelter as approved by the Department. Thermo Bond Buildings exterior panels and accessories or equivalent are acceptable.

Fire retardant: 1-hour rated, minimum.

#### **2.1.2.6 Inter-building electric power service and communications cabling**

The contractor shall provide a conduit between the Generator Shelter and the Communications Equipment Shelter for routing electric power from to the equipment shelter from to the generator building electric service panel and from the generator to the equipment shelter transfer switch.

An additional conduit shall be provided between the buildings for a 25 pair 22 gauge communications cable.

Proposals for both above and below ground solutions shall be prepared for the Departments' selection and approval.

Both conduits shall be constructed entirely of stainless or galvanized steel. All service runs shall be continuous.

The contractor shall terminate the Communications cable on the termination backboard of both buildings.

All wiring shall be per applicable electrical codes and owner standards.

#### **2.1.2.7 Electric Service**

The contractor shall provide electric service to the building.

#### **2.1.2.8 Interior Electrical Service Wiring**

The Contractor shall remove all interior electrical components and replace with new. The work includes, but is not limited to: electric service sub panel, electric outlets, lighting fixtures, detectors, switches and timers.

All electrical wiring shall be in conduit and/or raceways, as required.

All conduit, raceways, and outlet or junction boxes shall be exposed and attached to the interior surfaces of the shelter.

All conduit, raceways, fittings, and hardware shall be of galvanized or stainless steel.

All service runs shall be continuous

All wiring shall be per applicable electrical codes and owner standards.

#### **2.1.2.9 Surge Protection - Service Entrance**

Transient Voltage Surge Suppressor (TVSS)

Liebert Corporation Model Type SS Hybrid or equivalent.

Dry-contact, form-C (NO/NC) closure alarm.

#### **2.1.2.10 Utility Outlets**

Quad receptacles.

Rating 20 amp

Wall-mounted, 24-inches above finished floor.

As needed, 4-feet on-center spaced evenly on all walls.

### **2.1.3 Lighting**

#### **2.1.3.1 Interior**

Lighting shall be via fluorescent light fixtures appropriate for cold temperature operation (building is unheated).

Fixtures shall be 48-inches in length.

Fixtures shall use dual straight tube bulbs.

Fixtures shall protect bulbs via wire guard or translucent cover.

Fixtures shall be furnished on both sides of the generator set.

As needed to provide a minimum of 150 foot-candles of illumination at floor level.

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

#### **2.1.3.2 Interior - Emergency**

Integrated, solid-state design emergency light fixture for each doorway.

Self-contained in single, interior, wall-mountable housing.

Medium to heavy-duty industrial-use rated.

1-hour operation rated, minimum.

10-year operating life rated.

Dual light beams lamps.

Sealed maintenance-free rechargeable battery.

Battery viewport.

Automatic battery charger.

Low battery cutoff.

Voltmeter.

Indicators: 1) On; 2) Charging.

Test Switch, externally accessible.

Dry-contact, form-C (NO/NC) closure alarm.

### **2.1.3.3 Exterior**

Light fixture for each exterior doorway.

Bulb: Halogen, standard screw-base, 150 watt rated, minimum.

Bulb Life: 10,000-hour rated, minimum.

Shatter/tamper resistant lens.

Remote activated by key fob or garage-door-opener type device.

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

## **2.1.4 Door - Exterior**

### **2.1.4.1 Fabrication**

Door: Inspect existing door. If replacement is required the replacement door shall be galvanized or stainless steel, welded fabrication.

14-gauge, minimum.

Sized the same as the existing door. .

Poly-urethane insulation.

Gasket sealed.

Frame: hi-strength, galvanized or stainless steel, welded.

#### **2.1.4.2 Accessories**

Lockset: stainless steel; replaceable cores; keyed the same as the site equipment shelter.

Interior pull handle.

Anti-prying exterior plate, hi-strength, galvanized or stainless steel.

Vandal resistant, non-removable hinge pins.

Hydraulic-damper closer with sliding passage set.

Wind check or chain.

Overdoor exterior drip awning, galvanized or stainless steel, or aluminum.

Intrusion sensor with a dry-contact, form-C (NO/NC) closure alarm.

#### **2.1.5 Air Conditioning System**

Not required.

#### **2.1.6 Heating System**

Single unit electric with internal thermostat. The unit will be sufficient to provide warmth to service personnel. It is not intended for continuous operation. The unit will be connected to a one hour timed switch that will automatically turn the unit off after one hour.

#### **2.1.7 Building Ventilation System**

##### **2.1.7.1 Design**

12-inch motorized fan, minimum.

Wall-mounted controls.

Programmable/adjustable start-up cycle timer.

Programmable/adjustable run cycle timer.

Dual, parallel thermostats, manually adjustable.

##### **2.1.7.2 Intake**

Mechanically activated louver/damper.

Galvanized or stainless steel, or aluminum weather hood.

Galvanized or stainless steel, or aluminum screen to prevent insect or rodent intrusion.

Filtered.

### **2.1.7.3 Exhaust**

Gravity-type louver/damper.

Galvanized or stainless steel, or aluminum weather hood.

Galvanized or stainless steel, or aluminum screen to prevent insect or rodent intrusion.

### **2.1.8 Generator Cooling**

The room shall be equipped with the necessary intakes, exhausts, ducts, flanges, adapters, and associated hardware to provide adequate cooling of a generator specified in section 3.

All components will meet or exceed the minimum requirements of the generator manufacturer.

If motorized louvers and/or dampers are used they shall be equipped to be controlled by the generator.

### **2.1.9 Communication Cable Termination Backboard**

Size: 4-feet x 4-feet x 3/4 inches.

Location: In proximity to the inter-building communications cabling conduit.

Material: plywood sheet, 1-hour fire retardant rated.

Furnish backboard with 3-inch standoffs.

Painting: gray or black, fire retardant.

### **2.1.10 Heat/Smoke/CO Detection & Fire Suppression**

#### **2.1.10.1 Heat**

The shelter shall be equipped with heat detectors, as needed, spaced for maximum coverage.

Detectors shall be equipped with a dry-contact, form-C (NO/NC) closure alarm.

Combination heat, smoke and CO detectors are not acceptable.

#### **2.1.10.2 Smoke**

The shelter shall be equipped with smoke detectors spaced for maximum coverage.

Detectors shall be of the photoelectric and ionization type.

Detectors shall be equipped with a dry-contact, form-C (NO/NC) closure alarm.

Combination heat, smoke and CO detectors are not acceptable.

#### **2.1.10.3 Carbon Monoxide (CO)**

The shelter shall be equipped with carbon monoxide detectors spaced for maximum coverage.

Detectors shall be equipped with a dry-contact, form-C (NO/NC) closure alarm.

Combination heat, smoke and CO detectors are not acceptable.

#### **2.1.10.4 Suppression**

The shelter shall be equipped with one (1) wall-mounted fire extinguisher.

Type: Class ABC all purpose dry chemical.

Size: 10 lbs.

### **3. Installation**

#### **3.1 Delivery & Storage of Materials**

- A. The contractor shall be responsible for all aspects of shipment and/or transportation of materials to their destination.
- B. The contractor shall be responsible for coordinating, unloading, inspecting, accepting and storing all material deliveries.
- C. All stored materials shall remain the responsibility of the contractor until final acceptance by the Department.

#### **3.2 General**

- A. Refurbishment of the existing building shall include but not be limited to:
  - Inspect and evaluate and certify entire shelter for structural soundness.
  - Upgrade existing floor as necessary to support the generator.
  - Refurbish, recondition/replace existing roof as approved by the Department.
  - Install generator ventilation louvers in two building walls (intake and exhaust).
  - Install ducting as required and seal any existing wall vent (s).
  - Remove existing electrical wiring as necessary
  - Upgrade building electrical service entrance.
  - Replace inside wiring and install lighting and power outlets to spec.
  - Install building ventilation system.
  - Replace/refurbish door and door lock as required.
  - Install R-56 compliant grounding and connect to site ground
  - Refinish inside and outside
  - Smoke CO2 and Heat detectors installed and wired to site alarm system.
  - Outside area lighting.

- B. Prior to installation, the contractor shall coordinate with and receive approval of the Department of all proposed work.
- C. The contractor shall be responsible for:
1. Providing all materials, labor and tools to ensure a complete installation whether or not specified or shown.
  2. All workmanship shall conform to applicable standards and prevailing practices as approved by the Department.
  3. Delivery of all materials to the site.
  4. Restoring the site to its original pre-installation condition.
  5. All access road improvements and clearing as necessary for delivery as approved by the Department.
  6. All access road repairs after delivery. Road shall be restored to original pre-installation condition as approved by the Department.
  7. All commercial electric utility service necessary for the installation as approved by the Department.
  8. Removing all rubbish and debris associated with all aspects of the installation.
  9. The installation of the shelter and components.
  10. Providing all materials, labor and tools to ensure a complete installation whether or not specified or shown.
  11. Installing the shelter components in accordance with the professional engineer's design, as applicable and as approved by the department.
  12. Neat and professional workmanship.
  13. Coordination with other trades, as necessary.
  14. Design, Furnish & Install:
    - Shelter upgrades as required with the Departments approval.
    - Electrical & Lighting.
    - HVAC Systems.
    - Building Ground System

15. Furnish & Install:

- Shelter accessories.
- Grounding materials and bonding hardware.
- Connection of accessories to the shelter's ground system.
- Connection of shelter to earth ground grid system.

16. All site planning, clearing, preparation and development, as required.

17. All engineering design certification and documentation.

18. Design & Construction

- Prepare all pre-stamped drawings and specifications necessary for the designs and construction, as applicable.
- Department to review and approve pre-stamped drawings and specifications prior to zoning, permitting, and ordering.
- Provide State of Maine PE stamped drawings and specifications to the Department.

19. Utility Services

- All commercial utility service relocations and/or improvements necessary for the installation.

20. Access

- All access road improvements and clearing as necessary for delivery of all materials.
- All access road repairs after the delivery. Road shall be restored to its pre-installation condition.

21. Premises

- To the greatest applicable and practical extent, the contractor shall restore the premises to its pre-installation condition. See SP 656 SEWPCP
- Removing all rubbish and debris associated with site preparation, unpacking of shipping materials, and/or the installation, from the premises.

22. Other work as needed to ensure a complete installation whether or not specified or shown elsewhere in this document.

### **3.2.1 Shelter**

Install all materials in accordance with State of Maine PE stamped drawings and specifications.

Contractor to provide written certification to the Department that shelter was refurbished in accordance with a State of Maine PE stamped drawings and specifications.

### **3.2.2 Locations & Placement**

The shelter will remain in its present location.

### **3.2.3 Electrical**

#### **3.2.3.1 Outlets**

Utility wall duplex outlets can be doubled to a single circuit breaker.

All outlets shall be labeled with its associated circuit breaker or labeled with its circuit number.

#### **3.2.3.2 Lighting**

All interior and exterior lighting shall be dispersed between 2 circuit breakers, at a minimum.

Interior emergency lighting shall be mounted above each entry door.

#### **3.2.3.3 Interior Wiring**

All wiring shall be per applicable electrical codes.

All electrical wiring shall be in conduit and/or raceways, as required.

All conduit, raceways, fittings, and hardware shall be of galvanized or stainless steel.

All conduit, raceways, and outlet or junction boxes shall be exposed and attached to the interior surfaces of the shelter.

Service wiring raceways shall be separate and isolated from any communications or antenna cable trays.

All service wiring runs shall be continuous.

#### **3.2.3.4 Switchgear - Interior Service**

Bypass and isolation switchgear, as needed.

Switchgear shall allow for service and testing without disrupting power to critical loads.

### **3.2.4 Alarms**

All dry-contact alarms shall be terminated at a demarcation point inside the shelter.

## **3.3 Grounding & Surge Protection**

### **3.3.1 General**

The contractor shall be responsible for providing all materials and labor for the installation of grounding, and lightning and power surge protection devices in accordance with the manufacturer's recommendations, the Department's standards, or the contractor's practices.

The State has adopted Motorola's "STANDARDS & GUIDELINES FOR COMMUNICATIONS SITES" document, latest edition, to serve as its standard for the grounding of communications structures and equipment. This document is sometimes referred to as the "R56 Manual" and is available from Motorola as hard copy (part # 6881089E50-B) and in CD (part # 9880384V83). Refer to section 5 "specification for a **Radio Communications Site Earth Ground and Lightning Protection System**."

In the event certain aspects of the recommendations, the standards, or the practices are in conflict, then the most stringent shall prevail.

### **3.3.2 Interior Perimeter Halo**

Tinned-bare solid-copper conductor no less than No. 2 AWG. Furnish insulated standoffs as required.

### **3.3.3 Certification**

Contractor shall provide written certification to the Department that grounding was performed in accordance with the State's standards, manufacturer's recommendations, or the contractor's practices as specified in the General section above.

### **3.3.4 Grounding**

#### **A. General**

1. Connection to the site's earth ground grid system (EGGS) shall be required.
2. All bonded welds shall be of the exothermal-type.
3. Wire conductors size shall be no less than 2/0 AWG.
4. Wire conductors shall be bare, tinned, solid copper.

B. Shelter

1. Ground the shelter to the EGGS.
2. Conductors shall be weld-bonded to the closest EGGS ground rod.
3. Conductors shall be weld-bonded to the tower leg.

C. Generator

1. Ground generator to the EGGS.
2. Ground exterior fuel tank to the EGGS.
3. Ground automatic transfer switch to the EGGS.

### **3.4 Inspection & Acceptance**

#### **3.4.1 Field Inspection**

- A. After installation of all the components furnished under this section, the contractor along with the Department, at its discretion, shall perform a field inspection, to verify that the installation of the components furnished under this contract has been performed and completed in accordance with the following, as applicable.
  1. The professional engineer's design.
  2. The manufacturer's instructions and recommendations.
  3. The Department's specifications.
  4. The Contractor's installation practices and standards as approved by the Department.
- B. The Contractor shall provide all items, instrumentation, materials, equipment, and personnel necessary to conduct the inspection.
- C. Prior to the commencement of this activity, the contractor shall deliver a preliminary field inspection plan to the Department for review and approval.
- D. At the conclusion of this activity, the contractor shall present to the Department written certification that the inspection performed was in accordance with, and that the results of the inspection was in compliance with, the approved field inspection plan.
- E. The Department's signature on the certification shall constitute acceptance by the Department of the inspection.

#### **3.4.2 Final Acceptance**

A. General

1. After acceptance of all the inspections and all the tests. Conducted under this section, the contractor shall present to the Owner written certification that the activities were

performed in accordance with, and that the results were in compliance with, the approved plans.

2. This certification shall include the original signed copy of the individual inspection and test certifications previously accepted by the Owner.
  3. Final acceptance will be deemed final when the Owner's signature appears on this certification.
- B. Post-Final Acceptance Documentation
1. After final system acceptance, the contractor shall deliver to the Owner, in both printed and electronic form, the following documents, on a per-site basis, in one consolidated package.
    - a. Copies of all signed certifications.
    - b. Copies of all approved inspection and test plans.

### **3.5 Warranty**

- A. The Contractor shall include a copy of the manufacturer's standard commercial warranty for all furnished shelter and associated components in their response (excluding generator which is covered in the generator section).
- B. The Contractor shall warrant for one year workmanship and all items provided by the Contractor.

### **3.6 Documentation**

#### **3.6.1 With the Contractor's Bid**

- A. The Contractor's bid shall include a catalog or specification sheet for this site as described in Section 2.1.

#### **3.6.2 Post-Contract Award**

- A. General
  1. Thorough documentation of all major shelter components, and their respective installations, will be required from the Contractor. This documentation will be comprised of both factory-provided and field-generated documents and/or manuals.

2. Every document exchanged between Department and contractor shall be in paper and/or electronic form, as mutually agreed. Electronic documents shall use the latest version of the application software or by a mutually agreed version. The following applications are preferred:
    - a. Text - Microsoft Word
    - b. Spreadsheets - Microsoft Excel
    - c. Databases - Microsoft Access
    - d. Scanned documents - Adobe Acrobat
    - e. Simple Diagrams & Charts - Microsoft Visio or Excel
    - f. Large Drawings – mutually agreed software program
    - g. Schedules - Microsoft Project
  3. The Department shall approve the contents and organization of all field-generated documents supplied by the contractor.
  4. Costs associated with documentation shall be clearly and individually identified in the pricing section of the response.
- B. Factory Provided – Technical & Service Manuals
1. All factory-provided documentation shall be available on CD media.
  2. Manuals shall be provided for the following components on a per-site basis:
    - a. All available manufacture’s manuals for the building and major components.
  3. The following sets of manuals are to be furnished prior to project closeout on a per-site basis:
    - a. Five (5) complete paper-form sets
    - b. Five (5) complete electronic-form sets
- C. Field Generated - As-Built
1. All field-generated documentation shall be prepared in a format suitable for storage in loose-leaf 3-ring binders. This documentation shall also be supplied on CD media.
  2. All field-generated drawings shall be prepared using a mutually agreed software program.
  3. The following documentation shall be provided. Specification or catalog cut sheets for each of the major items illustrated in the documents shall be included with the submittals to the Department.
    - a. Shelter & foundation – top view diagram.

- b. Foundation – side elevation view diagram illustrating both above and below grade portions.
  - c. Shelter – 4-sided elevation view diagram.
  - d. Shelter – interior layout w/list of materials.
  - e. A site plan illustrating the installed location of the components supplied under this contract relative to other existing major site components (e.g., towers, fences, generators, etc.). Plan shall be to scale; and the new and existing components shall be contrasted by the use of a gray scale.
  - f. The site plan shall identify the interconnection between the shelters or accessories to the site electrical ground grid system.
4. The following sets of field-generated documentation are to be furnished prior to project closeout:
- a. Five (5) complete paper-form sets
  - b. Five (5) complete electronic-form sets
- D. Costs associated with the post-contract award documentation defined in this section shall be clearly and individually identified in the pricing section of the response.

## 4. MEASUREMENT AND PAYMENT

### 4.1 Method of measurement.

Method of Measurement: The following items will be paid for by the lump sum:

ITEM #	DESCRIPTION
643.99	Communications Equipment Shelter, Repaired, Reconditioned, Refurbished, Set
643.991	Communications Equipment Shelter, Inspection and Acceptance, Field Testing
643.992	Communications Equipment Shelter, Inspection and Acceptance, Final Acceptance
643.993	Communications Equipment Shelter, Inspection and Acceptance, Training

### 4.2 Basis of payment.

The accepted Communications Equipment Shelter items will be paid for at the contract lump sum prices which will include payment for all respective items as called for in the contract, designed, delivered, stored, placed, constructed, installed, tested, documented, all clearing, demolition, remediation, preparation, materials, labor, equipment, training and incidentals necessary to complete the work.

Payment will be made under:

ITEM #	DESCRIPTION	UNIT
643.99	Communications Equipment Shelter, Repaired, Reconditioned, Refurbished , Set	LS

643.991	Communications Equipment Shelter, Inspection and Acceptance, Field Testing	LS
643.992	Communications Equipment Shelter, Inspection and Acceptance, Final Acceptance	LS
643.993	Communications Equipment Shelter, Inspection and Acceptance, Training	LS

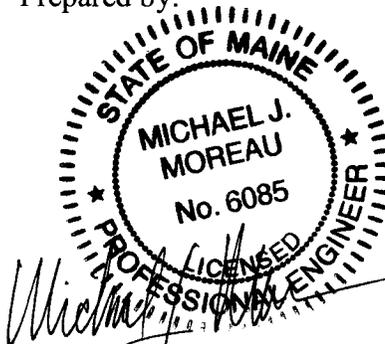
**END OF DOCUMENT**

Maine Department of Transportation

Highway Program  
Geotechnical Section

**AMMENDED GEOTECHNICAL DESIGN REPORT**  
for  
**COOPER RADIO TOWER REPLACEMENT**  
**TOWN OF COOPER**  
**WASHINGTON COUNTY, MAINE**

Prepared by:



Michael J. Moreau, P.E.  
Geotechnical Design Engineer

Reviewed by:

Laura Krusinski, P.E.  
Senior Geotechnical Engineer

Washington County

PIN 14274.00

Soils Report 2007-18C

November 2007

## Memorandum

*To: Joel Kittredge, Project Manager*  
*From: Mike Moreau, PE*  
*Laura Krusinski, PE*  
*cc:*  
*Date: 7 November 2007*  
*Subject: Revised LRFD Geotechnical Recommendations*  
*Cooper Radio Tower*  
*Cooper, Maine*  
*PIN 14274*

Joel,

The original Cooper Tower geotechnical report was written by Golder Associates, Inc. dated 9 December 2004, and provided recommendations using Allowable Stress Design (ASD). We have attached a copy of that report for project team reference. The purpose of this memo is to provide revised geotechnical recommendations as regards the Load Resistance Factor Design (LRFD) design methodology. The Golder report should be relied on for all other geotechnical recommendations for ASD bearing capacity, settlements, lateral and uplift load resistance without anchors, ground water table, site preparation. The exception is frost depth recommendations: we recommend the design frost depth be increased to 80 inches or 6.7 feet per TIA-222-G, p. 155.

The need for the Cooper Tower geotechnical report revisions was prompted by the new Telecommunications Industry Association Standard TIA-222-G approved August 2005 and Addendum 1: TIA-222-G-1, approved April 2007, which incorporates LRFD methodology. A copy of this revision will be provided to Golder Associates, Inc. to provide them the opportunity to make additional comments or affirm the design revisions at this time.

### **LRFD Geotechnical Design of Tower Foundations - General**

#### ***Strength Limit State Analyses***

Loads. Tower foundations (rock anchored spread footing foundations, individual pier leg spread footings and mat foundations) shall be designed so that the factored design strength (or factored

resistance) of the particular foundation element meets or exceeds the five strength limit state (factored) load combinations cited in TIA-222-G Article 2.3.2. Loads shall be calculated in accordance with TIA-222-G Article 2.0.

Project foundations shall be designed for the following site and structure classifications:

Ground Conditions: Site Class B (Table 2-11, p.45)  
 Structure Class: Class III (Table 2-1, p.39)

The earthquake spectral response acceleration at short periods ( $S_s$ ) for the site is less than 1.0. Based on the criteria found in Article 2.7, TIA-222-G, earthquake effects may be ignored for strength limit analyses of the foundations.

Resistances. Resistance of tower foundations shall be designed for the strength limit states in accordance with TIA-222-G Article 9.0 and the criteria defined in this report. When conflicting criteria arises, the more stringent criteria applies. For strength limit design, the nominal resistance of any foundation shall be multiplied by the resistance factors specified herein and shall be greater than the factored strength limit state loads combinations in TIA-222-G Article 2.3.2.

Recommended resistance factors for strength limit analyses are provided in the table, below:

Foundation Type	Mode of Failure	Geotechnical Resistance Factors, $\phi$		Recommended Geotechnical Resistance Factor, $\phi$
		TIA Standard	AASHTO LRFD	
Self-supported spread footings on rock	Bearing resistance	0.75	0.45	0.45
	Sliding	0.75	0.80	0.75
	Eccentricity	-	$e/B < 3/8$	$e/B < 3/8$
	Uplift	0.75	-	0.75
Guyed spread footings on rock	Bearing resistance	0.60	0.45	0.45
	Sliding	0.75	0.80	0.75
	Eccentricity	-	$e/B < 3/8$	$e/B < 3/8$
	Uplift	0.75	-	0.75
Anchored spread footing foundations and rock anchors	Pullout – Failure of grout/rock bond	0.40	$0.50^1$ $1.0^2$	0.40
	Uplift – Failure of grout/rock bond	0.75	0.60	0.60
	Tensile/structure failure of bar	-	0.80 (A 722 high strength steel)	0.80 (A 722, high strength steel)
	Tensile failure of strand anchor	None provided	None provided	Manufacturers recommendation

<sup>1</sup> Applied to presumptive pullout resistance values

<sup>2</sup> When every anchor is proof tested to at least 1.0 times the factored anchor load or 1.33 times the design load

Spread Footing on Bedrock – General. For LRFD analysis of spread footings on bedrock, the recommended practice is as follows: size footing at the service limit state load combination using the allowable bearing resistance value of 15 tsf (Golder), and check the footing at all other applicable strength limit states using a factored bearing resistance of 20 tsf:

$$R_s = 15 \text{ tsf} \times 3 = 45 \text{ tsf}; R_s \times \phi_s = 20 \text{ tsf}$$

Where  $\phi_s = 0.45$

Spread footings shall be evaluated for failure by sliding. Sliding analyses shall select the maximum horizontal load factors and minimum vertical load factors to produce the total extreme factored force effect. For footings on level, prepared bedrock, a sliding resistance factor,  $\phi_s$  of 0.75 is recommended, and the effective foundation area should be used. Spread footings shall be evaluated for eccentricity. The eccentricity of loading at the strength limit state, evaluated based on factored loads shall not exceed three-eighths of the corresponding footing dimensions, in both directions, (i.e.  $e/B < 3/8$  and  $e/L < 3/8$ ).

### ***Service Limit State Analyses***

Foundation resistances shall be calculated using a  $\phi$  of 1.0 when investigating foundation displacements for the serviceability limit states; (reference TIA-222-G Article 9.4.1).

Foundation and anchorage displacements need not be calculated for the service and strength limit state combination, except when the structure is supported solely by a nonredundant foundation or single mat or caisson. Calculated displacement shall be less than 0.75 inch for the service limit state analysis. Serviceability limit state analyses shall investigate displacement under the service limit state load combinations in accordance with TIA-222-G, Article 2.8.

### **Rock Anchors for Lateral and Uplift Load Resistance**

The Golder report indicates competent granite bedrock at the site with an average unconfined compressive strength of about 29,876 psi. Consequently, permanent rock anchors incorporating ASTM A 722 150 ksi thread bars or ASTM A 416 strand anchors may be used to provide uplift and lateral load resistance for the tower foundation. Bond stresses in Post-Tensioning Institute, 2004, indicate typical average ultimate rock/grout bond stresses in competent granite between 250 and 450 psi. The granite at this site is generally good to excellent, but some near vertical veins and joints are noted in the core logs. Consequently, we recommend using a middle range bond stress value. Considering an ultimate rock/grout bond stress of 350 psi and a FS of 2, we recommend that a maximum ASD rock/grout bond stress of 175 psi should be used for ASD designs (PTI, 2004; NAVFAC, 1983). A factored resistance for anchor uplift of 210 psi should be used for LRFD designs:

$$\text{Factored Bond Stress} = \phi \times 350 \text{ psi} = 210 \text{ psi}$$

Where  $\phi = 0.60$

Either bar type anchors such as Dywidag or Williams threadbar anchors or strand type anchors may be used, however bar anchors are commonly used. Based on the findings of our exploration, laboratory testing, and rock anchor design guidance from several references (NAVFAC, DM 7.3, 1983; Post-Tensioning Institute, 2004; Fang, 1991), we recommend the following criteria for rock anchor design:

- Use anchor tendons furnished with double corrosion protection
- Size the anchor tendon for a design load less than 60 percent of the specified minimum tensile strength of the tendon steel, or the allowable geotechnical capacity, whichever is less for ASD design. For LRFD, the maximum factored load group shall not exceed the nominal yield strength of the anchor bar times a resistance factor of  $\phi = 0.80$ . We defer to manufacturer's recommendations for strand anchor resistance factors (no guidance documents available)
- Use a minimum rock/grout bond length of 10 feet regardless of the design load
- Provide anchor hole diameter in accordance with manufacturer's recommendations
- Limit the allowable rock/grout bond stress to the values described above
- Assume a rock engagement angle of 60 degrees
- Assume a total unit weight of 168 pcf for rock within the engagement cone
- Assume the groundwater level at the ground surface

The free stressing length will depend on the type of anchor tendon used. We recommend minimum free stressing lengths of 10 feet for bar anchors and 15 feet for strand anchors.

We recommend that all of the rock anchors installed for the tower foundation be performance tested in accordance with the procedures described by the Post-Tensioning Institute. Specifically, we recommend a maximum test load of 1.33 times the design load, provided the maximum test load does not exceed 80 percent of the anchor tendon's specified minimum tensile strength. After testing, all anchors should be locked off at a load specified by the design engineer not exceeding 70 percent of the minimum specified tensile strength of the anchor (ASD design). For LRFD design, the anchor lock off load should be equal to a minimum of 50 percent of the nominal (unfactored) anchor load.

Please feel free to contact me if you have questions regarding these recommendations.

Regards, Mike

Attachment: Golder Associates, Inc. Report "Geotechnical Evaluation, Proposed Radio Tower, Cooper, Maine," dated 9 December 2004

**GEOTECHNICAL EVALUATION  
PROPOSED RADIO TOWER  
COOPER, MAINE**



**Golder Associates Inc.**

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**GEOTECHNICAL EVALUATION  
PROPOSED RADIO TOWER  
COOPER, MAINE**

Prepared for:

Maine Department of Transportation  
Bureau of Maintenance and Operations  
16 State House Station  
Augusta, Maine 04333-0016

Prepared by:

Golder Associates Inc.  
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Distribution:

3 copies – Maine DOT  
3 copies – Golder Associates

December 9, 2004

Our Ref.: 043-6838.004



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December 9, 2004

Our Ref.: 043-6838.004

Maine Department of Transportation  
Bureau of Maintenance and Operations  
16 State House Station  
Augusta, ME 04333

Attn: Clifton Curtis, P.E.

**RE: GEOTECHNICAL EVALUATION  
PROPOSED RADIO TOWER  
COOPER, MAINE**

Dear Mr. Curtis:

This report summarizes the results of Golder Associates Inc.'s (Golder's) geotechnical evaluation for a proposed radio tower at the Maine Department of Transportation's (MaineDOT's) existing radio tower facility in Cooper, Maine. The purpose of the evaluation was to investigate subsurface soil and groundwater conditions at the proposed radio tower site and develop geotechnical criteria suitable for design and construction of the new tower foundation. Our work was conducted in accordance with our Project Contract with the MaineDOT executed 7/29/04, and the provisions of our General Consultant Agreement # U088040396 with MaineDOT.

**SITE AND PROJECT DESCRIPTION**

MaineDOT plans to install a new 120-foot (ft.) high self-supported radio tower at the current radio tower facility in Cooper, Maine. The existing tower is located at the end of Tower Road as shown on the Site Location Map on Figure 1. The proposed new tower site is located in a cleared grassy area roughly 30 ft. to the east of the existing MaineDOT tower as shown on Figure 2. Local ground surface topography at the proposed tower site slopes down gently to the wooded area in the west. The general vicinity of the proposed tower site is flat, with bedrock outcrop present east and south of the site, as shown in Figure 2.

In addition to the existing MaineDOT radio tower, twelve other towers and related buildings are located in the general vicinity of the site. The other towers are generally arranged as shown on Figure 2, vary in height from roughly 50 ft. to 180 ft., and are predominantly guyed. The tallest existing tower is a four-pole self supported type. Except for the existing MaineDOT tower and block building, the closest existing structure to the proposed site is a fire tower with its base located about 200 ft. northeast of the proposed new tower. The radio tower and the four-pole, self-supported tower appeared to be founded directly on bedrock exposed at the ground surface at both locations. Information concerning foundation support systems for the other towers, guy anchorages and existing buildings was not available to Golder during this evaluation.

The new tower at Cooper is planned to be a self-supporting tower: either a triangular tower with three solid rod truss-style legs or a monopole structure. We understand foundation design will be



provided by the tower manufacturer selected by MaineDOT for this site. The tower and the foundation support requirements will be designed in accordance with the Telecommunications Industry Association (TIA) Standard TIA-222-F<sup>1</sup> titled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures" (June, 1996). Although design loads for the tower are currently unknown, we understand loads for a triangular tower can be on the order of 250 kips/leg compression and 200 kips/leg uplift. To provide resistance against lateral, overturning and uplift loads, the tower foundation typically consists of a large concrete pier pad. At shallow bedrock sites rock anchor installation may be cost effective.

## **EXPLORATION PROGRAM**

Subsurface conditions at the tower site were explored by drilling one test boring to a depth of about 24 ft. below ground surface (bgs) at the location shown on Figure 2. The boring was located at the approximate center of the proposed tower as staked on-site by MaineDOT personnel. The test boring, designated GAI-CO-1, was drilled on 8/31/04 by Maine Test Borings, Inc. of Brewer, Maine, using a track-mounted Mobile B-47 drill rig. Drilling in soil was performed using driven casing and wash boring methods and Standard Penetration Test (SPT) split spoon sampling protocols. Drilling in bedrock was performed using diamond NQ2 rock coring with a double-tube core barrel, which produced a 3-inch diameter borehole and a 2 inch diameter rock core sample.

At the completion of drilling a 0.75 inch diameter Schedule 40 PVC standpipe piezometer was installed in the upper portion of the borehole to measure groundwater levels with time. The piezometer was installed in the borehole with a 5 ft. long slotted well screen from 18.0 ft. to 23.0 ft. bgs. The riser pipe was left sticking about 2.6 ft. above ground surface.

Golder geotechnical engineer Ross Bennett was present throughout the field program to select the boring location, determine protocols for soil/rock sampling and piezometer installation, and log the conditions encountered. A detailed description of the conditions encountered is presented on the boring log in Appendix A. A key to the soil and rock descriptions and terms used in the log is provided on Table A-1 in Appendix A.

## **LABORATORY TESTING**

Laboratory tests conducted by Golder's Atlanta, Georgia geotechnical laboratory were limited to five point load index tests conducted on a section of rock core sample R-1 from 9.9-10.7 ft. bgs. Point load index data can be used to assess variations in the rock unconfined compressive strength. The point load tests were conducted using a RocTest Pil-7 apparatus. Test results are presented in Appendix B and indicated on the boring log.

## **SUBSURFACE CONDITIONS**

Subsurface conditions encountered at the test boring included about 5.9 ft. of soil overlying bedrock. The soils included a 0.5-ft. surficial layer of topsoil overlying a 3.0-ft. layer of fill and 2.4-ft. layer of glacial till. The fill is described as loose to medium dense, brown, coarse to fine sand, with little

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<sup>1</sup> Telecommunications Industry Association, "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", TIA-222-F, originally published June 1996, Reaffirmed March 27, 2003.

gravel and trace silt. The till layer is described as dense to very dense, brown, coarse to fine sand, with some silt and little gravel. SPT N-values in the till ranged from 37 to 112.

Bedrock was encountered at a depth of 5.9 ft. bgs at the boring. The bedrock consisted of about 18.2 ft of granite. The granite is described as pink to gray, closely jointed, and medium grained. The degree of weathering observed in the granite was slight from 5.9 to 11.4 ft. bgs, and fresh from 11.4 to 24.1 ft bgs. The rock quality designations (RQDs) for the retrieved core samples ranged from 85% to 100 % indicating the granite was of good to excellent quality. Five point load index tests were completed on core samples of the granite and indicated index based values of unconfined compressive strength (per correlations with Bieniawski<sup>2</sup>) ranging from 13,190 pounds per square inch (psi) to 37,220 psi, with an average of 29,876 psi.

A reading taken from the standpipe piezometer on 8/31/04 at the completion of drilling indicated the groundwater level at the boring was at 13.5 ft. bgs in late summer. Subsequent measurements by MaineDOT personnel on 9/21/04, 9/28/04 and 10/6/04 indicated water levels 12.0 ft., 15.0 ft. and 18.2 ft. bgs, respectively. Groundwater levels will fluctuate with rainfall, snowmelt, surface water runoff, seasonal variations and near-by construction activity.

## **GEOTECHNICAL CONSIDERATIONS FOR DESIGN AND CONSTRUCTION**

### Foundation Support

We recommend the new tower foundation subgrade be established at the surface of unfractured bedrock or 1-ft. below the design frost depth, whichever is shallower. The design frost depth is 5.0 ft. Based on the conditions encountered at the boring, we expect very dense till to be present approximately 4.0 ft. bgs and unfractured bedrock to be present approximately 6.0 ft. bgs at the proposed tower location. However, these depths are likely to vary over the area covered by a large footing. Thus, the tower foundation can bear directly on unfractured rock, compacted structural fill placed on unfractured bedrock, or compacted structural fill placed on very dense undisturbed glacial till, depending on the actual conditions encountered. Considering frost depth criteria and typical foundation design practice for self-supported towers discussed below, we believe a single concrete pier pad supporting all tower legs is the appropriate foundation type for this tower.

From preliminary discussions with a tower manufacturer we understand a concrete foundation pier pad without rock anchors for a three legged self-supported tower would typically need to be about 15 to 20 ft. square, 2 to 3 ft. thick, and founded at least 5 to 6 ft. bgs to provide adequate resistance to overturning.<sup>3</sup> Deeper foundation depths would possibly be required considering design frost depth and site specific soil/rock subgrade conditions. At this site the recommended foundation subgrade is based on the design frost depth and possible variations in the till thickness underlying the foundation footprint. Considering the depth to bedrock at the site and the typical foundation embedment design practice for overturning resistance, rock anchor installations are not applicable to this site. Accordingly, rock anchor design criteria are not discussed in this report. The following subsections provide geotechnical criteria for foundation design.

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<sup>2</sup> Bieniawski, Z.T., "The Point Load Test in Geotechnical Practice", Geomechanics Division, CSIR, Pretoria, South Africa, 1974.

<sup>3</sup> Personal communication between Mark Peterson of Golder and Rick Gaul of Valmont Structures via telephone on 8/24/04.

*Frost Depth* – Based on a design freezing index for Athens, Maine of 1400 degree days<sup>4</sup>, and correlations to frost penetration depth presented on Table 5-1 of the MaineDOT Bridge Design Guide<sup>4</sup>, the design frost depth is 5.0 ft. for this site. Accordingly, the base of a pier pad foundation should be founded at least 5.0 ft. below the lowest adjacent grade for frost protection.

*Groundwater Table* – The groundwater level at the borehole measured between August and early-October 2004 varied from about 13.5 ft. to 18.2 ft. bgs. Higher groundwater levels may occur during wet periods of the year. The existing piezometer at the boring location could be measured during the course of the year to assess actual groundwater fluctuations at the site. In the absence of such measurements and considering the depth and high quality of the bedrock at the site, and the relatively dry fall 2004 season in Maine, we recommend the groundwater table be assumed at the bedrock surface (i.e., 6 ft. bgs) for design purposes.

*Bearing Capacity* – For foundations bearing directly on unfractured granite bedrock the allowable bearing capacity of the rock is very high when correlated to the estimated rock compressive strengths determined from the point load testing. We recommend an allowable bearing pressure of 30 kips per square foot (ksf) for compression loads be used for design. A minimum footing width of 3 ft. for individual tower leg footings is recommended in the event a large pad is not used.

If unfractured rock is not encountered at the 5 ft. design frost depth, we recommend the subgrade be overexcavated 1-ft. so that the foundation can be supported either on bedrock at the lower grade, or on compacted structural fill placed between the frost depth and the overexcavated depth. For the latter case, the structural fill should meet the gradation requirements of MDOT 703.06 (b), Type D with a 3-in. maximum particle size. The structural fill should be placed in loose lifts not exceeding 9 inches in thickness, and compacted to at least 95 percent of its ASTM D-1557 maximum dry density. For structural fill subgrades prepared as recommended, we recommend an allowable bearing capacity of 5 kips per square foot (ksf) be used for design.

Since actual conditions across the tower foundation footprint may vary from the conditions encountered at the boring, we recommend the footing subgrade be approved by an experienced engineer or geologist during construction.

*Settlement* – For foundation bearing pressures less than or equal to 30 ksf for footings on unfractured rock, or 5 ksf for footings on compacted structural fill, foundation settlements are expected to be negligible and less than ½ inch. Settlement will occur rapidly as the tower structure dead and live loads are applied.

#### Resistance to Lateral Loads

Lateral loads can be resisted by passive earth pressure acting against the side of the foundation or friction along the bottom of the foundation pier pad. Due to differences in the deformation required

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<sup>4</sup>Maine Department of Transportation, "Bridge Design Guide", prepared by Guertin Elkerton & Associates, August 2003.

to mobilize passive earth pressures and that to develop base friction, we do not recommend the use of both forces together to resist lateral loads. For passive earth pressure resistance we recommend equivalent fluid pressure values for design equal to 400 psf per foot of depth for native soils. For design, the water table can be assumed to be at 6 ft. bgs.

For base friction we recommend a concrete to rock interface friction angle of 35 degrees be used for design, resulting in a friction factor of 0.70 times the normal load on the base of the footing. For a concrete to structural fill interface we recommend a friction factor of 0.55 be used. The normal load should include the total weight of the tower foundation and overlying soil above the water table, and the dead weight of the tower. A minimum factor of safety of 1.5 against sliding is recommended for design.

### Uplift Resistance

In accordance with TIA-222-F resistance to uplift for a pier pad foundation can be provided by the weight of the concrete pier and the weight of soil overlying the foundation enclosed within an inverted pyramid whose sides form a 30 degree angle with the vertical. The unit weight of soil overlying the foundation is required to be assumed equal to 100 pcf per TIA-222-F. Similarly, the weight of foundation concrete is required to be assumed equal to 150 pcf for this analysis. If applicable, buoyant weights should be used for soil and concrete below a depth of 6 ft.

### Site Preparation

Excavations for the tower foundation are expected to extend up to about 6 ft. below the existing ground surface. Open cut slopes should be sloped or braced in accordance with applicable OSHA requirements. For excavations beneath the foundation to replace existing soils with structural fill, the width of the overexcavated area should be equal to at least  $B+1.2H$ , where B is the footing width and H is the total depth of overexcavation.

For foundations supported directly on bedrock, the rock surface should be cleaned of all overburden soils, and loose, disturbed or visibly fractured bedrock should be removed by mechanical means. Mechanical means include expansive agents, use of hydraulic hoe ram, hydraulic splitters, or wedging and prying. Final rock surface preparation should include washing with a high pressure water jet.

For foundations supported on soil, any subgrade soils or weathered rock loosened or disturbed during the excavation process should be compacted in accordance with the criteria discussed in the Foundation Support section of this report (assuming the water content of the native soil is conducive to compaction) to produce a firm and relatively smooth bearing surface, or excavated and replaced with compacted structural fill. If the subgrade conditions are wet and difficult excavation drainage conditions are encountered, we recommend any disturbed foundation subgrade soils be replaced with  $\frac{3}{4}$  inch crushed drainage stone meeting the material requirements of MaineDOT 703.22 Underdrain Backfill Material Type C. For this application the crushed stone should be compacted with several passes of a vibratory plate compactor. Structural fill or  $\frac{3}{4}$ -inch drainage stone fill should be placed in compacted lifts not exceeding 9 inches in thickness.

Surface water should be diverted away from the foundation excavation throughout the period of construction. If groundwater is encountered at the base of the foundation excavation it should be

removed promptly by dewatering with a sump pump located in a corner of the excavation beyond the foundation footprint.

The existing fill material at the site extending from about 0.5 ft. to 3.5 ft. bgs at the boring location is described as coarse to fine sand with little gravel and trace (less than 10%) silt. Assuming the fill encountered at the boring location is found to be representative of the existing fill present throughout the tower foundation area, we believe this material is suitable for reuse as backfill above the pier pad foundation and/or as backfill around the perimeter of the foundation excavation. These materials should be placed in 9-inch lifts and compacted to at least 93 percent of their ASTM D-1557 maximum dry density.

The existing glacial till soils at the site are considered highly frost susceptible and are not suitable for reuse as backfill above the tower foundation or as backfill against the perimeter of the foundation pier pad. Imported soil backfill used for these purposes should meet the requirements for structural fill (MaineDOT 703.06 (b) Type D) and should be placed in 9-inch lifts. These materials should be compacted to at least 93 percent of their ASTM D-1557 maximum dry density.

#### Rock Removal

Assuming the bedrock surface is consistently at or below a depth of about 6 ft. bgs throughout the proposed foundation area, we do not expect that bedrock excavation will be required. However, in the event bedrock removal is required it is anticipated that removal by mechanical means (i.e., ripping, hoe ramming, etc.) would be of limited success due to the high strength and limited fracturing of the granite bedrock, and blasting would be required. To avoid damage to existing nearby structures, the effects of blast-related ground vibration, airblast overpressure and flyrock must be considered. If blasting is required, allowable ground vibration criteria should be established for nearby structures, pre-blast condition surveys of the nearby structures should be performed, and a blasting specification should be prepared and incorporated with the construction documents. The blasting specification should address the following considerations:

- Applicable blasting codes and standards
- Health and Safety plans
- Blasting contractor qualifications
- Submittals/notifications
- Preblast surveys
- Blasting schedule/hours
- Thunderstorm/lightning protocol
- Insurance requirements
- Safety precautions/warning signals
- Blast Monitoring
- Indemnification
- Blasting materials/environmental restrictions
- Storage/delivery of explosive materials
- Rock excavation methods
- Excavation limits and overblast mitigation
- Controlled blasting
- Flyrock and overbreak control
- Vibration and airblast limits
- Blasting records

#### Construction Monitoring

We recommend that a qualified geotechnical or construction engineer observe and evaluate certain phases of the tower foundation construction including:

- Foundation subgrade prior to placement of footing form work.
- Subgrade soil overexcavation and replacement, if required.

- Placement and compaction of soils around the perimeter of and on top of the tower pier pad foundation.

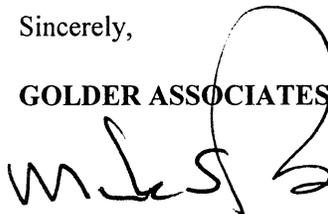
## CLOSURE

This report has been prepared for the use of the MaineDOT Maintenance and Operations division for specific application to the proposed radio tower in Cooper, Maine in accordance with generally accepted professional engineering and geologic principles and practice. Golder makes no other warranty express or implied. The findings and recommendations were based on results of the field investigation, combined with an interpolation of soil, bedrock and groundwater conditions encountered. If changes in the tower structure or location are planned from that described herein, or if subsurface conditions encountered during construction differ from those described in the exploration logs, Golder should be notified so that we may review and verify or modify our conclusions and recommendations. We also recommend that Golder be provided the opportunity to review final design drawings and specifications to confirm that the earthwork and foundation recommendations are properly interpreted and implemented in the design and specifications.

We appreciate the opportunity to assist MaineDOT with this project. If you have any questions or if we can be of further assistance please contact Mark Peterson at 373-1520.

Sincerely,

GOLDER ASSOCIATES INC.

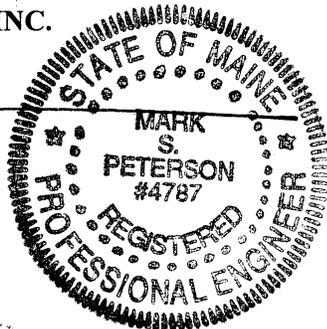


Mark S. Peterson, P.E.  
Senior Consultant

MSP/msp

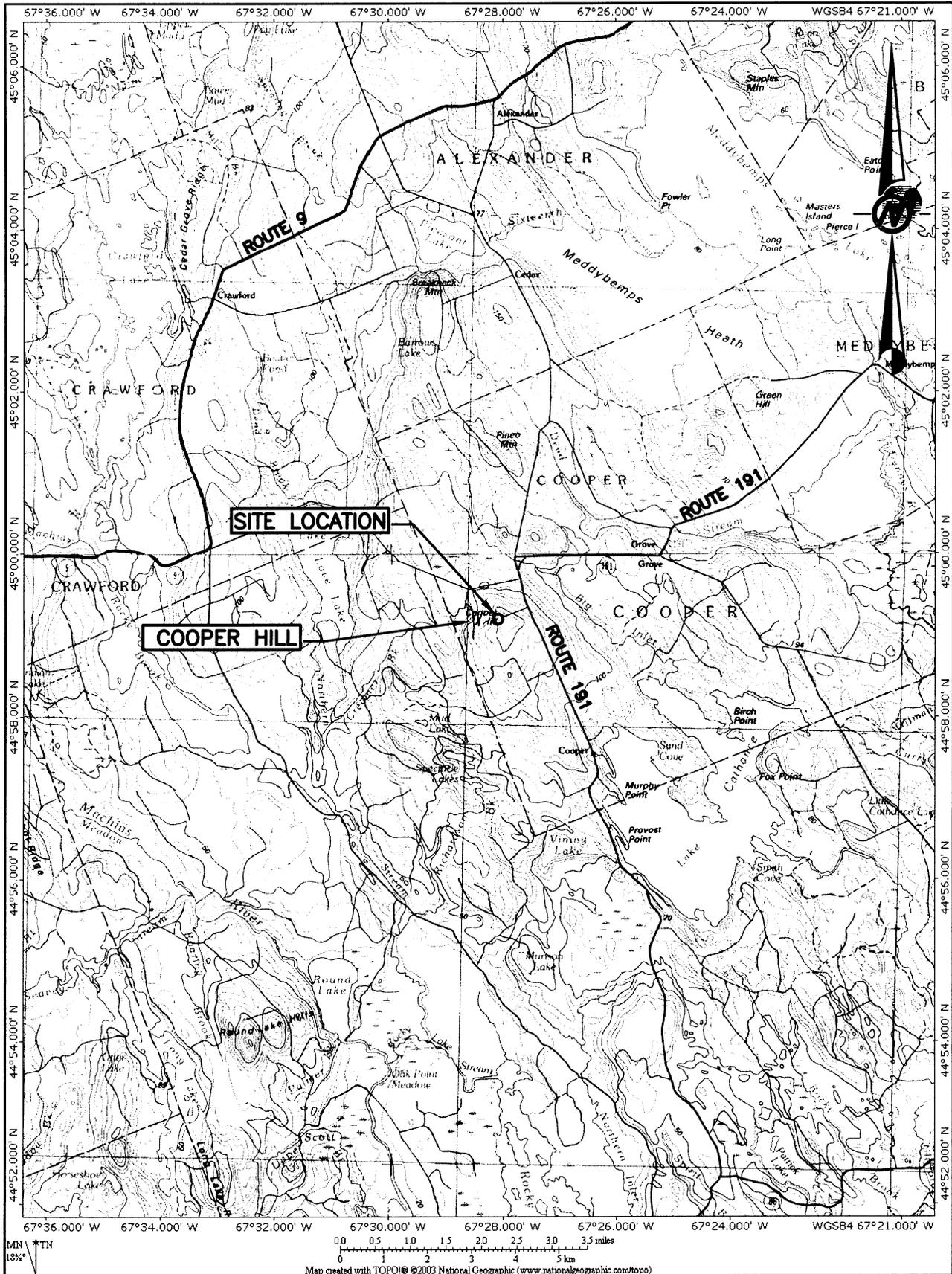
Attachments

- |            |                              |
|------------|------------------------------|
| Figure 1   | Site Area Map                |
| Figure 2   | Boring Location Sketch       |
| Appendix A | Log for Test Boring GAI-CO-1 |
| Appendix B | Laboratory Test Results      |



Peter C. Conti, P.E.  
Principal

## **FIGURES**



Dec 10, 2004 - 10:40am

Drawing file: 0436838D001.dwg



SCALE	AS SHOWN
DATE	11/23/04
DESIGN	RWB
CADD	MPB
CHECK	MSP



# SITE LOCATION MAP

FILE No. 0436838D001

PROJECT No. 043-6838.004 REV. 0

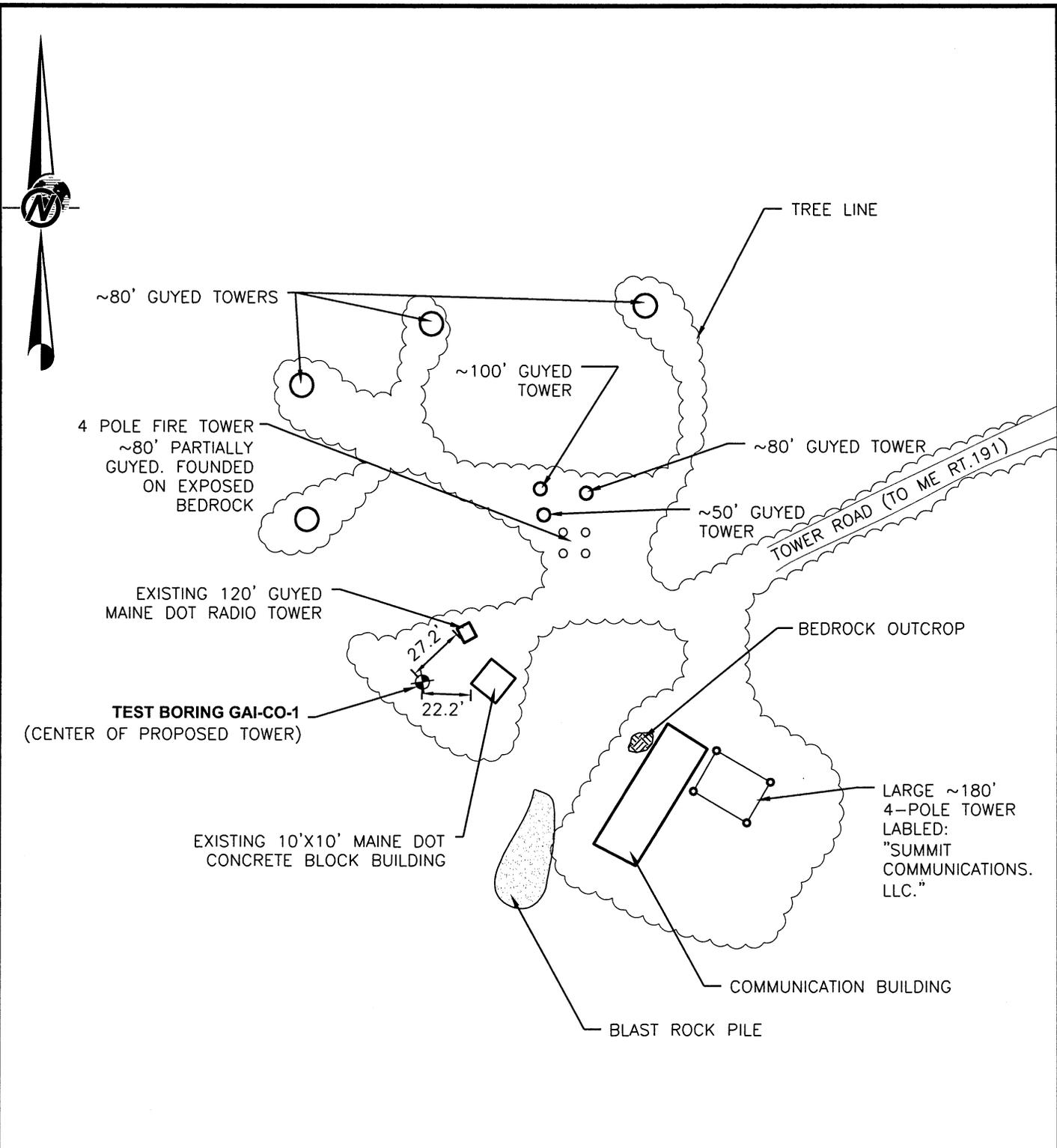
CHECK MSP

REVIEW *pec*

MAINEDOT, PROPOSED RADIO TOWER,  
COOPER, MAINE

FIGURE

1



**NOTES**

1.) LOCATION SKETCH DEVELOPED FROM TAPED MEASUREMENTS TO EXISTING FACILITIES ON 8/31/04 BY GOLDER PERSONNEL. SKETCH NOT TO SCALE

Drawing file: 0436838D002.dwg Dec 10, 2004 - 10:41am

 <p><b>Golder Associates</b> BRUNSWICK, ME</p>	SCALE	NTS	<p><b>BORING LOCATION SKETCH</b></p>	
	DATE	11/23/04		
	DESIGN	RWB		
	CADD	MPB		
FILE No.	0436838D002	CHECK	MSP	<p>MAINEDOT, PROPOSED RADIO TOWER, COOPER, MAINE</p>
PROJECT No.	043-6838.004	REV.	0	
		REVIEW	<i>pc</i>	

**APPENDIX A**

**LOG FOR TEST BORING GAI-CO-1**

UNIFIED SOIL CLASSIFICATION SYSTEM				TERMS DESCRIBING DENSITY/CONSISTENCY																												
MAJOR DIVISIONS		GROUP SYMBOLS		TYPICAL NAMES																												
COARSE-GRAINED SOILS  (more than half of material is larger than No. 200 sieve size)	GRAVELS  (more than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVELS	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.	<p><b>Coarse-grained soils</b> (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) silty or clayey gravels; and (3) silty, clayey or gravelly sands. Consistency is rated according to standard penetration resistance.</p> <p>Modified Burmister System</p> <table border="1"> <thead> <tr> <th>Descriptive Term</th> <th>Portion of Total</th> </tr> </thead> <tbody> <tr> <td>trace</td> <td>0% - 10%</td> </tr> <tr> <td>little</td> <td>11% - 20%</td> </tr> <tr> <td>some</td> <td>21% - 35%</td> </tr> <tr> <td>adjective (e.g. sandy, clayey)</td> <td>36% - 50%</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Density of Cohesionless Soils</th> <th>Standard Penetration Resistance N-Value (blows per foot)</th> </tr> </thead> <tbody> <tr> <td>Very loose</td> <td>0 - 4</td> </tr> <tr> <td>Loose</td> <td>5 - 10</td> </tr> <tr> <td>Medium Dense</td> <td>11 - 30</td> </tr> <tr> <td>Dense</td> <td>31 - 50</td> </tr> <tr> <td>Very Dense</td> <td>&gt; 50</td> </tr> </tbody> </table>	Descriptive Term	Portion of Total	trace	0% - 10%	little	11% - 20%	some	21% - 35%	adjective (e.g. sandy, clayey)	36% - 50%	Density of Cohesionless Soils	Standard Penetration Resistance N-Value (blows per foot)	Very loose	0 - 4	Loose	5 - 10	Medium Dense	11 - 30	Dense	31 - 50	Very Dense	> 50					
		Descriptive Term	Portion of Total																													
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Medium Dense	11 - 30																															
Dense	31 - 50																															
Very Dense	> 50																															
GP	Poorly-graded gravels, gravel sand mixtures, little or no fines.																															
GRAVEL WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.																														
GC	Clayey gravels, gravel-sand-clay mixtures.																															
SANDS  (more than half of coarse fraction is smaller than No. 4 sieve size)	CLEAN SANDS	SW	Well-graded sands, gravelly sands, little or no fines																													
	(little or no fines)	SP	Poorly-graded sands, gravelly sand, little or no fines.																													
	SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures																													
		SC	Clayey sands, sand-clay mixtures.																													
FINE-GRAINED SOILS  (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS  (liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity.	<p><b>Fine-grained soils</b> (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) gravelly, sandy or silty clays; and (3) clayey silts. Consistency is rated according to shear strength as indicated.</p> <table border="1"> <thead> <tr> <th>Consistency of Cohesive soils</th> <th>SPT N-Value blows per foot</th> <th>Approximate Undrained Shear Strength (psf)</th> <th>Field Guidelines</th> </tr> </thead> <tbody> <tr> <td>Very Soft</td> <td>0 - 2</td> <td>0 - 250</td> <td>Fist easily Penetrates</td> </tr> <tr> <td>Soft</td> <td>3 - 4</td> <td>250 - 500</td> <td>Thumb easily penetrates</td> </tr> <tr> <td>Medium Stiff</td> <td>5 - 8</td> <td>500 - 1000</td> <td>Thumb penetrates with moderate effort</td> </tr> <tr> <td>Stiff</td> <td>9 - 15</td> <td>1000 - 2000</td> <td>Indented by thumb with great effort</td> </tr> <tr> <td>Very Stiff</td> <td>16 - 30</td> <td>2000 - 4000</td> <td>Indented by thumbnail</td> </tr> <tr> <td>Hard</td> <td>&gt;30</td> <td>over 4000</td> <td>Indented by thumbnail with difficulty</td> </tr> </tbody> </table>	Consistency of Cohesive soils	SPT N-Value blows per foot	Approximate Undrained Shear Strength (psf)	Field Guidelines	Very Soft	0 - 2	0 - 250	Fist easily Penetrates	Soft	3 - 4	250 - 500	Thumb easily penetrates	Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort	Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort	Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail	Hard	>30	over 4000	Indented by thumbnail with difficulty
		Consistency of Cohesive soils	SPT N-Value blows per foot		Approximate Undrained Shear Strength (psf)	Field Guidelines																										
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Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail																													
Hard	>30	over 4000	Indented by thumbnail with difficulty																													
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.																															
OL	Organic silts and organic silty clays of low plasticity.																															
SILTS AND CLAYS  (liquid limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.																														
	CH	Inorganic clays of high plasticity, fat clays.																														
	OH	Organic clays of medium to high plasticity, organic silts.																														
HIGHLY ORGANIC SOILS	Pt	Peat and other highly organic soils.																														
<p><b>Desired Soil Observations: (in this order)</b>  Color (Munsell color chart)  Moisture (dry, damp, moist, wet, saturated)  Density/Consistency (from above right hand side)  Name (sand, silty sand, clay, etc., including portions - trace, little, etc.)  Gradation (well-graded, poorly-graded, uniform, etc.)  Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic)  Structure (layering, fractures, cracks, etc.)  Geologic Origin (till, marine clay, alluvium, etc.)  Unified Soil Classification Designation  Groundwater level</p>				<p><b>Rock Quality Designation (RQD):</b>  <math>RQD = \frac{\text{sum of the lengths of intact pieces of core} &gt; 4 \text{ in.}}{\text{length of core advance}}</math>  *Minimum NQ rock core (1.88 in. OD of core)</p> <table border="1"> <thead> <tr> <th>Rock Quality Description</th> <th>RQD</th> </tr> </thead> <tbody> <tr> <td>Very Poor</td> <td>&lt;25%</td> </tr> <tr> <td>Poor</td> <td>26% - 50%</td> </tr> <tr> <td>Fair</td> <td>51% - 75%</td> </tr> <tr> <td>Good</td> <td>76% - 90%</td> </tr> <tr> <td>Excellent</td> <td>91% - 100%</td> </tr> </tbody> </table> <p><b>Desired Rock Observations: (in this order)</b>  Color (Munsell color chart)  Texture (aphanitic, fine-grained, etc.)  Lithology (igneous, sedimentary, metamorphic, etc.)  Hardness (very hard, hard, mod. hard, etc.)  Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.)  Geologic discontinuities/jointing:  -dip (horiz - 0-5, low angle - 5-35, mod. dipping - 35-55, steep - 55-85, vertical - 85-90)  -spacing (very close - &lt;5 cm, close - 5-30 cm, mod. close 30-100 cm, wide - 1-3 m, very wide &gt;3 m)  -tightness (tight, open or healed)  -infilling (grain size, color, etc.)  Formation (Waterville, Ellsworth, Cape Elizabeth, etc.)  RQD and Rock Mass Description (very poor, poor, fair, etc.)  Recovery</p>		Rock Quality Description	RQD	Very Poor	<25%	Poor	26% - 50%	Fair	51% - 75%	Good	76% - 90%	Excellent	91% - 100%															
Rock Quality Description	RQD																															
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**Table A-1**  
**KEY TO SOIL and ROCK DESCRIPTIONS**  
Including Boring Log Terms and  
Field Identification Information





**APPENDIX B**

**LABORATORY TEST RESULTS**



**TABLE B-2**  
**MAINEDOT - BUREAU OF MAINTENANCE AND OPERATIONS**  
**PROPOSED RADIO TOWER AT COOPER, MAINE**  
**SUMMARY OF POINT LOAD TESTING ON ROCK CORE SAMPLES**  
**ASTM D5731**

SAMPLE IDENTIFICATION	DEPTH (ft)	BREAK NUMBER	TEST TYPE <sup>1</sup>	CORE DIAMETER (mm)	P FORCE AT FAILURE (lb)	I <sub>s</sub> POINT LOAD STRENGTH INDEX <sup>2</sup> (psi)	ESTIMATED UCS BASED ON CORRELATION WITH POINT LOAD INDEX <sup>3</sup> (psi)	DRY UNIT WEIGHT (pcf)	COMMENTS
GAI-CO-1/R-1	9.9-10.7	1	D	50.6	5160.9	1308.2	30,090		
		2	D	50.6	5887.7	1492.5	34,330		
		3	D	50.6	6383.7	1618.2	37,220		
		4	D	50.6	5926.2	1502.2	34,550		
		5	D	50.6	2261.9	573.4	13,190		

**Notes:**

1. D = Diametral.
2. I<sub>s</sub> = Point Load Strength Index = P/core diameter squared.
3. Estimated UCS values calculated from I<sub>s</sub> x 23 based on correlation in "Rock Slope Engineering" Hoek and Bray, 1981.